Code Check® Building

Fourth Edition

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Based on the 2015 International Residential Code®, including major changes from the 2012 edition

For updates and information related to this book, visit www.codecheck.com

SCOPE OF THIS BOOK

Code Check Building is a field guide to commonly used provisions of chapters 1–10 of the 2015 edition of the International Residential Code (IRC). The scope of the IRC is one- and two-family dwellings and townhouses and their accessory structures (such as detached garages). A townhouse, in this sense, is a single-family dwelling unit constructed in a group of three or more units with each unit extending from foundation to roof and open to a yard or public way on at least two sides. In all cases, the scope of the IRC and this book is limited to structures not more than three stories above grade plane in height. Other books in the Code Check series deal with the electrical, mechanical, and plumbing aspects of the IRC. Multi-family dwelling units are within the scope of the International Building Code (IBC).

The IRC contains prescriptive requirements. Within specified geologic and climatic conditions, it provides construction methods that do not require further engineering design. The methods and materials covered in the IRC are not the only ones allowed; rather, they are simply the ones for which there is a standard methodology. As an example, the IRC tells us how far we need to set back the foundation from a slope break (**p. 12**). If you want to build it closer than allowed by the IRC, a design professional must apply the engineering requirements of the IBC.

The text lines in Code Check provide a brief summary of a code citation, followed by the code number. The amount of text in Code Check is not the complete code, and we encourage you to refer to the entire code text whenever possible. The full text of each code cited in Code Check is available online on ICC's website. For 2015 IRC references, go to http://codes.iccsafe.org/I-Codes.html. For 2012 and earlier IRC references, go to http://publicecodes.cyberregs.com/icod/irc/index.htm.

Always consult with the local building department before beginning a project. They will provide information on which model code editions are used in your area and on the state or local amendments that apply. The codes for some states and cities are also available on ICC's website at http://codes.iccsafe.org/.

This book is primarily geared to wood frame buildings over concrete or CMU foundations. Other topics covered in the IRC, such as wood foundations, structural insulated panel (SIP) construction, insulated concrete forms (ICF), and steel framing, cannot be included because of space limitations.

The actual code lines in the IRC begin with the letter R; we have omitted the R to save space.

KEY TO USING THIS BOOK

The line for each code rule starts with a checkbox and ends with a code reference from the 2015 IRC. Exceptions and lists start with a bullet, and exception lines also end with a code reference. Changes from the 2012 code are highlighted by having the reference in a different color and an endnote to the table on the inside back cover. In some cases, the change occurred in the 2012, as shown in the table.

Example from p. 22:

☐ Footings supported on undisturbed soil or engineered fill **F18** _____ 403.1

This line is telling us that section 403.1 requires footings on previously undisturbed soil and that figure 18 is an example.

Exceptions to a code rule are noted by EXC at the end of a line, followed by a bulleted line with the exception, as in this example from **p. 8**:

☐ Threshold at req'd egress door max 1 1/2 in. above landing or floor EXC **F7** 311.3.1

• 7 3/4 in. below threshold OK if door not swinging over landing ____ 311.3.1X

These lines tell us that section 311.3.1 limits the required egress door threshold height to 1 1/2 in. except for a landing that can be 7 3/4 in. below if the door does not swing over it, and that figure 7 is an example.

Significant changes are given a different color code citation followed by a superscript number that is commented on in the inside back cover, as in this example from **p. 4**:

☐ Min 6 ft. 8 in. bathrooms, toilet rooms & laundry rooms _____ 305.1[10]

The rule for min ceiling height has been lowered from 7 ft. to 6 ft. 8 in. for these rooms. It can be found in section 305.1 of the IRC. On the inside back cover, this line is explained as ***code change #10****.*

ABBREVIATIONS

AMI	in accordance with manufacturers' instructions	**LL**	lot line
ASTM	American Society for Testing & Materials	**max**	maximum
BO	building official	**min**	minimum
BWL	braced wall line	**mph**	miles per hour
BWP	braced wall panel	**o.c.**	on center
cfm	cubic feet per minute	**PT**	pressure treated
CMU	concrete masonry unit	**psf**	pounds per square foot
DFE	design flood elevation	**psi**	pounds per square inch
exc	except	**req**	require
EXC	exception (follows in next line)	**req'd**	required
FRT	fire-retardant treated	**req's**	requires, requirements
FSD	fire separation distance	**SDC**	seismic design category
GB	gypsum board	**SDC D**	SDC D_0, D_1, & D_2
hr	hour	**UL**	Underwriters Laboratories
IBC	International Building Code	**w/**	with
L&L	listed & labeled	**w/o**	without
		WRB	water-resistive barrier
		WSP	wood structural panel

ALTERNATIVE DESIGN DOCUMENTS

The American Forest and Paper Association publishes the *Wood Frame Construction Manual for One- and Two-Family Dwellings (WFCM)*, which can be used as an alternate to IRC designs for wood framing and can be used for buildings where wind design is required.

The American Iron and Steel Institute (AISI) publishes the *Standard for Cold-Formed Steel Framing–Prescriptive Method for One- and Two-Family Dwellings (AISI S230),* which can be used as an alternative to the IRC. It can also be used for buildings where wind design is required.

The American Concrete Institute (ACI) publishes two documents that supplement the prescriptive rules of the IRC. These are *ACI 318–Building Codes for Structural Concrete* and *ACI 530–Building Code Requirements for Masonry Structures.*

The Truss Plate Institute (TPI) publishes *TPI 1–National Design Standard for Metal Plate Connected Wood Truss Construction*, which is mandatory for metal-plate-connected truss design. TPI also contributes to *BCSI 1-03 Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses.*

The American Society of Civil Engineers (ASCE) publishes *ASCE 24–Flood-Resistant Design and Construction,* which can be used as an alternative to the prescriptive requirements of IRC R322. It is mandatory for construction in identified floodways.

The American Society of Civil Engineers (ASCE) publishes *ASCE 7–Minimum Design Loads for Buildings and Other Structures*. It is the basis of the structural engineering provisions of the IBC. It can be used for buildings where wind design is required.

The International Code Council (ICC) publishes *ICC 600–The Standard for Residential Construction in High-Wind Regions*. It can be used for buildings where wind design is required.

SEQUENCE OF THE BOOK

Pages 6–19 of this book cover topics that are relevant to planning, inspections, and non-structural issues.
Pages 19–48 deal with foundations and framing.
Pages 49–68 deal with cladding, coverings, and other items typically covered in the final inspection.
The inside back cover summarizes significant changes in the 2015 IRC.

Special thanks to Skip Walker for his invaluable assistance in making this book. Cheers!

Why Do We Feaure Ben?

Benjamin Franklin was chosen as the main character in our Code Check illustrations for a number of reasons. The “First American’s” insatiable curiosity, scientific genius, and civic-mindedness drove him to promote fire safety, safe exiting, public sanitation, improved heating methods to reduce air pollution, and of course, electricity. Franklin contributed to each of the four main disciplines of building inspection: Building, Plumbing, Mechanical, and Electrical.

To find out more, visit:
www.codecheck.com/why-do-we-feature-ben

In 1735, Benjamin Franklin organized the first volunteer fire department in Philadelphia, which still remains the model for U.S. fire departments.

GLOSSARY

The following glossary is an abbreviated version of the full glossary for this book, available online at www.codecheck.com/CCB4/Glossary.pdf. There is a more complete list of definitions found in Chapter 2 of each of the codes referenced in CodeCheck.

Aspect ratio: The ratio of longest to shortest dimensions, or for wall sections, the ratio of height to length.

Attic: The unfinished space between the ceiling assembly of the top story and the roof assembly.

Attic, habitable: A finished or unfinished area meeting minimum room dimension and ceiling height requirements and enclosed by the roof assembly above, knee walls (if applicable) on the sides, and the floor–ceiling assembly below. Habitable attics are sometimes referred to as lofts.

Basement: A portion of a building that is partly or completely below grade.

Braced wall line (BWL): A straight line on the building plan indicating the location of the lateral resistance provided by wall bracing. It does not necessarily align with the exact location of the bracing.

Braced wall panel (BWP): A full-height section of wall constructed to resist shear forces by application of bracing materials.

Building thermal envelope: The basement walls, exterior walls, floor, roof, and other building elements that enclose conditioned space.

Connector: A device such as a joist hanger, post base, hold-down, mudsill anchor, or hurricane tie used to connect structural components–***also see Fastener.***

Cripple wall: Wood-framed wall extending from the foundation to joists below the first floor. Found in the underfloor area.

Dampproofing: A coating intended to protect against the passage of water vapor through walls or other building elements. It is a lesser degree of protection than waterproofing.

Dead load: The weight of all materials of the building and fixed equipment.

Diaphragm: A horizontal or nearly horizontal system, such as a floor, acting to transmit lateral forces to the vertical resisting elements.

Fastener: Generic category that includes nails, screws, bolts, and anchors–***also see Connector.***

Fire separation distance: The distance measured perpendicular from the building face to the closest interior lot line or to the centerline of a street, alley, or public way.

Grade: The finished ground level adjoining the building at all exterior walls.

Habitable space: Space in a building for living, sleeping, eating, and cooking. Bathrooms, bathroom closets, hallways, storage, and utility areas are not considered habitable space.

Live loads: Loads produced by use and occupancy of the building and not including wind, snow, rain, earthquake, flood, or dead loads.

Monolithic: Concrete cast in one continuous operation with no joints, such as a footing and floor slab or a footing and foundation stem wall.

Perm: The unit of measurement of water vapor transmission through a material, based on the number of grains of water vapor at a given pressure differential. Vapor retarders are rated in perms.

Plain concrete or masonry: Structural concrete or masonry with less reinforcement than the minimum amount specified for reinforced concrete or masonry.

Seismic design category (SDC): Classification assigned to buildings based on the occupancy category and severity of earthquake ground motion expected at the site.

Story: That portion of a building that is between the upper surface of one floor and below the upper surface of the next floor above or the roof.

Story above grade: The parts of the building that are entirely above grade, or basements that are more than 6 feet above grade for more than 50% of the total building perimeter or more than 12 feet above ground at any point.

Townhouse: Single-family dwelling unit constructed in groups of three or more attached units in which each unit extends from foundation to roof and with a yard or public way on at least two sides.

Waterproofing: Materials that protect walls or other building elements from the passage of moisture as either vapor or liquid under hydrostatic pressure.

Wood structural panel (WSP): A panel manufactured from veneers (plywood) or wood strands (OSB) and bonded with waterproof synthetic resins. Wood structural panels must bear a grade stamp and are used in floors, roof diaphragms, and shear walls.

CODE CHECK BUILDING TABLE OF CONTENTS

PLANNING, PERMITS & INSPECTIONS

Prior to starting a project, approval is needed from the local planning and building departments; specific requirements vary from one jurisdiction to another. Local or state adoption of the codes may also include amendments that differ from the requirements shown in this book. Plans by a licensed design professional will bear a signature and stamp. In some cases, special inspections are required to be conducted either by 3rd party agencies or the engineer of record. The frame inspection is an important milestone. Bank draws are sometimes based upon passing that inspection.

Plans & Permits — 15 IRC

- ☐ Permits req'd for new work, additions, repairs & alterations _____ 105.1
- ☐ Permit application must identify proposed scope of work, address, intended use & valuation & include construction documents _____ 105.3
- ☐ Site or plot plan req'd for new structures & additions _____ 106.2
- ☐ If in flood hazard area, plans to include DFE, elevation of lowest floor & bottom of lowest structural member _____ 106.1.4[1]
- ☐ Local statutes may req stamped plans _____ 106.1
- ☐ BO may req plans to include BWL locations & methods _____ 106.1.3[2]
- ☐ BO may approve alternative materials, design & methods _____ 104.11
- ☐ Approved permit card req'd to be on site _____ 105.7
- ☐ Approved plans req'd to be on site _____ 106.3.1

Work Exempt from Permits — 15 IRC 105.2

- 1-story detached accessory structures ≤ 200 sq. ft. floor area
- Fences ≤ 7 ft. high*
- Retaining walls ≤ 4 ft. from bottom of footing to top of wall & no surcharge
- Water tanks on grade ≤ 5,000 gallons & ≤ 2:1 height/width ratio
- Sidewalks & driveways
- Painting, papering, tiling, carpeting, cabinets, countertops, similar finish work
- Pre-fab pools < 24 in. deep (check local – may req electric permit)
- Swings & playground equipment
- Window awnings projecting ≤ 54 in. & requiring only exterior wall support
- Decks ≤ 200 sq. ft. & ≤ 30 in. above grade & not attached to dwelling & not serving req'd exit door

** The intent of this 2012 code change was to consider that fence posts might be taller than the 6-ft. fence between them. Be sure to check with the local jurisdiction for its interpretation and any local regulations.*

Required Inspections — 15 IRC

- ☐ Inspection & approval req'd prior to concealing any work _____ 109.4
- ☐ In flood hazard areas, registered design professional req'd to document lowest floor elevation before construction above it _____ 109.1.3
- ☐ Foundation forms & reinforcement prior to placing concrete _____ 109.1.1
- ☐ MEP (mechanical, electrical, plumbing) roughs prior to frame _____ 109.1.2
- ☐ Frame after roof, masonry, bracing, fire & draftstop & MEP approved 109.1.4
- ☐ BO may req 3rd-party inspection of specified items _____ 104.4 & 109.2
- ☐ Fire-resistance-rated drywall req's inspection before tape & plaster 109.1.5.1
- ☐ If in flood hazard area, documentation of elevations must be submitted to BO prior to final inspection _____ 109.1.6.1
- ☐ Final inspection req'd prior to occupancy _____ 109.1.6

TABLE 1 — ALLOWABLE DEFLECTION OF STRUCTURAL MEMBERS [T301.7]

Structural Member	Deflection
Rafters ≤ 3:12 slope & no finished ceiling attached to rafters	*L*/180
Interior walls and partitions	*H*/180
Floors	*L*/360
Ceilings w/ brittle finishes – including plaster & stucco	*L*/360
Ceilings w/ flexible finishes – including gypsum board	**L/240[3]**
All other structural members	*L*/240[A]
Exterior walls – wind loads w/ plaster or stucco finishes	*H*/360
Exterior walls – wind loads w/ other brittle finishes	*H*/240
Exterior walls – wind loads w/ flexible finishes & GB interior	*H*/180
Exterior walls – wind loads w/ flexible finishes & no GB	*H*/120
Lintels supporting masonry veneer walls	*L*/600

A. For cantilevers, *L* shall be considered twice the length of the cantilever.

T1 is a performance standard that serves as the design basis for T3 & the span tables for joists, rafters & studs.

TABLE 2 CLIMATIC & GEOGRAPHIC DESIGN CRITERIA (FILL-IN TABLE) T301.2(1)

Ground Snow Load[A]	Wind Design				Seismic Design Category[B]	Subject to Damage From			Winter Design Temp[B]	Ice Barrier Req'd[B,C]	Flood Hazards[B]	Air Freezing Index[B]	Mean Annual Temp[B]
	Speed (mph)[B]	Topo-graphic Effects[B,C]	Special Wind Re-gion[B,C]	Wind-borne Debris Zone[B,C]		Weathering (Concrete)[D]	Frost Line Depth[B]	Termites[B]					

A. From IRC figure 301.2(5) or local information.
B. To be filled in by the building jurisdiction.
C. These questions can be answered yes or no.
D. From IRC figure 301.2(3).

DESIGN

The first design considerations are geographic. Determine whether the property is in a flood hazard area based on FEMA maps or other sources. Determine the design wind speed and the seismic design category from the maps in the IRC. Where these indicate that wind design is required, ASCE-7 or other design standards must be used. Site-specific wind maps are available at www.atcouncil.org/windspeed. The IRC assigns a seismic design category (SDC) from A to E, with A the least likely to experience seismic activity and E the most vulnerable. Category D is further broken down into 3 subparts, D_0, D_1, and D_2. Buildings in SDC E must be designed to the IBC. However, the BO can allow an E to be designated as D_2 (and therefore within the prescriptive scope of the IRC) if the building has no "irregular" portions and has wall bracing continuous in one plane from the foundation to the uppermost story with no cantilevers.

General Design Criteria — 15 IRC

- ☐ Determine climatic & geographic design criteria _____ 301.2
- ☐ Complete **T2** from IRC maps & information from building department _ 301.2
- ☐ Non-conventional building elements req design in accordance w/ accepted engineering practice _____ 301.1.3
- ☐ Engineered design per IBC permitted for all structures _____ 301.1.3

Flood Hazard Areas — 15 IRC

- ☐ Establish design flood elevation _____ 322.1.4
- ☐ Buildings in flood hazard areas req design per IRC R322 or ASCE 24 301.2.4
- ☐ Buildings w/substantial damage of any origin w/ repair costs > 50% of value require 100% compliance w/flood-resistant design EXC __ 105.3.1.1
  - Health and safety improvements req'd by BO or alterations of historic buildings that do not change its designation _____ 105.3.1.1[4]

Wind Design — 15 IRC

- ☐ Determine ultimate wind speed from maps _____ 301.2.1[5]
- ☐ If history of damage due to wind speed-up at hills, modify map values to consider topographic effects _____ 301.2.1.5
- ☐ Cladding, covering, fenestration, etc., req design for specified pressure loads or per IRC T301.2(2&3) & IRC F301.2(7) _____ 301.2.1
- ☐ When wind design req'd per maps, design per ICC-600, ASCE-7, WFCM, AISI S230, or the IBC _____ 301.2.1.1
- ☐ Glazed openings in wind-borne debris regions must meet ASTM 1886 & 1996 as modified in IRC 301.2.1.2.1 EXC_____ 301.2.1.2[6]
  - Buildings to 45 ft. high protected w/ pre-cut, pre-drilled structural panels to fit on permanently installed anchors on building _____ 301.2.1.2X[7]

STRUCTURAL PLANNING

For wood or steel studs, the height of individual stories is limited to 11 ft. 7 in., provided the laterally unsupported stud heights do not exceed the amounts in **T15** on **p.19**. The 2015 IRC resolved conflicts between the story height restrictions, bracing requirements, and floor framing height.

Story Height — 15 IRC

- ☐ Stud walls 11 ft. 7 in. CMU walls 13 ft. 7 in. EXC _____ 301.3[8]
  - • CMU additional 8 ft. bearing height gable end walls _____ 301.3X
- ☐ Engineered design per IBC req'd when exceeding above _____ 301.3

PLANNING–HABITABILITY

Light — 15 IRC

- ☐ Habitable rooms req natural light w/ glazing ≥ 8% floor area EXC _____ 303.1
  - • Artificial light & whole-house vent system present _____ 303.1X
- ☐ Borrowed light & ventilation OK from adjoining rooms or sunroom if common opening min 1/2 of wall, min 25 sq. ft. (20 sq. ft. if sunroom) & min 10% interior room area _____ 303.2
- ☐ OK to place sunroom additions /w min 7-ft. ceiling & > 40% open or screened outside of the req'd glazed openings _____ 303.8.1

Ventilation — 15 IRC

Ventilation requirements for tight houses entered into the 2012 IRC and are coordinated with requirements that are also found in ASHRAE 62.2 & IRC section 1507.3. These requirements are sometimes modified by state energy codes, so check with your local jurisdiction.

- ☐ Habitable rooms req natural ventilation openings to outdoor air min 4% of floor area EXC _____ 303.1
  - • When approved whole-house mechanical ventilation installed _____ 303.1X1
- ☐ Whole-house mechanical ventilation req'd when air infiltration is ≤ 5 air changes per hr _____ 303.4
- ☐ Whole-house mechanical ventilation systems can be supply or exhaust fans operating continuously or intermittently _____ 303.4

See Code Check Plumbing & Mechanical *for further info on req'd system types & sizes.*

Heat — 15 IRC

- ☐ Habitable rooms req heating capable of maintaining 68°F at 3 ft. above floor & 2 ft. from exterior walls (exc Hawaii) _____ 303.9
- ☐ Portable space heaters not OK as means of compliance _____ 303.9

Room Areas — 15 IRC

- ☐ Min area of habitable room 70 sq. ft. except kitchens _____ 304.1[9]
- ☐ Min horizontal dimension of habitable room 7 ft. EXC _____ 304.2
  - • Kitchens _____ 304.2X

Ceiling Height — 15 IRC

- ☐ Min 7 ft. for habitable space & hallways EXC _____ 305.1
  - • Min 7 ft. in 50% of room area of sloped ceiling rooms _____ 305.1X1
- ☐ Sloped ceiling room area = portions ≥ 5 ft. ceiling _____ 304.3
- ☐ Min 6 ft. 8 in. bathrooms, toilet rooms & laundry rooms _____ 305.1[10]
- ☐ Sloped ceiling bathroom min 6 ft. 8 in. at center of req'd clear area in front of fixtures & 30×30 in. footprint above shower _____ 305.1X2
- ☐ Min 6 ft. 8 in. basement area w/o habitable space EXC _____ 305.1.1
  - • Beams or ducts OK to within 6 ft. 4 in. of floor _____ 305.1.1X

Bathroom Fixture Clearances — 15 IRC

- ☐ 21-in. clearance in front of toilets and lavatory sinks/vanities _____ 307.1
- ☐ Shower min 30×30 in. w/ 24-in. clearance in front of opening _____ 307.1
- ☐ Hinged shower doors must open outward _____ 2708.1
- ☐ 15-in. clearance each side of centerline of toilet or bidet _____ 307.1
- ☐ Tub/shower floors & walls nonabsorbent surface to 6 ft. above floor _____ 307.2

LOCATION ON SITE

Site Identification — 15 IRC

- ☐ Address numbers visible from street & contrasting background _____ 319.1
- ☐ Min 4-in.-high Arabic numerals, min 1/2-in. stroke width _____ 319.1

Lot Line Setbacks — 15 IRC

- ☐ FSD is measured perpendicular to face of wall _____ 202
- ☐ Openings OK in walls perpendicular to line determining FSD _____ 302.1X1
- ☐ Rating not req'd for walls facing other structures on same lot _____ 302.1X2
- ☐ Rating not req'd for accessory structures exempted from permits ___ 302.1X3
- ☐ No eave or other projections over the LL _____ 302.1X3
- ☐ Foundation vents not counted as openings for purpose of **F1** _____ 302.1X5
- ☐ No openings in walls < 3 ft. from LL exc as noted above _____ T302.1(1)

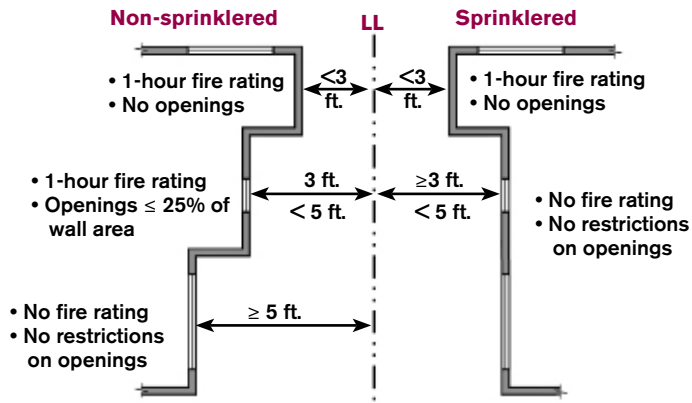
Projections — 15 IRC

- ☐ No projections (eaves) < 2 ft. of LL EXC _____ T302.1
  - • Detached garages within 2 ft. of LL eave projections ≤ 4 in. OK ___ 302.1X4
- ☐ Underside of eaves req's 1-hr rating if FSD ≥ 2 ft. to 5 ft. EXC ____ T302.1(1)
  - • Unrated OK if fireblocking between top plate & roof sheath __ T302.1(1&2)[11]
  - • Unrated OK if sprinkler protected & no gable vent opening ____ T302.1(2)[12]
  - • Unrated OK if sprinkler protected & 3 ft. from LL _____ T302.1(2)[13]

Rated Exterior Walls — 15 IRC

- ☐ 1-hr-rated walls req'd when FSD < 5 ft. **F1** EXC _____ T302.1(1)
  - • Unrated walls min 3 ft. **F1** if dwelling has fire sprinklers _____ T302.1(2)[14]
- ☐ Openings to 25% of wall area OK if FSD 3 ft.–5 ft. **F1** EXC _____ T302.1(1)
  - • Unlimited openings ≥ 3 ft. **F1** if dwelling has fire sprinklers ____ T302.1(2)[15]
- ☐ Unrated walls & unlimited openings OK to 0 ft. in subdivisions where all dwellings sprinklered & adjoining lot has open setback yard 6 ft. or more on opposite side of the property line _____ T302.1(2)[16]

FIG. 1 Fire Separation Distances & Openings



LIVE LOADS

Live Loads & Allowable Deflection — 15 IRC

- ☐ Dead load determined by actual weights of materials & equipment ____ 301.4
- ☐ Min uniformly distributed live load per **T3** _____ 301.5
- ☐ Glazing in guards & handrail assemblies req's safety factor of 4 _____ T301.5
- ☐ Allowable deflection of structural members per **T1** _____ 301.7

T3** is a guide to which table to choose from **T11**, **12**, **21** & **23

TABLE 3 MIN UNIFORMLY DISTRIBUTED LIVE LOADS [T301.5]

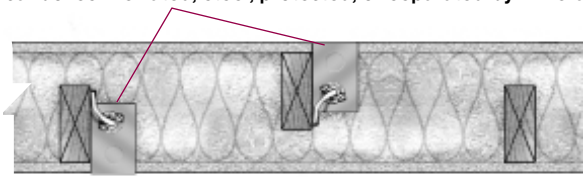
Use	Live Load (psf)
Uninhabitable attic without storage	10
Uninhabitable attic with limited storage (see **p. 23**)	20
Habitable attics & attics with fixed stairs	30
Sleeping rooms	30
Exterior balconies & decks	40
Rooms other than sleeping rooms	40
Stairs	40[A]
Concentrated point load at handrails & top of guards	200[B]
Guardrail in-fill components	50[C]

A. Individual treads can be designed for 300-lb. load over a 4-sq.-in. area.
B. Single concentrated load applied in any direction.
C. Horizontally applied load over a 1-sq.-ft. area.

FIG. 2

Townhouse Separation Wall

Electrical boxes fire-rated, steel, protected, or separated by mineral wool



A 1-hour-rated wall typically has 1 layer of 5/8-in. Type X gypsum board on each side. A 2-hour wall has two layers on each side. Staggered-stud walls help to lower sound transmission between units.

FIRE SEPARATION

Setbacks and rated walls provide protection for adjacent properties, and topics here pertain to slowing the spread of fire within an individual dwelling or between touching townhouse units. Fire-resistive construction materials such as gypsum board provide passive protection against the rapid spread of a fire. Fireblocking slows the spread of fire in small concealed spaces, and draftstopping accomplishes the same function in larger concealed areas. The requirement for fire protection of floors **F4** moved from chapter 5 to chapter 3 in the *2015 IRC*.

Separation between Townhouses — 15 IRC

- ☐ No plumbing/mechanical in common wall cavity _____ 302.2
- ☐ 1-hr rating if building protected w/ fire sprinklers OR _____ 302.2#1[17]
  - 2-hr rating if building not protected w/ fire sprinklers _____ 302.2#2[17]
- ☐ Electrical boxes meeting penetration rules OK in common wall **F2** ___302.2X
- ☐ Common walls continuous from foundation to roof _____ 302.2.1
- ☐ Rated parapet req'd to min 30 in. above roof EXC _____ 302.2.2
  - Noncombustible roof deck w/ class C surface & fire-retardant treated roof deck or GB wrapback for 4 ft. or_____ 302.2.2X
  - Roofs w/ > 30-in. elevation difference_____ 302.2.2

FIRE SEPARATION (CONTINUED)

Separation in Two-Family Dwellings — 15 IRC

- ☐ 1-hr common wall req'd from foundation to underside of roof EXC ____ 302.3
  - • 1/2-hr OK if building protected by automatic sprinkler system _____ 302.3X1
- ☐ Attic separation can be draft stop if ceilings 5/8 in. Type X GB _____ 302.3X2
- ☐ Supporting construction equal rating as floor assembly above _____ 302.3.1

Penetrations of Fire-Resistive Membranes — 15 IRC

- ☐ Steel electrical boxes allowed in wall membrane if max 16 sq. in. & aggregate area of openings ≤ 100 sq. in. over 100-sq.-ft. area ___ 302.4.2X1
- ☐ Boxes on opposite sides of wall min 24 in. horizontal separation or protected by mineral wool, fireblocking, or listed putty pads **F2** 302.4.2X1
- ☐ L&L fire-rated boxes allowed in walls AMI **F2** _____ 302.4.2X2
- ☐ Through penetrations req listed firestop penetration system EXC __ 302.4.1.2
  - • Through penetrations of copper, iron, or steel pipes, tubes, or conduits OK if firecaulked equal to rating of penetrated construction _____ 302.4.1X2

Separation from Garages — 15 IRC

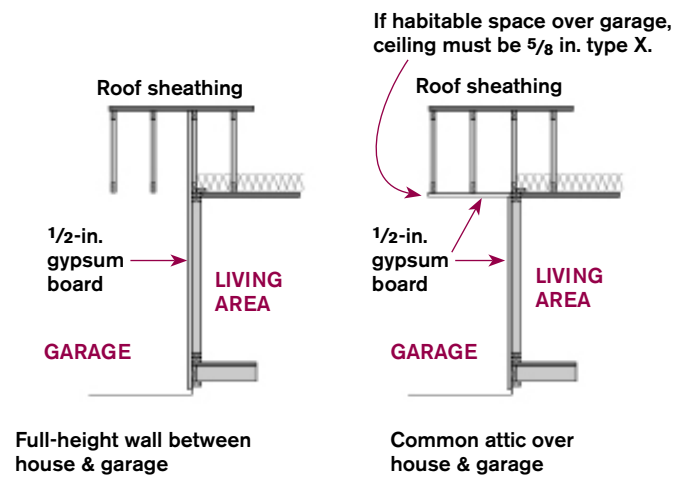
- ☐ Min 1/2-in. GB or equivalent on garage side of walls & ceilings common to house or shared attic space EXC **F3** _____ 302.6
  - • Min 5/8-in. Type X GB req'd on ceiling under habitable room **F3** ____ T302.6
- ☐ Min 1/2-in. GB on walls, beams, or other structures that support ceilings providing separation between house and garage _____ T302.6
- ☐ Garage walls perpendicular to dwelling OK unprotected unless supporting floor/ceiling separations _____ 302.6
- ☐ No direct openings between garage and sleeping rooms _____ 302.5.1
- ☐ Door to house steel or solid wood min 1 3/8 in. thick or 20-min rated _ 302.5.1
- ☐ Door must be equipped w/ self-closing device _____ 302.5.1[18]
- ☐ Ducts in garage & penetrating common walls min 26-gage steel ____ 302.5.2
- ☐ No duct openings in garage _____ 302.5.2
- ☐ Seal penetrations of common walls w/ approved material _____ 302.5.3
- ☐ Sealant does not have to comply w/ ASTM E 136 ____ 302.5.3 & 302.11#4
- ☐ Detached garages < 3 ft. req 1/2-in. GB on walls facing house _____ T302.6

GARAGES & CARPORTS–GENERAL

- ☐ Floor surfaces approved noncombustible material EXC _____ 309.1
  - • Asphalt permitted at carports _____ 309.2X
- ☐ Floors must slope to a drain or the main vehicle entry doorway _____ 309.1&2
- ☐ Carport must be open on at least 2 sides or be considered a garage __ 309.2

FIG. 3

Fire Separation from Garage



Full-height wall between house & garage

Common attic over house & garage

FIRE PROTECTION

Finish Surfaces & Insulation — 15 IRC

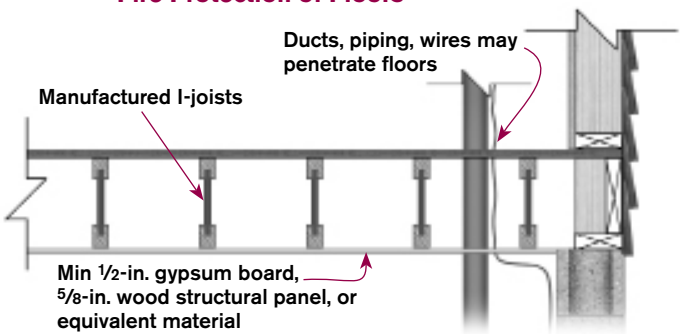
- ☐ Enclosed accessible space below stairs req's min 1/2-in. GB _____ 302.7
- ☐ Wall & ceiling finishes max flame spread index 200, max smoke-developed index 450 in accordance w/ ASTM E 84 / UL 723 _____ 302.9
- ☐ Insulation & facing max flame spread index 25, max smoke-developed index 450 in accordance w/ ASTM E 84 / UL 723 EXC _____ 302.10.1
  - • Facing material exempt when in substantial contact w/ unexposed surface of wall, floor, or ceiling – i.e., not visible in finished job __ 302.10.1X1
- ☐ Foam plastic max flame spread index 75, max smoke-developed index 450 in accordance w/ ASTM E 84 / UL 723 _____ 316.3
- ☐ Foam plastic not OK to be exposed to building interior _____ 316.4
- ☐ Foam req's thermal barrier of min 1/2-in. GB EXC _____ 316.4
  - • In roof assembly separated by wood structural panels _____ 316.5.2
  - • In crawlspaces & attics only entered for repairs or maintenance, alternate covering barriers are allowed _____ 316.5.3&4

Fire Protection of Floors — 15 IRC

- ☐ Underside of floor assembly req's 1/2-in. GB or 5/8-in. WSP EXC **F4** _ 302.13[19]
  - • Crawlspace & no storage or fuel-burning appliances _____ 302.13X2
  - • Over a space protected with approved fire sprinkler system _____ 302.13x1
  - • Unprotected portion of crawlspace ≤ 80 sq. ft. & separated by fireblocking from remainder of floor assembly _____ 302.13X3
  - • Floor constructed of dimensional 2×10 lumber or greater _____ 302.13X4
- ☐ OK to penetrate floor for ducts, wires, piping, etc. **F4** _____ 302.13[19]

FIG. 4

Fire Protection of Floors



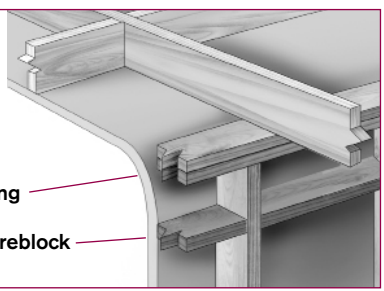
FIREBLOCKING & DRAFTSTOPPING

Fireblocking — 15 IRC

- ☐ Purpose is to cut off concealed draft openings _____ 302.11
- ☐ Materials can be 2 in. lumber, 2 thicknesses 1 in. lumber, 3/4 in. WSP, 3/4 in. particleboard, 1/2 in. GB, 1/4 in. millboard, mineral wool or glass fiber batts securely retained in place _____ 302.11.1
- ☐ Unfaced fiberglass must fill entire cavity to height of 16 in._____302.11.1.2
- ☐ Caulking does not have to comply w/ ASTM E 136_____ 302.11#4
- ☐ Required locations of fireblocking: _____ 302.11
  - In walls vertically at ceiling & floor levels, horizontally max 10 ft.
  - Intersections of concealed vertical/horizontal spaces (e.g., soffits) **F5**
  - Concealed spaces between stair stringers at top & bottom of run
  - Openings around vents, ducts, pipes & cables at ceilings & floors **F6**
  - In space between chimneys & combustible framing
  - In two-family dwelling cornices at line of unit separation

FIG. 5

Fireblocking at Coved or Dropped Ceiling

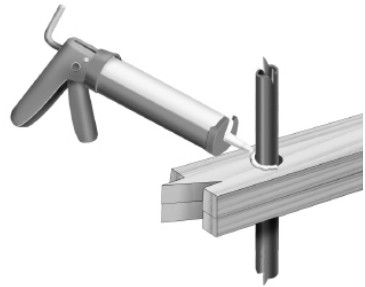


Draftstopping — 15 IRC

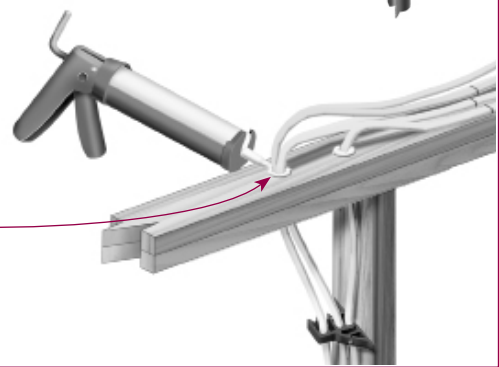
- ☐ Req'd at floor/ceiling assemblies to limit concealed space to 1,000 sq. ft. when using suspended ceiling or open-web trusses ____ 302.12
- ☐ Materials min 1/2-in. GB, 3/8-in. WSP, or equivalent _____ 302.12.1

FIG. 6

Fireblocking at Wall/Ceiling



Pipes, vents, ducts, wires, and cables req fireblocking where the wall intersects the ceiling.



If more than 2 NM cables in a single hole are fireblocked, they must be derated *(see Code Check Electrical).*

EGRESS

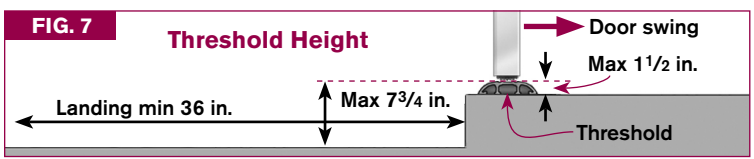
Required Egress Doors — 15 IRC

- ☐ Min 1 egress door req'd each dwelling unit _____ 311.2
- ☐ Egress door side-hinged & min net clear width 32 in. (standard 3-0 door) 311.2
- ☐ Min clear height of egress door 78 in. top of threshold to bottom of stop _311.2
- ☐ Other doors do not need to comply w/ these min dimensions _____ 311.2
- ☐ Egress doors req keyless operation from interior side _____ 311.2
- ☐ Req'd egress door must open directly to public way or equivalent ___ 311.1[20]
- ☐ Req'd egress travel cannot be through garage _____ 311.1

Thresholds & Landings at Doors — 15 IRC

- ☐ Floor or landing min 36 in. deep on each side of exterior door EXC ___ 311.3
  - • Balconies < 60 sq. ft. OK for landing to be < 36 in. deep _____ 311.3X
  - • OK for stair of 1 or 2 risers at exterior door other than the req'd egress door provided the door does not swing over stair _____ 311.3.2X
- ☐ Landing width at least the width of door served by landing _____ 311.3
- ☐ Max slope of exterior landings 2% _____ 311.3
- ☐ Threshold at req'd egress door max 1 1/2 in. above landing or floor EXC **F7** 311.3.1
  - • 7 3/4 in. below threshold OK if door not swinging over landing **F7** _ 311.3.1X
- ☐ Storm & screen doors may swing over lower landing _____ 311.3.3

FIG. 7

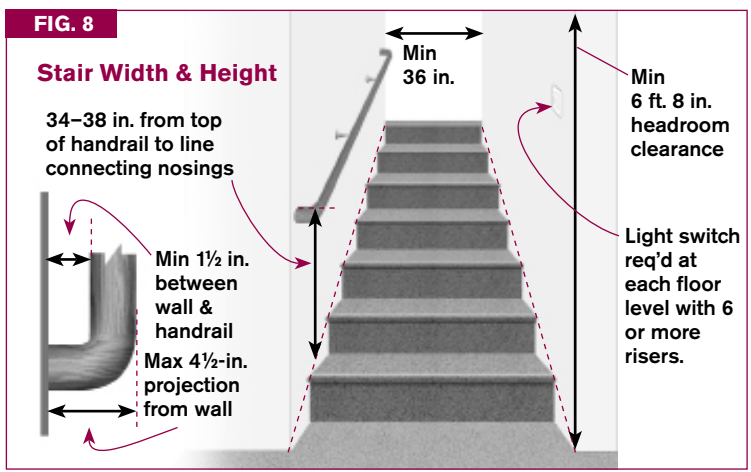


STAIRS

Stairs: General — 15 IRC

- ☐ Min width above handrail 36 in. except spiral stairways **F8** _____ 311.7.1
- ☐ Max handrail projection into stairway 4 1/2 in. **F8** _____ 311.7.1
- ☐ Min headroom 6 ft. 8 in. EXC **F8** _____ 311.7.2]
  - • Floor openings above stair OK to project 4 3/4 in. into req'd headroom at the side of a flight of stairs _____ 311.7.2X1
- ☐ Riser height max 7 3/4 in., tread depth min 10 in. EXC **F9** _____ 311.7.5.1&2
  - • Tallest riser not > 3/8 in. taller than shortest riser **F9** _____ 311.7.5.1
- ☐ Tread depth min 11 in. if no nosing projection on treads **F9** _____ 311.7.5.3X
- ☐ Deepest tread not > 3/8 in. more than shortest **F9** _____ 311.7.5.2
- ☐ Max 2% slope on treads & landings _____ 311.7.7
- ☐ Measure rise & run exclusive of carpets, rugs, or runners _____ 311.7.5

FIG. 8



Nosings — 15 IRC

- ☐ Nosing req'd for solid risers w/treads < 11 in. deep **F9** _____ 311.7.5.3
- ☐ Nosing projection min 3/4 in., max 1 1/4 in. **F9** _____ 311.7.5.3
- ☐ Greatest nosing projection not > 3/8 in. more than smallest **F9** ____ 311.7.5.3
- ☐ Beveling of nosing 1/2 in. max, radius of nosing 9/16 in. max **F9** _____ 311.7.5.3
- ☐ Risers vertical or sloped from tread above max 30° from vertical ___ 311.7.5.1
- ☐ Open riser treads must prevent passage of 4-in. sphere EXC _____ 311.7.5.1
  - • No limit on opening size when ≤ 30 in. above floor or ground ____ 311.7.5.1
  - • No limit on opening size on spiral stairways _____ 311.7.5.1X1

Landings at Stairs & Interior Doors — 15 IRC

- ☐ Min 36-in.-deep landing req'd at top & bottom each stair flight EXC **F12** _311.7.6
  - • Not req'd for door at top of interior stairs (including stairs to a garage) provided door does not swing over stairs _____ 311.7.6X
- ☐ Max 12 ft. 3 in. vertical between landings or floor levels _____ 311.7.3[21]

Winding Stairs **F10** — 15 IRC

- ☐ Walkline is measured 12 in. from first clear area on narrow side of winder walking surface _____ 311.7.4
- ☐ Min tread depth 10 in. at walkline _____ 311.7.5.2.1
- ☐ Deepest tread not > 3/8 in. than shortest measured at walkline ___ 311.7.5.2.1
- ☐ OK for consistent rectangular treads in same flight of stairs as winders to not be within 3/8 in. of depth of winders _____ 311.7.5.2.1

Spiral Stairways — 15 IRC

- ☐ Spiral stairways permitted for all means of egress stairs _____ 311.7.10.1
- ☐ Max rise between treads 9 1/2 in. _____ 311.7.10.1
- ☐ Min width 26 in. measured at & below handrail _____ 311.7.10.1
- ☐ All treads identical, min headroom 6 ft. 6 in. _____ 311.7.10.1
- ☐ Min tread depth 6 3/4 in. measured at walkline _____ 311.7.10.1[22]
- ☐ Walkline radius max 24 1/2 in. from center point _____ 311.7.10.1[22]

FIG. 9

Stair Rise & Run

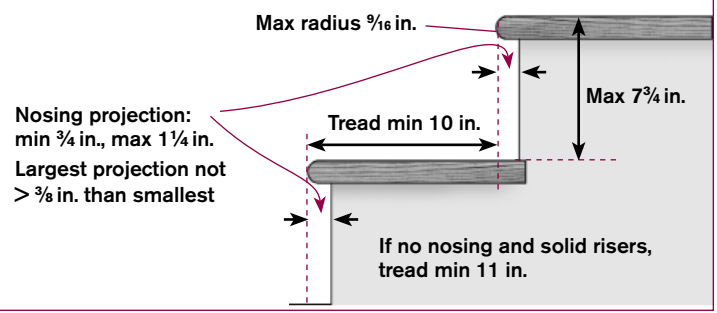
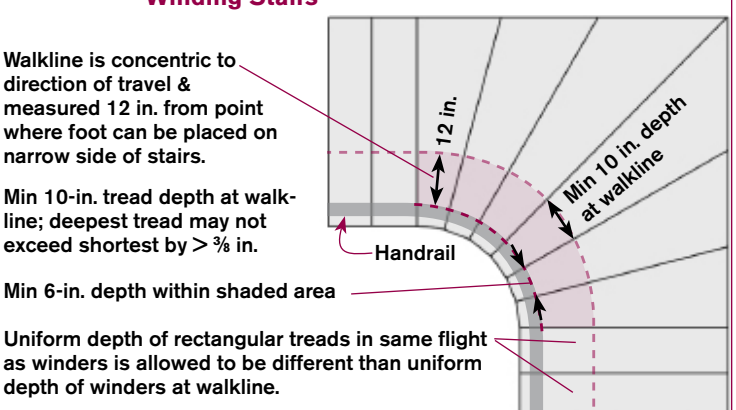


FIG. 10

Winding Stairs



Lighting at Stairs — 15 IRC

- ☐ Illumination req'd for stairs & landings _____ 303.7&8[23]
- ☐ Exterior stairs req artificial light at top landing_____ 303.8
- ☐ Interior stairs req artificial light min 1 ft. candle at treads_____ 303.7
- ☐ Interior stair switch at each floor level if ≥ 6 risers **F8** _____ 303.7

Ramps — 15 IRC

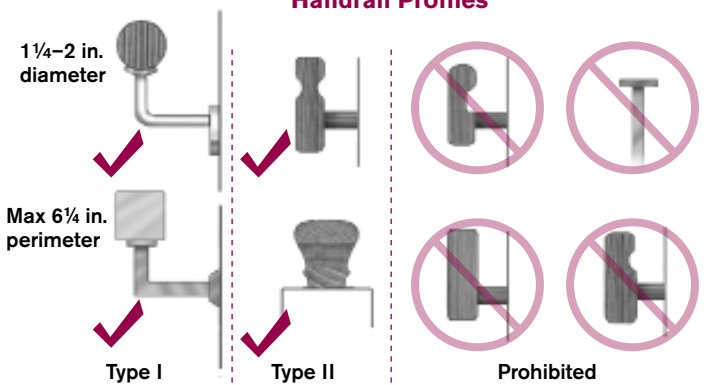
- ☐ Ramps serving req'd egress door max slope 1:12 EXC _____ 311.8.1[24]
  - • Where technically not feasible due to site constraints, 1:8 OK ___ 311.8.1X
- ☐ Ramps serving other areas max slope 1:8_____ 311.8.1[24]
- ☐ Landing or floor req'd top & bottom each ramp _____311.8.2
- ☐ Handrails req'd one side of ramps exceeding 1:12 slope _____311.8.3

Handrails — 15 IRC

- ☐ Req'd on at least one side of flights of stairs w/ ≥ 4 risers **F8**,**12**_____ 311.7.8
- ☐ Top of rail 34–38 in. above line connecting nosings **F12** EXC_____ 311.7.8.1
  - • Volute, turnout, or starting easing OK over lowest tread **F12** ___311.7.8.1X1
  - • Fitting or bending OK to exceed 38 in. at continuous transition between flights, start of flight, or from handrail to guard **F12** ___311.7.8.1X2
- ☐ Min 1½ in. space between wall and handrail **F8** EXC_____ 311.7.8.2
  - • Ends must return to wall or post or safety terminal **F8**,**12**_____ 311.7.8.2
- ☐ Handrail continuous for full length each flight of stairway _____ 311.7.8.2
- ☐ Volute, turnout, or starting easing OK over lowest tread **F12** ____311.7.8.2X2
- ☐ Round Type I handrails min 1¼ in.–max 2 in. diameter **F11** _____ 311.7.8.3
- ☐ Non-round Type I handrails perimeter 4 in.–6¼ in. **F11**_____ 311.7.8.3
- ☐ If perimeter > 6¼ in. (Type II), finger recess req'd both sides **F11**__ 311.7.8.3

FIG. 11

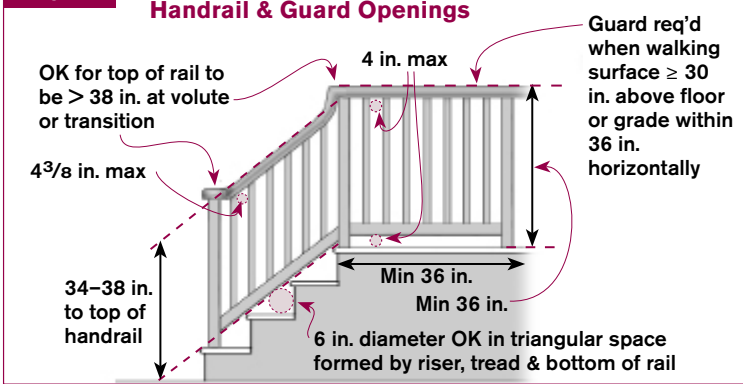
Handrail Profiles



Type II handrails must have graspable finger recess on both sides.

FIG. 12

Handrail & Guard Openings

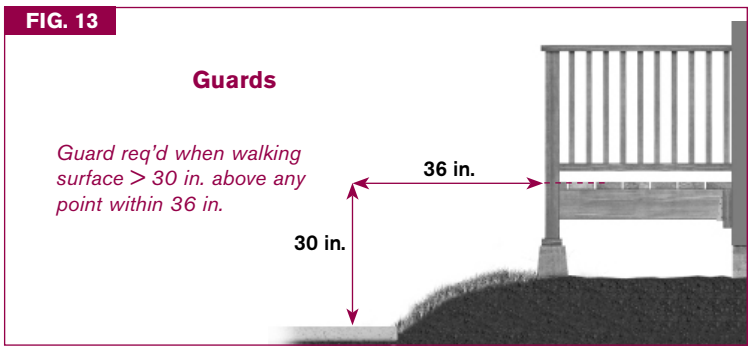


GUARDS

Location & Height	15 IRC
☐ Req'd at open-sided walking surface including stairs & landings > 30 in. above lower floor or grade within 36 in. horizontally **F13**	312.1.1
☐ Guard min 36 in. above walking surface EXC	312.1.2[25]
• Guard on open side of stair can be 34-in.-high handrail **F12**	312.1.2X1
• Handrail 34–38 in. above imaginary line connecting nosings **F12**	312.12X2

Infill & Openings	15 IRC
☐ Openings must prevent passage of 4-in. sphere **F12** EXC	312.1.3
• 4 3/8-in. sphere at open sides of stairs **F12**	312.1.3X2
• 6-in. sphere at triangle of tread, riser & bottom rail **F12**	312.1.3X1
☐ Guards & handrails must resist 200-lb. point load in any direction	T301.5
☐ Guard infill must resist 50-lb. load applied horizontally over 1 sq. ft.	T301.5

FIG. 13



ESCAPE & RESCUE OPENINGS

Window Wells **F14**	15 IRC
☐ Openings w/ finished sill below grade req window well	310.2.2
☐ Min horizontal area of window well 9 sq. ft.	310.2.3
☐ Min horizontal dimension opposite opening 3 ft. EXC	310.2.3
• Ladder may encroach 6 in. into req'd dimensions	310.2.3X
☐ Wells > 44 in. deep req permanent ladder	310.2.3.1
☐ Ladder rungs min 12 in. wide, 3-in. projection from wall & spacing max 18 in. for full height of window well	310.2.3.1
☐ Window wells req drainage system EXC	310.2.3.2
• Not req'd if well-draining Group 1 soils	310.2.3.2X
☐ Bulkhead enclosures req direct access from basement & min net clear areas (5.7 sq. ft.)	310.2.3
☐ Security bars cannot req keys, tools, or special knowledge	310.4

FIG. 14

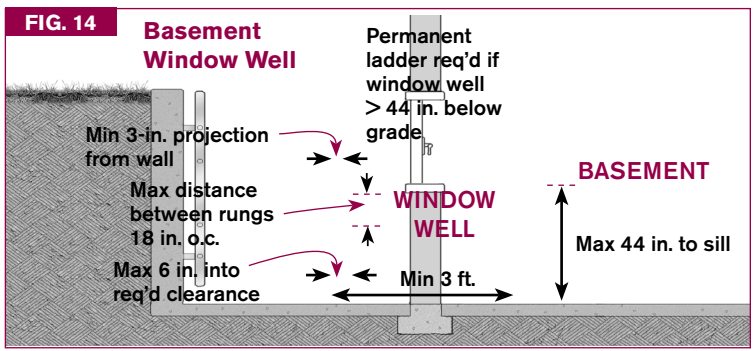


TABLE 4	ESCAPE & RESCUE: MIN HEIGHT & WIDTH REQUIREMENTS TO MEET REQ'D 5.7-SQ.-FT. OPENING SIZE (IN INCHES)																												
Width	20	20 1/2	21	21 1/2	22	22 1/2	23	23 1/2	24	24 1/2	25	25 1/2	26	26 1/2	27	27 1/2	28	28 1/2	29	29 1/2	30	30 1/2	31	31 1/2	32	32 1/2	33	33 1/2	34
Height	41	40	39 1/2	38 1/2	37 1/2	36 1/2	35 1/2	35	34 1/2	33 1/2	33	32 1/2	31	31	30 1/2	30	29 1/2	29	28 1/2	28	27 1/2	27	26 1/2	26 1/2	25 1/2	25 1/2	25	24 1/2	24

TABLE 5	ESCAPE & RESCUE: 5.0-SQ.-FT. OPENING: GRADE-FLOOR OPENINGS ONLY (IN INCHES)																				
Width	20	20 1/2	21	21 1/2	22	22 1/2	23	23 1/2	24	24 1/2	25	25 1/2	26	26 1/2	27	27 1/2	28	28 1/2	29	29 1/2	30
Height	36	35	34 1/2	33 1/2	33	32	31 1/2	31	30	29 1/2	29	28 1/2	28	27 1/2	27	26 1/2	26	25 1/2	25	24 1/2	24

Required Locations & Sizes — 15 IRC

- ☐ Req'd in sleeping rooms, habitable attics & basements _____ 310.1
  - • Mechanical equipment basements ≤ 200 sq. ft. _____ 310.1X
- ☐ Each basement sleeping room _____ 310.1
- ☐ Must open directly to public way or yard to same _____ 310.1
- ☐ Cannot req keys, tools, or special knowledge to open _____ 310.1.1
- ☐ Min net clear area 5.7 sq. ft. **T4,5** EXC _____ 310.2.1
  - • 5.0 sq. ft. OK for grade floor openings **T4,5** _____ 310.2.1X

** A grade floor opening is one not more than 44 in. above adjacent grade*

- ☐ Window sill max 44 in. above floor **F14** _____ 310.2.2[26]
- ☐ Min net clear height 24 in. **T4,5** _____ 310.2.1
- ☐ Min net clear width 20 in. **T4,5** _____ 310.2.1
- ☐ Addition sleeping rooms req escape & rescue openings _____ 310.5[27]
- ☐ Existing basements undergoing repairs exempt EXC _____ 310.6[27]
  - • New sleeping rooms req escape & rescue openings _____ 310.6[27]

GRADING & DRAINAGE

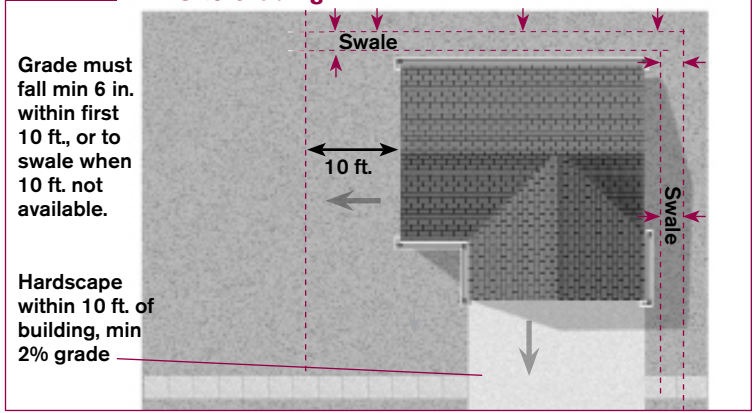
Grading

	15 IRC
☐ Grade surface to storm drain or other approved collection point	401.3
☐ Grade away from foundation min 6-in. fall within 1st 10 ft. **F15** EXC	401.3
• Use swale if physical barrier or lot line prohibits 6-in. fall in 10 ft.	401.3X
☐ Hardscape within 10 ft. min 2% slope from building **F15**	401.3X
☐ Grading to provide req'd slopes & clearances; 6 in. siding to soil, 2 in. siding to hardscape **F15**	317.1#5

Drainage

	15 IRC
☐ For graded sites, top of foundation min elevation above drainage inlet or street gutter 12 in. + 2% slope	403.1.7.3
☐ Drainage to point of discharge req'd at all locations on site	403.1.7.3
☐ If water does not readily drain from site, crawlspace on same level as outside grade or install approved drainage system	408.6
☐ If soils expansive or collapsible, roof drain must discharge min 5 ft. from footing or to approved drain system	801.3

FIG. 15 Site Grading



SOILS

A foundation wall supporting a building is a restrained wall, held in place at the top by the floor system. Retaining walls are unrestrained, and the type of retaining wall described below is not intended to support structural loads.

Soils — 15 IRC

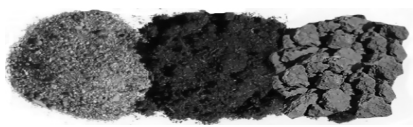
- ☐ BO may req soil tests if expansive, compressible, or questionable ____ 401.4
- ☐ BO may allow **T6** in lieu of complete geotechnical evaluation _____ 401.4.1
- ☐ Foundation design per IBC for sites w/ expansive soils EXC _____ 403.1.8
  - • BO may allow systems known to perform on similar sites _____ 403.1.8X
- ☐ Compressible or shifting soils must be removed to stable level _____ 401.4.2
- ☐ Filled soils layered & compacted per accepted engineering practice __ 401.2

Retaining Walls — 15 IRC

- ☐ Design req'd for retaining walls w/o lateral support & retaining > 48 in. unbalanced backfill or > 24 in. if also resisting lateral loads __ 404.4[28]
- ☐ Design against overturning, sliding, excessive pressure, & water uplift _ 404.4
- ☐ Design for safety factor of 1.5 against lateral sliding & overturning ____ 404.4
- ☐ Does not apply to walls supporting buildings _____ 404.4[29]

TABLE 6 PRESUMPTIVE LOAD-BEARING VALUES OF SOILS

Class of Material	Load-Bearing Pressure (psf)
Crystalline bedrock	12,000
Sedimentary & foliated rock	4,000
Sandy gravel &/or gravel	3,000
Sand, silty sand, clayey sand, silty gravel & clayey gravel	2,000
Clay, sandy clay, silty clay, clayey silt, silt & sandy silt	1,500



Sand, silt, and clay soils

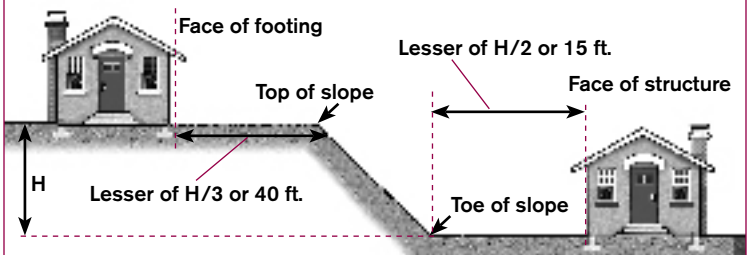
CONSTRUCTION ON SLOPED SITES

In addition to the clearances req'd in **F16** & **17**, the foundation footings must be placed such that proper drainage (**p. 11**) and foundation elevation are achieved.

Construction Adjacent to Slopes — 15 IRC

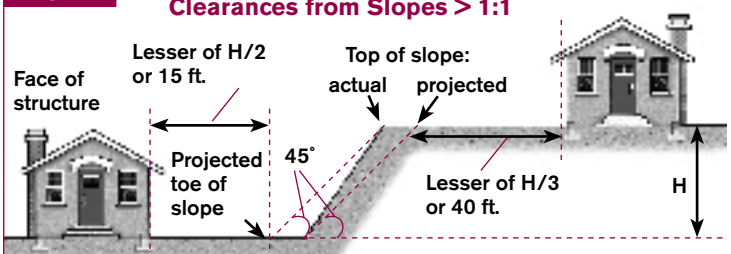
- ☐ Setback & clearance to slopes > 1:3 (vertical to horizontal) **F16** ____ 403.1.7
- ☐ Setback & clearance to slopes > 1:1 (vertical to horizontal) **F17** ____ 403.1.7
- ☐ Measure height from top of retaining walls at toe of slope **F16**,**17** __ 403.1.7.1
- ☐ BO may approve alternate setbacks per engineering investigation _ 403.1.7.4

FIG. 16 Clearances from Slopes > 1:3



Foundation footings must not be too close to top or toe of slope.

FIG. 17 Clearances from Slopes > 1:1



Assume 45˚ angle of repose for measurement of slope top & toe.

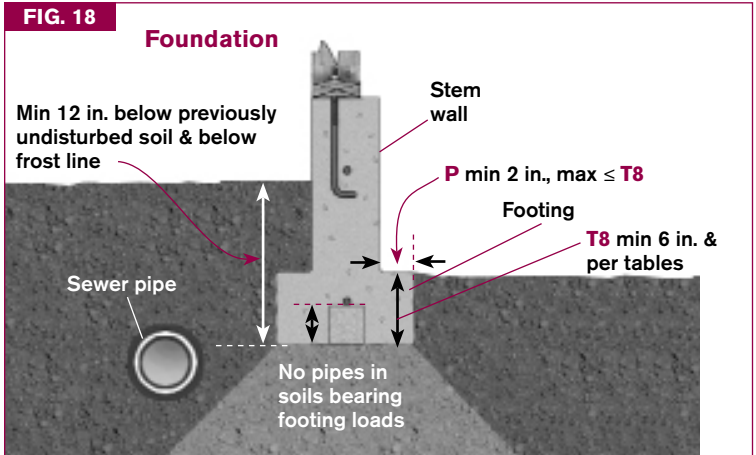
FOOTINGS

The minimum width of footings in the 2012 IRC is unchanged from 2009, and appears in *Code Check Building 3rd edition* as **T8**. In the 2015 edition, distinctions are made between footings that support a slab on grade, basement walls, or a floor over a crawlspace. Snow load is now considered in footing design.

General

	15 IRC
☐ Footings supported on undisturbed soil or engineered fill **F18**	403.1
☐ Placement min 12 in. below previously undisturbed ground surface **F18**	403.1.4
☐ Extend below frost line or be frost-protected **F18**	403.1.4.1
☐ Top surface of all footings level **F18**	403.1.5
☐ Bottom surface of footings max 10% slope (step when > 10%)	403.1.5

FIG. 18



Footings in SDC D

	15 IRC
☐ All exterior walls req support on continuous footings	403.1.2[30]
☐ Continuous footings req'd below interior braced wall panels in buildings w/ plan dimensions > 50 ft. (see code text for exceptions)	403.1.2

Size

	15 IRC
☐ Min width for concrete footings per **T7**	403.1.1[31]
☐ Min thickness 6 in. & per table **F18**, **T7**	403.1.1[31]
☐ Projection past foundation min 2 in., max = footing thickness **F18**	403.1.1

TABLE 7 MIN WIDTH OF FOOTINGS FOR LIGHT FRAME[A] T403.1(1)

Light Frame Construction[B]	# of Stories	Load-Bearing Value of Soil				
		1,500	2,000	2,500	3,000	3,500+
Slab-on-Grade	1	12	12	12	12	12
	2	12	12	12	12	12
	3	14	12	12	12	12
Crawlspace	1	12	12	12	12	12
	2	16	12	12	12	12
	3	19	14	12	12	12
Basement	1	18	14	12	12	12
	2	22	16	13	12	12
	3	25[C]	19	15	13	12

A. This table based on 20 psf roof live load (no snow load). See the full code tables for values in snow country.
B. See code tables for values with masonry veneer or concrete/masonry walls.
C. 8-in. footing thickness – all other cells in this table require 6-in. thickness.

CONCRETE

Special inspections of concrete are typically required where more than 2,500 psi strength is required, though the jurisdiction may waive these inspections for prescriptively required 3,000 psi concrete in SDC_D.

Mixing & Strength — 15 IRC

- ☐ Min 2,500 psi in SDC A, B, or C _____ 404.1.3.3.1
- ☐ Min 3,000 psi in SDC D_0, D_1 & D_2 _____ 404.1.3.3.1
- ☐ Min compressive strength 3,000 psi if moderate to severe weathering potential **T2** for basement or exterior walls or other vertical concrete exposed to weather & for porches, carports slabs & garage floors ___ T402.2
- ☐ Air-entrained req'd if exposed to freeze/thaw during construction _____ T402.2
- ☐ Air-entrained req'd in areas of moderate to severe weathering potential & exposed to weather or in garage slab _____ T402.2
- ☐ Max slump 6 in. for concrete in removable forms _____ 404.1.3.3.4
- ☐ Thoroughly work around rebar & into corners _____ 404.1.3.3.5
- ☐ Slump in stay-in-place forms (ICF) > 6 in. _____ 404.1.3.3.4
- ☐ Immersion vibrate stay-in-place forms (ICF) _____ 404.1.3.3.5

FOUNDATION & BASEMENT WALLS

The IRC provides design tables for concrete and masonry foundation walls based upon soil type, height of unbalanced backfill, thickness of CMUs, and amount of reinforcement.

Foundation (Basement) Walls — 15 IRC

- ☐ Walls must be laterally supported at top & bottom _____ 404.1.3.2
- ☐ Design req'd if supporting > 48 in. unbalanced backfill or if subject to hydrostatic pressure from ground water _____ 404.1.1[32]
- ☐ No backfill until walls anchored to floor above _____ 404.1.7
- ☐ Masonry wall thickness not < thickness of wall supported EXC ____ 404.1.5.1
  - 8-in. walls OK under brick-veneered frame walls or 10-in. cavity walls designed in accordance w/ accepted engineering practice _____ 404.1.5.1
- ☐ Concrete wall thickness not < thickness of wall supported above __ 404.1.5.2

SDC C, D_0, D_1 & D_2 — 15 IRC

- ☐ Plain concrete or masonry OK if complying w/ following: _____ 404.1.4.1&2
  - Min wall thickness for plain concrete 7 1/2 in., plain masonry 8 in.
  - Max height 8 ft., max unbalanced backfill 4 ft.
  - Plain masonry req's 2 #4 horizontal bars in upper 12 in. of wall
  - Plain concrete req's #4 horizontal bars upper 12 in. & mid-height of wall
- ☐ Reinforced masonry per tables _____ 404.1.4.1
- ☐ Reinforced concrete per tables _____ 404.1.4.2

Foundation Forms — 15 IRC

- ☐ Pipe penetrations through foundations must be sleeved _____ 2603.5
- ☐ Excavation free of debris & roots _____ 408.5
- ☐ Wood beam connections min 1/2-in. air space 3 sides _____ 317.1#4
- ☐ Forms must resist deflection during concrete placement _____ 404.1.3.3.6
- ☐ Remove all wood forms used for placing concrete _____ 408.5
- ☐ Foundation wall min 6 in. above finished grade EXC _____ 404.1.6
  - 4 in. OK if masonry veneer is used _____ 404.1.6
- ☐ Cold joints req reinforcement (404.1.2.3.7.8 2012 IRC) _____ 404.1.3.3.7.8

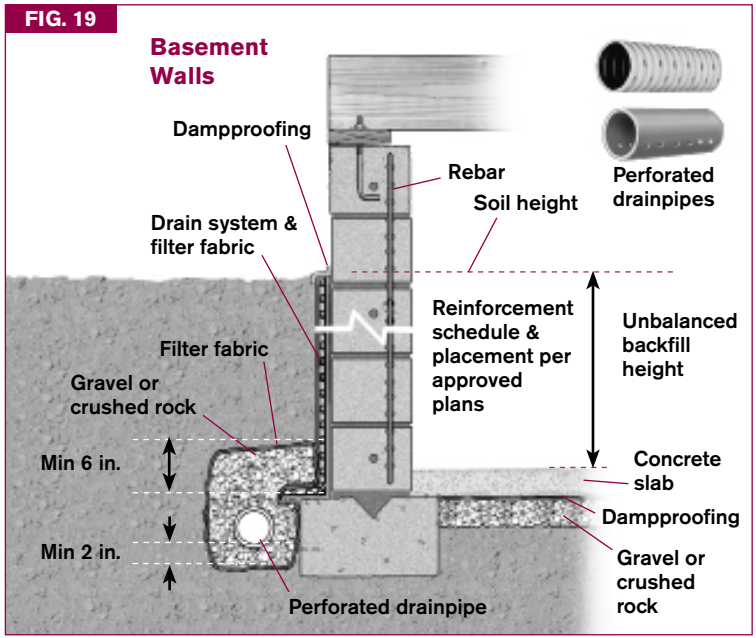
Frost-Protected Shallow Foundations — 15 IRC

- ☐ If monthly mean building temp maintained at 64°F, footing not req'd to extend below frost line if protected by insulation _____ 403.3
- ☐ If unheated slab abuts frost-protected foundation, provide insulation under slab & between slab & protected foundation _____ 403.3.1.1

Waterproofing & Dampproofing — 15 IRC

- ☐ Drains req'd for foundations retaining earth & enclosing habitable or useable spaces below grade **F19** EXC _____ 405.1
  - • If group 1 soils (sand-gravel mixture) _____ 405.1X
- ☐ Drains to extend 1 ft. past footing, 6 in. above & req filter fabric _____ 405.1
- ☐ Dampproofing req'd for foundations retaining earth & enclosing interior spaces & floors below grade **F19** _____ 406.1
- ☐ CMU walls req min 3/8 in. parging prior to dampproofing EXC _____ 406.1
  - • When using material approved for direct application _____ 406.1X
- ☐ If high water table exists, waterproofing req'd from top of footing or 6 in. below basement floor to finished grade _____ 406.2
- ☐ Dampproofing material = Bituminous coating, 3 lb. sq. yard acrylic modified cement, 1/8 in. surface bonding cement per ASTM C 887, or any material approved as waterproofing **F19** _____ 406.1
- ☐ Waterproofing material = Two-ply hot-mop felt, 55-lb. roll roofing, 6-mil poly, 45-mil poly-modified asphalt, 60-mil poly cement, 1/8-in. cement-based fiber-reinforced waterproof coating, or 60-mil liquid-applied synthetic rubber _____ 406.2

FIG. 19



REINFORCING STEEL

Note: 2012 IRC numbers within section 403.1.3 are slightly different than 2015.

Footing Reinforcement in SDC D — 15 IRC

- ☐ Foundations w/ stem walls req #4 bar top & bottom **F18** _____ 403.1.3.1
- ☐ If joint between footing & stem wall (not monolithic), #4 vertical bars req'd at max 4-ft. intervals w/ standard hooks in footings _____ 403.1.3.1
- ☐ Slab w/ footings min #4 bar top & bottom **F22** EXC _____ 403.1.3.3
  - Monolithic slab 1 #5 bar in middle 1/3 of footing depth **F22** _____ 403.1.3.3
- ☐ If slab not monolithic, min #3 vertical dowels w/hooks each end at max 4-ft. intervals _____ 403.1.3.3

Reinforcement Methods — 15 IRC

- ☐ Bottom reinforcement min 3 in. clear from soils _____ 403.1.3
- ☐ Secure w/ tie wire, dobies, etc., to prevent displacement _____ 404.1.3.7.4
- ☐ Min concrete cover of reinforcement per **T8** _____ 404.1.3.3.7.4
- ☐ Tolerances in **T8** 3/8 in. or 1/3 req'd cover, whichever is less ____ 404.1.3.3.7.4
- ☐ Splices lapped min 20 in. #4 bar, 25 in. #5 bar, 30 in. #6 bar _ 404.1.3.3.7.5
- ☐ Spacing between lapped bars max 1/5 lap splice length _____ 404.1.3.3.7.5

TABLE 8 REINFORCING STEEL COVER [404.1.2.3.7.4]

Foundation Surface	Min Cover
Concrete cast against & permanently exposed to earth	3 in.
Concrete exposed to earth or weather after forms removed	1 1/2 in.[A]
Not exposed to weather (e.g., top of slab)	3/4 in.
Concrete in stay-in-place forms (ICF)	3/4 in.

A. 2-in. cover req'd for #6 or larger bars.

FOUNDATION ANCHORAGE

General — 15 IRC

- ☐ All wood sills & walls supported on foundations req anchoring _____ 403.1.6
- ☐ Req'd for wood sole plates at exterior walls & BWP of monolithic slabs _____ 403.1.6
- ☐ Anchoring min 1/2-in. bolts or approved straps providing equivalent **F20** 403.1.6
- ☐ Bolts min 7 in. into concrete or grouted CMU cell **F19,20** _____ 403.1.6
- ☐ Bolts min 1/2 in. diameter, nut & washer on each bolt **F20** _____ 403.1.6
- ☐ Bolt distance from end of plate min 7 in. diameter, max 12 in. **F20** __ 403.1.6
- ☐ Bolt in middle third of width of plate **F20,21** _____ 403.1.6[33]
- ☐ Max spacing 6 ft. o.c. & min 2 bolts per plate EXC **F20** _____ 403.1.6
  - Walls ≤ 24 in. connecting offset BWs 1 bolt in center 1/3 _____ 403.1.6X1
  - Walls ≤ 12 in. connecting offset BWs no bolt OK _____ 403.1.6X2

Wood structural panel sheathing continuous through offset for above exceptions

- ☐ Interior bearing wall sole plates on slab that are not part of braced wall panel OK to use other types of approved fasteners _____ 403.1.6

SDC D_0, D_1 & D_2 & SDC C Townhouses — 15 IRC

- ☐ Plate washers or anchor straps for full length of braced wall lines __ 403.1.6.1
- ☐ Slotted plate washers permitted if standard washer also used ____ 602.11.1
- ☐ Interior braced wall plates on continuous foundation req bolts ____ 403.1.6.1
- ☐ Interior bearing wall sole plates req anchor bolts _____ 403.1.6.1
- ☐ Max anchor bolt spacing 4 ft. o.c. if > 2 stories in height _____ 403.1.6.1

FIG. 20

Sill Plate & Bolt Distances

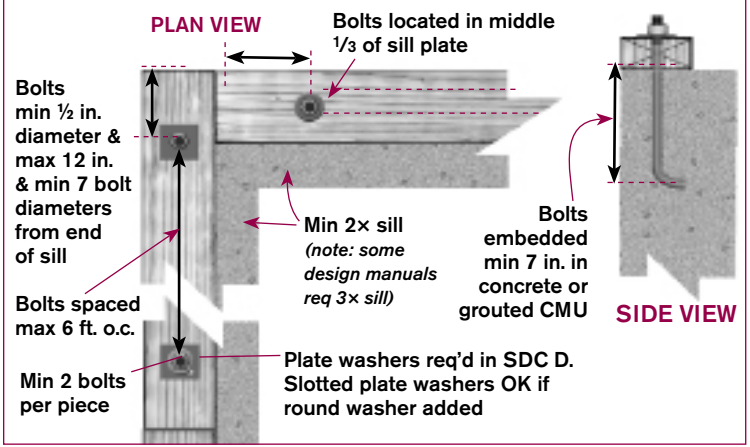
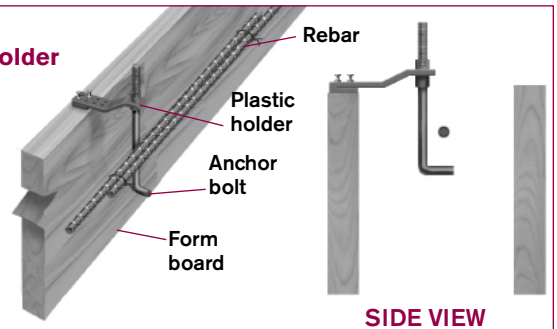


FIG. 21

Anchor Bolt Holder



Anchor bolt templates help to ensure that the bolt will be in the required 1/3 center of the plate and also keep the bolt straight. Bolts that are "wet set" often fail to have proper embedment. Bolts that are crooked may be too close to the foundation forms, resulting in cracking.

In addition to the requirements for a bolt within 12 in. of the end of each sill piece and the maximum spacing of 6 ft. between bolts, plan ahead for the length of the sill pieces and also the placement of beams, studs, or other framing members so that they do not have to be notched over the bolts.

Hold-down bolts must be installed using templates. Accurate placement is critical, especially with hold-downs that connect hardware bolted into posts or studs that are part of alternate braced wall panels (AWBs). Manufactured alternatives to AWBs may have templates supplied by the manufacturer.

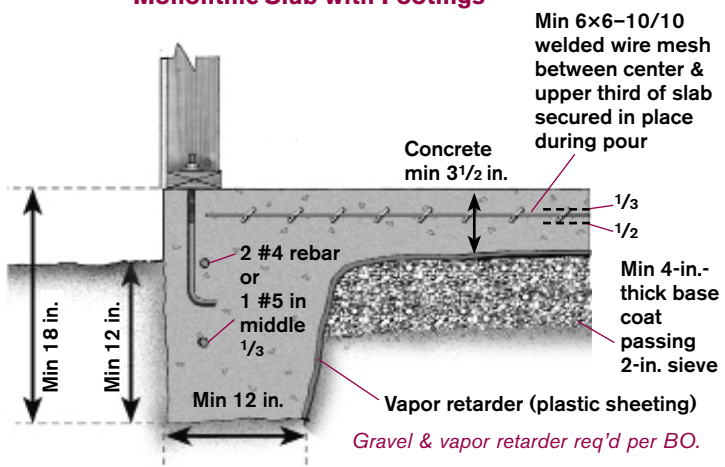
CONCRETE SLABS

Concrete Slabs on Ground **15 IRC**

- ☐ Min 3½ in. thick **F22** _____ 506.1
- ☐ Excavation and fill free of debris & roots _____ 506.2
- ☐ Max fill 24 in. clean sand/gravel or 8 in. earth _____ 506.2.1
- ☐ Below-grade slabs req min 4-in. base course **F22** _____ 506.2.2
- ☐ Min 6-mil poly or approved vapor retarder req'd EXC **F19,22** _____ 506.2.3
  - • Garages & unheated accessory structures _____ 506.2.3X1[34]
  - • Unheated storage rooms ≤ 70 sq. ft. & carports _____ 506.2.3X2
  - • Driveways & other unenclosed flatwork _____ 506.2.3X3
  - • Where approved by BO based on local site conditions _____ 506.2.3X4
- ☐ Dobies or other support req'd to hold reinforcement in place between center & upper third of slab during concrete placement **F18** _____ 506.2.4

FIG. 22

Monolithic Slab with Footings



CONCRETE MASONRY UNIT WALLS (CMUS)

High-lift grouting refers to a pour height in excess of 64 in. Low-lift grouting req's separate inspections for each lift; high-lift grouting req's continuous special inspection during the pour.

General — 15 IRC

- ☐ Empirical provisions of TMS 402/ACI 530/ASCE 5 can be used in design, shop drawings, and project submittals w/o stamp of registered design professional unless otherwise req'd by BO _____ 606.1.1
- ☐ Min 8 in. thickness EXC _____ 606.4.1
  - • 6 in. OK for 1 story to 9 ft. + 6 ft. to peak of gable _____ 606.4.1
- ☐ Lateral support req'd vertically &/or horizontally per **T9** _____ 606.6.4
- ☐ Horizontal lateral support by cross walls in bond, pilasters, buttresses, or structural frame, vertical lateral support by floors & roofs _____ 606.4.1&2
- ☐ Type M or S mortar in SDC_D _____ 606.2.7.3
- ☐ Unsupported height of masonry piers max 10× their least dimension __ 606.7

FIG. 23

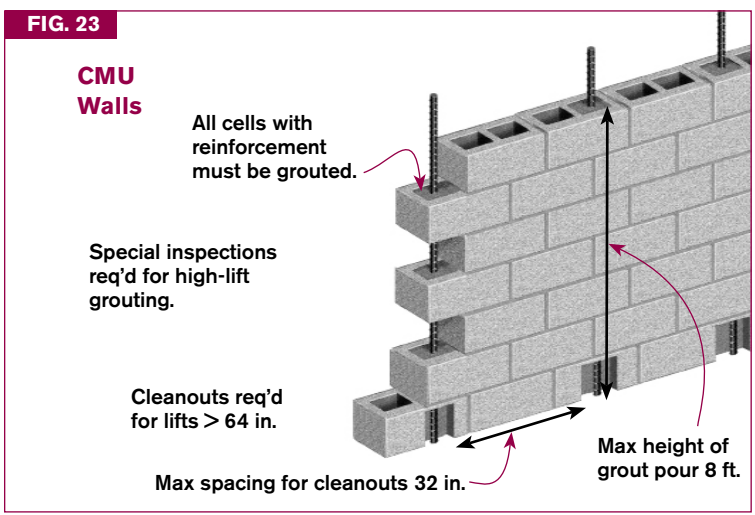


TABLE 9 MASONRY WALL LATERAL SUPPORT SPACING [T606.4]

Construction	Length to Thickness or Height to Thickness Ratio
Bearing walls – solid or solid grouted	20
All other bearing walls	18
Nonbearing exterior walls	18
Nonbearing interior walls	36

Ledgers & Sills — 15 IRC

- ☐ Beam supports min bearing 3 in. on 4-in. solid masonry or metal plate _ 606.6.3
- ☐ Joist support min bearing 1½ in. on 3-in. nominal ledger w/ bolt embedded min 4 in. _____ 606.6.3.1

Reinforcement — 15 IRC

- ☐ Masonry piers req reinforcement EXC _____ F606.11(2&3)
  - • Unfilled hollow OK in SDC A & B up to 4× height of least dimension _ 606.7
- ☐ Hollow piers req cap of solid masonry or concrete or top course filled _606.7.1
- ☐ Reinforcement req'd in SDC_C shear walls _____ 606.12.2.3.3
- ☐ Reinforcement req'd in all SDC_D walls _____ 606.12.3.2
- ☐ Masonry columns in SDC C & D req reinforcement _____ 606.12.2.3.2
- ☐ All reinforcing bars fully embedded in mortar or grout _____ 606.3.4
- ☐ Min ¼ in. between bars & CMUs EXC _____ 606.3.5.3
  - • ¼-in. bars OK to be embedded in ½-in. horizontal mortar joints __606.3.5.3
- ☐ Reinforcement cover min 2 in. from face if exposed to weather or soil _606.3.4
- ☐ Bars held in place top & bottom & max 200 bar diameter intervals _606.3.5.3

Grout — 15 IRC

- ☐ If construction stopped for ≥1 hr in grouted masonry walls, all tiers stop at same elevation & grout within 1 in. of top _____ 606.3.5.1
- ☐ Max pour height 8 ft. **F23** _____ 606.3.5.1
- ☐ Higher pours must be placed in lifts ≤ 64 in. **F22** _____ 606.3.5.1[35]
- ☐ High-lift grouting req's special inspection **F22** _____ 606.3.5.1
- ☐ Cleanouts req'd for high-lift grouting (> 64 in.) **F22** _____ 606.3.5.2[36]
- ☐ Cleanouts max 32 in. spacing **F22** _____ 606.3.5.2

UNDERFLOOR AREA (CRAWLSPACES)

Foundation Walls & Crawlspaces — **15 IRC**

- ☐ Remove all vegetation & organic material _____ 408.5
- ☐ Wood forms must be completely stripped off foundation _____ 408.5

Access Openings — **15 IRC**

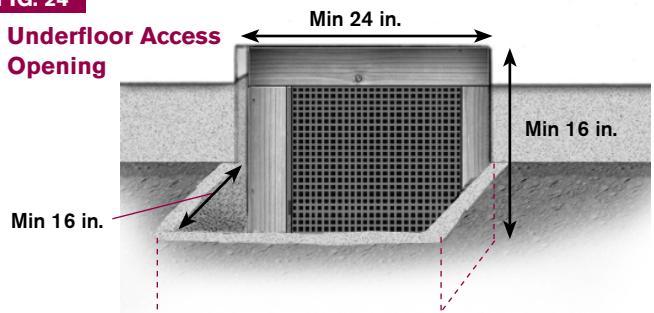
- ☐ Min 18-in.-high × 24 in. wide opening EXC _____ 408.4
  - • 16 in. high OK in perimeter wall **F24** _____ 408.4
- ☐ Openings below grade req min 16×24 in. areaway **F24** _____ 408.4
- ☐ Through-wall openings not OK below a door _____ 408.4
- ☐ Opening large enough to remove underfloor mechanical equipment __ 408.4

Ventilation — **15 IRC**

- ☐ Underfloor space req's venting except space for basements _____ 408.1
- ☐ One vent opening within 3 ft. of each corner _____ 408.1&2
- ☐ Openings req protective cover of screens, grates, or plates _____ 408.2
- ☐ Largest allowable dimension of covering elements ¼ in. _____ 408.2
- ☐ Min area 1 sq. ft. per 150 sq. ft. of underfloor area EXC _____ 408.2
  - • Reduction to 1/1500 OK w/ Class 1 vapor retarder _____ 408.2X
- ☐ Unvented crawlspaces allowed w/ vapor retarder on ground & sealed to stem wall & space conditioned or provided w/ continuous mechanical ventilation _____ 408.3

FIG. 24

Underfloor Access Opening



UNDERFLOOR FRAMING

Naturally durable wood refers to the heartwood of redwood, cedar, black locust & black walnut. Fastener corrosion can be a major problem with preservative-treated wood.

Preservative-Treated (PT) Wood — 15 IRC

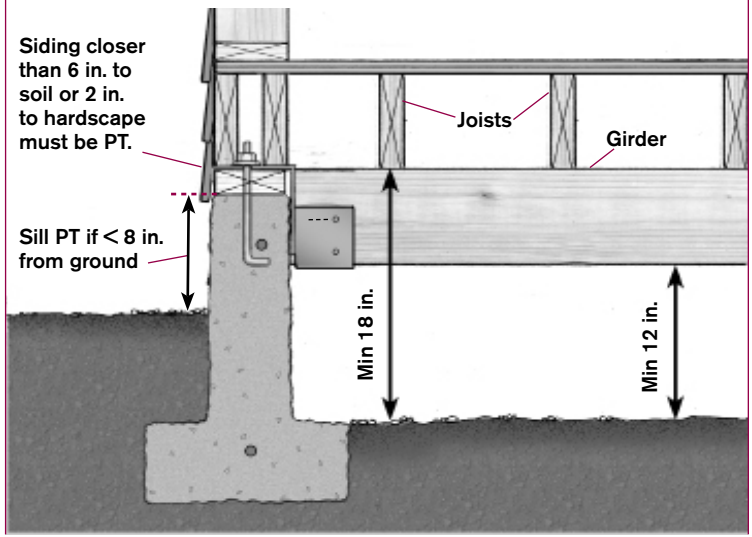
- ☐ Wood in ground contact or embedded in concrete must be rated for ground-contact _____ 317.1.2
- ☐ Connector coatings for preservative-treated wood AMI or min G185 __ 317.3.1
- ☐ Fasteners, nuts & washers for preservative-treated wood hot-dipped zinc-coated, stainless steel, silicon bronze, or copper EXC _____ 317.3.1
  - • Bolts ≥ 1/2 in. diameter _____ 317.3.1X1
  - • Fasteners in SBX/DOT or zinc-borate PT interior dry location ___ 317.3.1X3
- ☐ Field-cut ends of wood to be retreated in field _____ 318.1.2

Sills, Sleepers & Furring Strips — 15 IRC

- ☐ Min 2×4 nominal size _____ 404.3
- ☐ Sills < 8 in. from exposed ground PT or naturally durable wood **F25** 317.1#2
- ☐ Sills & sleepers on slabs PT or separated by moisture barrier _____ 317.1#3
- ☐ Basement furring strips PT, naturally durable, or on vapor retarder __ 317.1#7

FIG. 25

Soil Clearance



Wood Posts & Steel Columns — 15 IRC

- ☐ Crawlspace & basement wood columns PT or naturally durable EXC _ 317.14
  - • Basement w/ pedestal ≥ 1 in. above slab or 6 in. above earth ___ 317.1.4X1
  - • Crawlspace pier ≥ 8 in. above earth w/ vapor retarder _____ 317.1.4X2
- ☐ Steel columns painted or treated to protect against corrosion _____ 407.2
- ☐ Steel columns min 3 in. diameter, wood columns min 4×4 _____ 407.3
- ☐ Restrain bottom of columns to prevent lateral displacement EXC _____ 407.3
  - • SDC A, B & C if on pier & in area enclosed by foundation & ≤ 48 in. 407.3X

Masonry Piers — 15 IRC

- ☐ Isolated hollow piers not OK under bearing walls _____ 404.1.9.2
- ☐ Isolated hollow piers min nominal dimension 8 in. _____ 404.1.9
- ☐ Isolated hollow piers height max 4× their least dimension _____ 404.1.9
- ☐ Isolated solid-filled piers max height 10× their least dimension _____ 404.1.9
- ☐ Piers supporting girders min 12 in. nominal dimension _____ 404.1.9.2
- ☐ Piers supporting interior bearing wall girders max 10 ft. high _____ 404.1.9.2
- ☐ Piers supporting exterior bearing wall girders max 4 ft. high _____ 404.1.9.2
- ☐ Girders & sills req anchorage to piers _____ 404.1.9.2

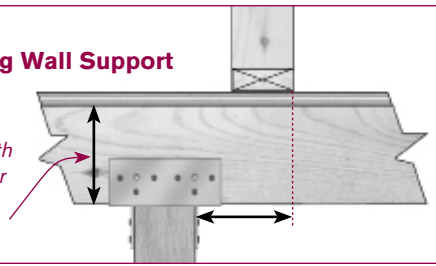
Girders — 15 IRC

- ☐ Girders min 12 in. above earth if not PT or naturally durable _____ 317.1
- ☐ Built-up girder and header spans per T602.7(1,2&3) _____ 502.5
- ☐ Built-up girders nailing per **T20** _____ T602.3(1)[37]
- ☐ End bearing min 3 in. on concrete or masonry EXC _____ 502.6
  - • 1½ in. OK on wood sill w/ min nominal bearing area 48 sq. in. _____ 502.6[38]
- ☐ End bearing min 1½ in. on wood or metal _____ 502.6
- ☐ Positive connection req'd between posts & girders _____ 502.9
- ☐ Max offset 1 joist depth from bearing wall above **F26** _____ 502.4
- ☐ Notching & boring per **F28** & **T10** _____ 502.8.1

FIG. 26

Bearing Wall Support

Bearing walls should not offset more than 1 joist depth from the supporting girder or wall below the floor.



Joists — 15 IRC

- ☐ Joists & subfloor min 18 in. above earth if not PT or naturally durable ___ 317.1
- ☐ Size & span for sleeping areas & attics w/ stairs per **T11** _____ 502.3.1[39]
- ☐ Size & span for all other areas per **T12** _____ 502.3.2[39]
- ☐ Cantilevers see IRC T502.3.3.(1)&(2) _____ 502.3.3
- ☐ Double joists under parallel bearing walls **F27** _____ 502.4
- ☐ Bearing min 3 in. on concrete or masonry, 1½ in. on wood or metal EXC 502.6
  - • On 1×4 ribbon strip & nailed to adjacent stud (balloon frame) _____ 502.6
  - • Into side of wood girder on approved joist hangers or 2×2 ledger _ 502.6.2
- ☐ Min lap across girder 3 in. & min 3-10d face nails **F29** _____ 502.6.1
- ☐ Notching & boring per **F28** & **T10** _____ 502.8.1

FIG. 27

Double Joists under Parallel Bearing Wall

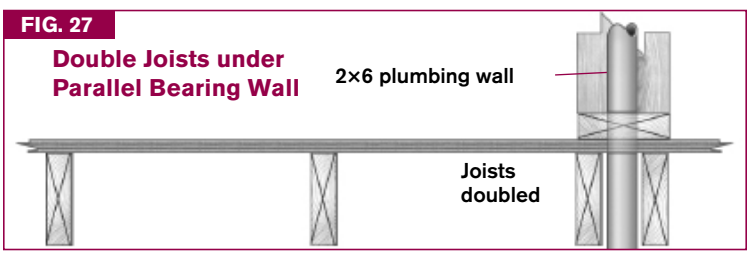
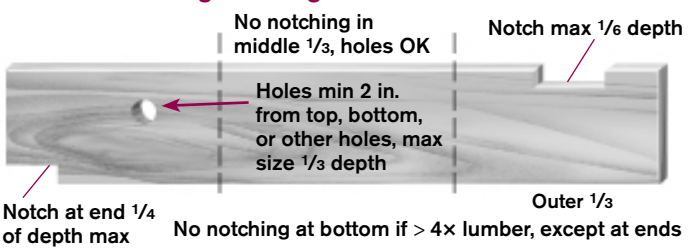


TABLE 10 NOTCHING & BORING JOISTS [502.8.1]

Nominal[A] Dimension Joist or Girder	Max Diameter Bored Hole	Max Notch Length	Max Notch Depth Outer 1/3	Max Depth End Notch
6	1 1/2 in.	1 3/4 in.	7/8 in.	1 3/8 in.
8	2 3/8 in.	2 3/8 in.	1 3/16 in.	1 7/8 in.
10	3 1/16 in.	3 1/16 in.	1 1/2 in.	2 3/8 in.
12	3 3/4 in.	3 3/4 in.	1 7/8 in.	2 7/8 in.

A. Table numbers based on actual dimensions: Typically 5½, 7¼, 9¼ & 11¼.

FIG. 28 Notching & Boring



Framing at Openings — 15 IRC

- ☐ Combustible framing min 2 in. from masonry chimneys _____ 1003.18
- ☐ Openings to be framed using headers & trimmers _____ 502.10
- ☐ Double trimmers for openings > 3 ft. from trimmer bearing points ____ 502.10
- ☐ Double headers & trimmers when header span > 4 ft. _____ 502.10[40]
- ☐ Headers & trimmers req bearing support or approved joist hangers ___ 502.6

Manufactured Lumber & Floor Trusses — 15 IRC

- ☐ Cuts, notches & holes only where specified by manufacturer or registered design professional _____ 502.8.2
- ☐ Point loads & other installation details AMI _____ 502.1.2
- ☐ Blocking, bridging & other lateral support AMI _____ 502.7.1X
- ☐ Truss drawings to include bracing requirements _____ 502.11.2
- ☐ No truss alterations w/o approval of registered design professional _ 502.11.3

TABLE 11 JOIST SPANS FOR 30-PSF LIVE LOAD T502.3.1(1) (IN FEET–INCHES)

Size	Douglas Fir-Larch #2[A] Spacing (in. o.c.)				Hem-Fir #2[A] Spacing (in. o.c.)			
	12	16	19.2	24	12	16	19.2	24
2×6	11–10	10–9	10–1	9–3	11–0	10–0	9–5	8–9
2×8	15–7	14–2	13–0	11–8	14–6	13–2	12–5	11–4
2×10	19–10	17–5	15–11	14–3	18–6	16–10	15–6	13–10
2×12	23–4	20–3	18–6	16–6	22–6	19–8	17–1	16–1
Size	**Southern Pine #2[A]** Spacing (in. o.c.)				**Spruce-Pine-Fir #2[A]** Spacing (in. o.c.)			
	12	16	19.2	24	12	16	19.2	24
2×6	11–3	10–3	9–6	8–6	11–3	10–3	9–8	8–11
2×8	14–11	13–3	12–1	10–10	14–11	13–6	12–9	11–6
2×10	18–1	15–8	14–4	12–10	19–0	17–2	15–8	14–1
2×12	21–4	18–6	16–10	15–1	23–0	19–11	18–3	16–3

A. Dead load = 10 psf. For other grades or dead loads, see IRC Table R502.3.1(1).

TABLE 12 JOIST SPANS FOR 40-PSF LIVE LOAD T502.3.1(2) (IN FEET–INCHES)

Size	Douglas Fir–Larch #2[A] Spacing (in. o.c.)				Hem–Fir #2[A] Spacing (in. o.c.)			
	12	16	19.2	24	12	16	19.2	24
2×6	10–9	9–9	9–2	8–3	10–0	9–1	8–7	7–11
2×8	14–2	12–9	11–8	10–5	13–2	12–0	11–3	10–2
2×10	18–0	15–7	14–3	12–9	16–10	15–2	13–10	12–5
2×12	20–11	18–1	16–6	14–9	20–4	17–7	16–1	14–4
Size	**Southern Pine #2[A]** Spacing (in. o.c.)				**Spruce-Pine-Fir #2[A]** Spacing (in. o.c.)			
	12	16	19.2	24	12	16	19.2	24
2×6	10–3	9–4	8–6	7–7	10–3	9–4	8–9	8–1
2×8	13–6	11–10	10–10	9–8	13–6	12–3	11–6	10–3
2×10	16–2	14–0	12–10	11–5	17–3	15–5	14–1	12–7
2×12	19–1	16–6	15–1	13–6	20–7	17–10	16–3	14–7

A. Dead load = 10 psf. For other grades or dead loads, see IRC Table R502.3.1(2).

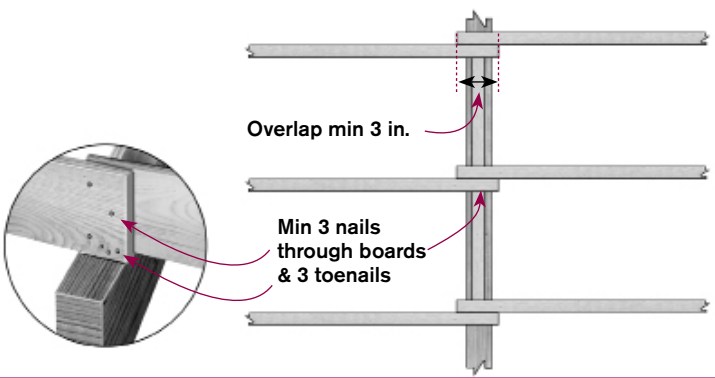
UNDERFLOOR FRAMING (CONTINUED)

Joist Blocking & Bridging **15 IRC**

- ☐ Joists blocked or attached to rim joists at all ends **F29** _____ 502.7
- ☐ Blocking min 2× material & full depth of joist **F29** _____ 502.7
- ☐ Blocking also req'd at intermediate supports in SDC D _____ 502.7X2
- ☐ Joists > 2×12 req bridging at max 8-ft. intervals_____ 502.7.1
- ☐ Truss & I-joist blocking & bridging AMI_____ 502.7X1 & 502.7.1X

FIG. 29

Joist Blocking & Bridging



WOOD STRUCTURAL PANEL SHEATHING

Wood structural panels (plywood & OSB) are used as sheathing for subfloors, roofs & walls. When used on roofs and floors, the allowable live load is based upon the panel rating, orientation & support span in accordance with **T13**. Sanded plywood used as a "combination subfloor underlayment" **T14** is often covered directly with carpeting or other finish floor materials. It is marked with a species group number as well as the grades of its surface veneers, such as an "A-C" marking.

Wood Structural Panel (WSP) Sheathing — 15 IRC

- ☐ WSP sheathing used for structural purposes req's grade stamp from approved agency **F30** _____ 503.2.1 & 803.2.1
- ☐ Allowable spans & loads per **T13** _____ 503.2.2 & 803.2.2
- ☐ Sanded plywood combination subfloor spans per **T14** _____ 503.2.1.1
- ☐ Fastened in accordance w/ **T20** _____ 503.2.3 & 803.2.3

FIG. 30

Wood Structural Panel Grade Mark

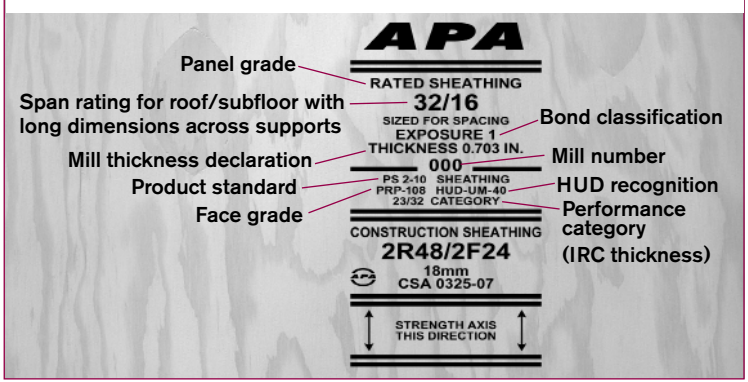


TABLE 13 — WOOD STRUCTURAL PANEL SUBFLOOR & ROOF SHEATHING SPANS & LOADS[A,B] [T503.2.1.1(1)]

Span Rating	Thickness (in.)	Allowable Live Load (psf)		Max Subfloor Span	Max Span (Roof)		Roof Live Load
		16 in.	24 in.		Edge Support[C]	No Edge Support	
16/0	3/8	30	–	0	16	16	30
20/0	3/8	50	–	0	20	20	30
24/0	3/8	100	30	0	24	20	30
24/16	7/16	100	40	16	24	24	40
32/16	15/32, 1/2	180	70	16	32	28	30
40/20	19/32, 5/8	305	130	20	40	32	30
48/24	23/32, 3/4	–	175	24	48	36	35
60/32	7/8	–	305	32	60	48	35

A. Based on 10-psf dead load; if more then live load should be reduced accordingly.
B. Panels continuous over min 2 spans with strength axis perpendicular to supports.
C. Blocking or T&G panel edges or (roof) edge clips midway between supports.

TABLE 14 — SANDED PLYWOOD SUBFLOOR UNDERLAYMENT THICKNESS & SPANS[A] T503.2.1.1(2)

Species Group	16-in. o.c. Joists	20-in. o.c. Joists	24-in. o.c. Joists
1	1/2	5/8	3/4
2,3	5/8	3/4	7/8
4	3/4	7/8	1

A. Face-grain perpendicular to supports & edges T&G or blocked.

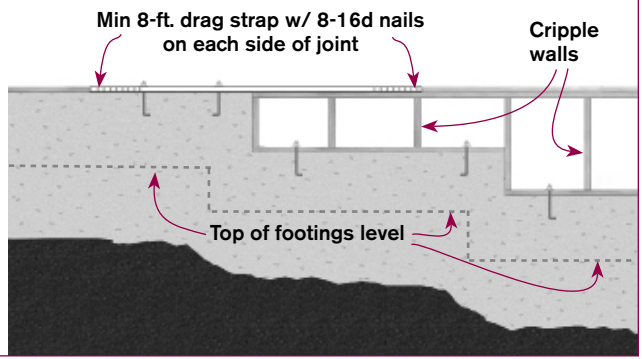
CRIPPLE WALLS

Cripple Walls **15 IRC**

- ☐ No smaller than size of studding above cripple wall _____ 602.9
- ☐ If < 14 in. high, solid WSP sheathing or solid blocking req'd _____ 602.9
- ☐ If > 4 ft. high, size studs as req'd for additional story _____ 602.9
- ☐ SDC A, B & C bracing length 1.15× req'd length of wall above __ 602.10.11
- ☐ SDC D_0 & D_1 bracing length 1.5× req'd length of wall above ___602.10.11.1
- ☐ SDC D_2 bracing per tables 602.10.3(3&4) _____602.10.11.2
- ☐ If any segment > 4 ft. high, entire cripple wall counts as additional story for bracing purposes & stories above redesignated _____602.10.11.3
- ☐ Max spacing between adjacent BWLs 14 ft. in SDC C & D _____602.10.11.1
- ☐ Stepped foundations w/ min 8 ft. direct on foundation considered braced & must be tied to cripple wall per **F31** _____ 602.11.2

FIG. 31

Cripple Walls in SDC D



WALL FRAMING

Sections 301.3 and 602.3 were each modified for consistency in the 2015 IRC. An engineered design must be provided for walls that exceed the design limits of **T15**. If the story height limits are exceeded, follow a design in accordance with the International Building Code.

Stud Walls — 15 IRC

- ☐ Studs req full bearing on plate at least equal to stud width _____ 602.3.4
- ☐ Studs continuous from sole plate to top plate EXC _____ 602.3
  - • Jack studs, trimmer studs & cripple studs _____ 602.3X
- ☐ Lumber req's grade mark or certification by lumber-grading agency _ 602.1.1
- ☐ End-jointed lumber OK if identified by grade mark _____ 602.1.2
- ☐ End-jointed lumber in fire-rated assemblies req's "HRA" mark _____ 602.1.2[41]
- ☐ Utility grade studs max 16 in. o.c. & not to support > roof & ceiling 602.3.1X1
- ☐ Max story height of wood frame 11 ft. 7 in., masonry 13 ft. 7 in. _____ 301.3[8]
- ☐ Max bearing wall stud height 10 ft. between lateral support (floor or roof-ceiling assembly perpendicular to plane of wall EXC _T602.3(5)
  - • 2×6 studs supporting roof load with ≤ 6 ft. tributary length OK to 18 ft. height or to 20 ft. if studs spaced 12 in. o.c. _____ 603.3.1X2
- ☐ Stud size & spacing per **T15** _____ 602.3.1

Top Plates — 15 IRC

- ☐ Double top plates req'd EXC _____ 602.3.2
  - • Single plate OK w/ metal ties at joints per **T16** & joists/rafters centered over studs within 1-in. tolerance _____ 602.3.2X
- ☐ Single top plate connections per **T16** _____ 602.3.2X[42]
- ☐ Plates min 2 in. nominal thickness & at least same width as studs___ 602.3.2
- ☐ End joints offset min 24 in., need not occur over studs **F33** _____ 602.3.2
- ☐ Nailing per **T16** _____ 602.3.2
- ☐ Studs to have full bearing on nominal 2× bottom plates ≥ stud width 602.3.4

TABLE 15 STUD SIZE AND SPACING [602.3(5)]

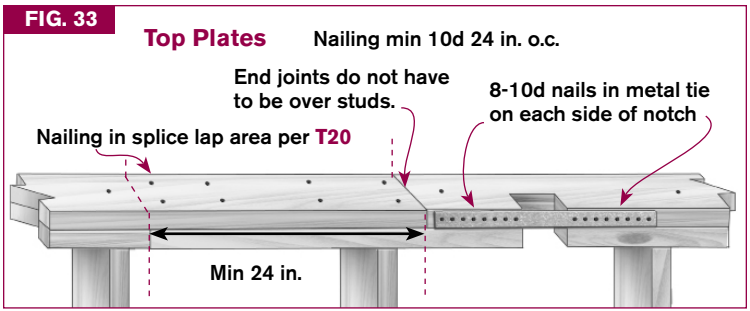
Bearing Walls to 10 Ft. Laterally Unsupported Height[A]				
Load supported	Stud size & maximum o.c. spacing (in.)			
	2×4	3×4	2×5	2×6
Roof + ceiling or habitable attic	24	24	24	24
1 floor	24	24	24	24
1 floor & roof+ceiling or habitable attic	16	24	24	24
2 floors & roof+ceiling or habitable attic	-	16	-	16
Nonbearing walls				
Stud size	2×3[B]	2×4	2×5	2×6
Max laterally unsupported height[A]	10	14	16	18

A. Lateral support refers to walls or roof/ceiling assemblies.
B. Not allowed in exterior walls.

TABLE 16 SINGLE TOP PLATE SPLICES

Condition	Corners & Intersecting Walls		Butt Joints in Straight Walls	
	Plate Size	Nails Each Side	Plate Size	Nails Each Side
SDC A-C & D if BWL spacing < 25 ft.	3 in. × 6 in. × 0.036 steel	6–8d box	3 in. × 12 in. × 0.036 steel	12–8d box
SDC D if BWL spacing ≥ 25 ft.	3 in. × 8 in. × 0.036 steel	9–8d box	3 in. × 16 in. × 0.036 steel	18–8d box

FIG. 33



Notching & Boring of Studs & Plates — 15 IRC

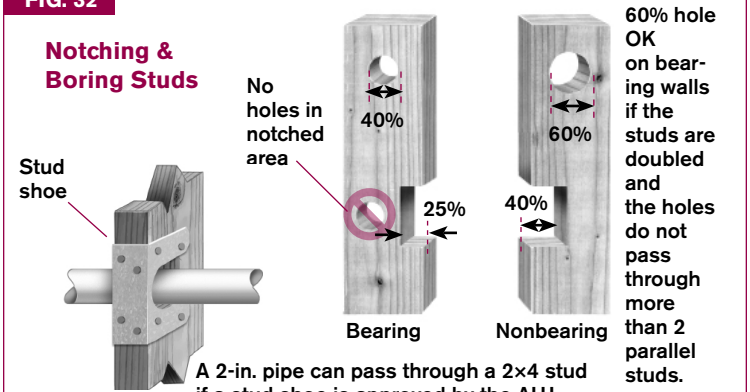
- ☐ Notching 25% max in bearing wall, 40% nonbearing **F32** _____ 602.6#1
- ☐ Bored holes min 5/8 in. from face of stud _____ 602.6#2
- ☐ OK to exceed above limits with approved stud shoes installed AMI __ 602.6X
- ☐ Holes not OK in same area as notch _____ 602.6#2
- ☐ Boring 40% max in bearing wall, 60% nonbearing EXC **F32** _____ 602.6
  - • 2 successive doubled bearing studs 60% OK **F32** _____ 602.6
- ☐ Top plate notches or bored holes > 50% of plate width req min 1 1/2 in. strap min 6 in. past notch or hole _____ 602.6.1
- ☐ Plate strap min 16 ga., min 8–10d nails each side of notch or hole EXC _____ 602.6.1
  - • Not req'd if entire side of wall w/ notch/hole covered with WSP __ 602.6.1X

TABLE 17 MAXIMUM SIZE STUD NOTCHES & BORED HOLES [602.6]

Wall Type	Exterior or Bearing Wall			Nonbearing Walls		
	2×4	3×4	2×6	2×3	2×4	2×6
Notches	7/8 in.	7/8 in.	1 3/8 in.	1 in.	1 3/8 in.	2 3/16 in.
Holes[A]	1 3/8 in.	1 3/8 in.	2 3/16 in.	1 1/2 in.	2 1/8 in.	3 1/4 in.

A. Holes min 5/8 in. from edge of stud.

FIG. 32

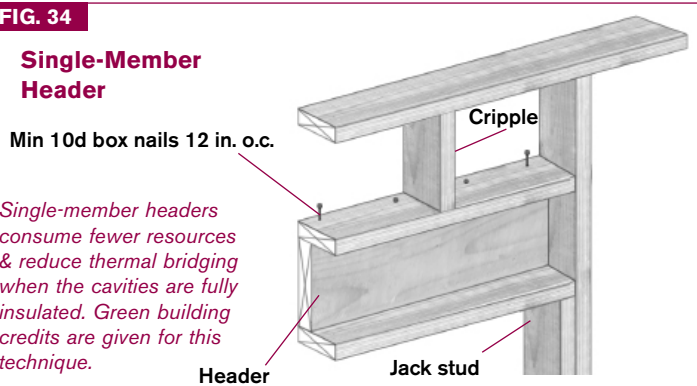


Headers — 15 IRC

- ☐ Header spans per download **T17B** _____ 602.7
- ☐ Nonbearing walls do not req headers at openings _____ 602.7.4
- ☐ Single-member headers **F34** face nail 12 in. o.c. top & bottom _____ 602.7.1[43]

FIG. 34

Single-Member Header



Single-member headers consume fewer resources & reduce thermal bridging when the cavities are fully insulated. Green building credits are given for this technique.

TABLE 17B — ALLOWABLE GIRDER & HEADER SPANS IN INTERIOR BEARING WALLS [T502.5(2)]

No. of floors supported	Min. Size	Building Width[A]					
		20 ft.		28 ft.		36 ft.	
		Span[B]	NJ[C]	Span[B]	NJ[C]	Span[B]	NJ[C]
1	2–2×4	3–1	1	2–8	1	2–5	1
	2–2×6	4–6	1	3–11	1	3–6	1
	2–2×8	5–9	1	5–0	2	4–5	2
	2–2×10	7–0	2	6–1	2	5–5	2
	2–2×12	8–1	2	7–0	2	6–3	2
	3–2×8	7–2	1	6–3	1	5–7	2
	3–2×10	8–9	1	7–7	2	6–9	2
	3–2×12	10–2	2	8–10	2	7–10	2
2	2–2×4	2–2	1	1–10	1	1–7	1
	2–2×6	3–2	2	2–9	2	2–5	2
	2–2×8	4–1	2	3–6	2	3–2	2
	2–2×10	4–11	2	4–3	2	3–10	3
	2–2×12	5–9	2	5–0	3	4–5	3
	3–2×8	5–1	2	4–5	2	3–11	2
	3–2×10	6–2	2	5–4	2	4–10	2
	3–2×12	7–2	2	6–3	2	5–7	3

A. Based on built-up #2 grade Douglas fir–larch lumber. Building widths are measured perpendicular to the ridge.
B. Spans are given in feet & inches (ft.–in).
C. NJ = number of jack studs under each end. If the number is 1, the header is permitted to be supported by framing anchors attached to full-length wall studs & the header.

TABLE 17C ALLOWABLE GIRDER & HEADER SPANS IN EXTERIOR BEARING WALLS [T502.5(1)]

Support	Min. Size	Building Width[A]					
		20 ft.		28 ft.		36 ft.	
		Span[B]	NJ[C]	Span[B]	NJ[C]	Span[B]	NJ[C]
Roof & Ceiling	1–2×8	4–6	1	3–10	1	3–5	1
	1–2×10	5–8	1	4–11	1	4–4	1
	1–2×12	6–11	1	5–11	1	5–3	2
	2–2×4	3–6	1	3–2	1	2–10	1
	2–2×6	5–5	1	4–8	1	4–2	1
	2–2×8	6–10	1	5–11	2	5–4	2
	2–2×10	8–5	2	7–3	2	6–6	2
	2–2×12	9–9	2	8–5	2	7–6	2
	3–2×8	8–4	1	7–5	1	6–8	1
	3–2×10	10–6	1	9–1	1	8–2	2
	3–2×12	12–2	2	10–7	7	9–5	2
Roof, Ceiling & 1 Center-Bearing Floor	1–2×8	3–11	1	3–5	1	3–0	1
	1–2×10	5–0	2	4–4	2	3–10	2
	1–2×12	5–10	2	4–9	2	4–2	2
	2–2×4	3–1	1	2–9	1	2 5	1
	2–2×6	4–6	1	4–0	1	3–7	2
	2–2×8	5–9	2	5–0	2	4–6	2
	2–2×10	7–0	2	6–2	2	5–6	2
	2–2×12	8–1	2	7–1	2	6–5	2
	3–2×8	5–9	2	5–0	2	4–6	2
	3–2×10	7–0	2	6–2	2	5–6	2
	3–2×12	8–1	2	7–1	2	6–5	2
Roof, Ceiling & 1 Clear-Span Floor	1–2×8	3–6	1	3–0	1	2–8	1
	1–2×10	4–6	1	3–10	1	3–3	1
	1–2×12	5–6	1	4–2	2	3–3	2
	2–2×4	2–8	1	2–4	1	2–1	1
	2–2×6	3–11	1	3–5	2	3–0	2
	2–2×8	5–0	2	4–4	2	3–10	2
	2–2×10	6–1	2	5–3	2	4–8	2
	2–2×12	7–1	2	6–1	2	5–5	2
	3–2×8	6–3	2	5–5	2	4–10	2
	3–2×10	7–7	2	6–7	2	5–11	2
	3–2×12	8–10	2	7–8	2	6–10	2
Roof, Ceiling & 2 Center-Bearing Floors	2–2×4	2–7	1	2–3	1	2–0	1
	2–2×6	3–9	2	3–3	2	2–11	2
	2–2×8	4–9	2	4–2	2	3–9	2
	2–2×10	5–9	2	5–1	2	4–7	3
	2–2×12	6–8	2	5–10	3	5–3	3
	3–2×8	4–10	2	4–2	2	3–9	2
	3–2×10	5–11	2	5–1	2	4–7	3
	3–2×12	6–10	2	5–11	2	5–4	3

A. Based on built-up #2 grade Douglas fir–larch lumber & a 30 lb. ground snow load. Building widths are measured perpendicular to the ridge.
B. Spans are given in feet & inches (ft.–in).
C. NJ = number of jack studs under each end. If the number is 1, the header is permitted to be supported by framing anchors attached to full-length wall studs & the header.

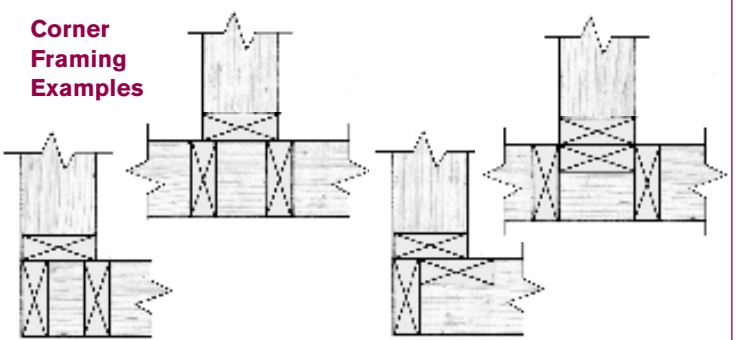
WALL FRAMING (CONTINUED)

Corners **15 IRC**

- ☐ 3 studs at corners **F35** EXC _____ 602.3
  - • 2 studs OK w/ devices as backing to secure face materials _____ 602.3
- ☐ Lap plates at corners _____ 602.3.2

FIG. 35

Corner Framing Examples



WALLS OTHER THAN WOOD FRAME

The IRC contains extensive prescriptive requirements and tables for cold-formed steel framing. These are based upon *AISI S230, Standard for Cold-Formed Steel Framing–Prescriptive Method for One- and Two-Family Dwellings*, 2007 Edition. In the latest edition and the IRC, the scope was expanded to include 3-story dwellings.

The IRC also has extensive sections on ICF (insulating concrete form) foundation and wall structures. These methods should not be considered as alternatives to foundations in conventional structures; they should be integrated into an overall "green" building design. Another new method–structural insulated panel wall construction–was added to the 2009 IRC. Through the prescriptive inclusion of this method, the project drawings are not required to bear the stamp of a design professional unless required by state law (as in California) or by the local jurisdiction. The U.S. Department of Housing & Urban Development has a free downloadable design guide for this method.

WALL BRACING

Foundation bolts prevent houses from moving off their foundations, and wall bracing resists distortion & overturning from the lateral & uplift forces of wind & earthquakes. In traditional carpentry, bracing typically consisted of diagonal braces or wood structural panels across at least a 4-ft.-wide section of wall. Shorter sections are able to obtain a bracing value by means of alternate braced wall panels (AWBs), including manufactured alternatives to the prescriptive AWBs in the code. These systems include tie-downs (referred to in the trades as hold-downs). For large spans with even higher aspect ratios on the braced walls, methods such as a portal frame with hold-downs are used. The IRC also recognizes braced walls less than 4 ft. using methods such as continuous sheathing and the simplified wall bracing method. The full tables necessary to prescriptively design wall bracing would fill this book; they can be viewed at http://codes.iccsafe.org/I-Codes.html.

Braced Wall Lines (BWLs) F36 — 15 IRC

- ☐ BWLs designated as straight line on building plan **F36** _____ 602.10.1
- ☐ Length of BWL is distance between its ends _____ 602.10.1.1
- ☐ End of BWL is intersection w/ perpendicular BWL or its extension _ 602.1.1[44]
- ☐ Braced walls max offset 4 ft. from BWL _____ 602.10.1.2
- ☐ Spacing between BWLs determined by Fig R602.10.1.1 _____ 602.10.1.3
- ☐ Angled walls w/ diagonal ≤ 8 ft. measured from projected corner _602.10.1.4
- ☐ Only 1 of projected lengths past angle counts toward req'd bracing 602.10.3
- ☐ Angled walls > 8 ft. considered separate braced wall line _____ 602.10.4

Braced Wall Panels (BWPs) & Methods — 15 IRC

- ☐ BWPs must be full-height wall section w/ no offsets _____ 602.10.2
- ☐ BWP must begin within 10 ft. of end of BWL _____ 602.10.2.2
- ☐ Max distance between BWPs in one BWL is 20 ft. _____ 602.10.2.2
- ☐ BWLs req min 2 BWPs EXC _____ 602.10.2.3
  - • BWLs ≤ 16 ft. min 2 BWPs or 1 BWP that is 4 ft. or more _____ 602.10.2.3
- ☐ BWP length in SDC A, B & C use wind tables 602.10.3(1&2) ____ 602.10.3
- ☐ Townhouses in SDC C use greater of wind or seismic design _____ 602.10.3
- ☐ BWP length in SDC D use seismic tables 602.10.3(3&4) EXC ___ 602.10.3
  - • If wind value greater, use wind tables 602.10.3(1&2) _____ 602.10.3
- ☐ Bracing method **T18** fastening per T602.10.4 _____ 602.10.4
- ☐ Simplified bracing method for SDC A & B _____ 602.12[45]

FIG. 36 **Braced Wall Lines**

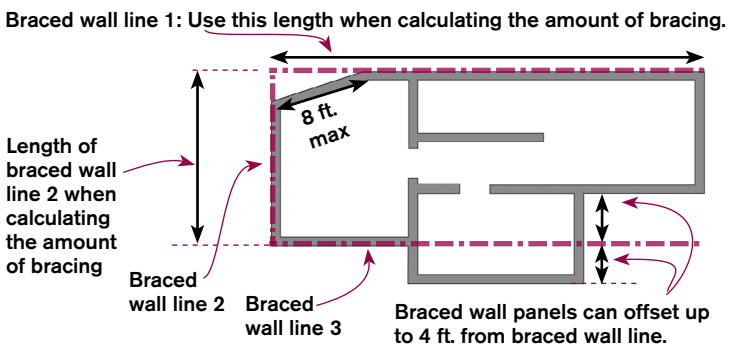


TABLE 18 **BRACING METHODS [T602.10.4]**

Acronym	Method/Material	Acronym	Method/Material
LIB	Let-in bracing	HPS	Hardboard panel siding
DWB	Diagonal wood boards	ABW	Alternate braced wall
WSP	Wood structural panel	PHF	Portal frame w/ HDs
BV-WSP	WSP w/ masonry veneer	PFG	Portal frame at garage
SFB	Structural fiberboard	CS-WSP	Continuous sheath WSP
GB	Gypsum board	CS-G	CS WSP at garage
PBS	Particleboard sheathing	CS-PF	CS portal frame
PCP	Portland cement plaster	CS-SFB	CS structural fiberboard

ROOF & CEILING FRAMING

An attic with limited storage is one that is provided with an entrance opening, no insulation above the joists or bottom truss chord, and where a 24×42-in.-high rectangle parallel to the rafters or trusses would fit within the openings of the framing. Portions of an attic near the entrance opening that qualify as limited storage must be designed for a 20-psf live load – **T23**.

General

	15 IRC
☐ Sawn lumber req's grade mark or agency approval certificate	802.1
☐ Conventional framing provisions apply to roof slopes ≥ 1:3	802.2
☐ Rafter or joist end min 1½ in. bearing on wood, 3 in. on masonry	802.6
☐ Cutting, boring & notching dimensional lumber per **T10**, **F28**	802.7.1
☐ Cutting, boring & notching of engineered wood products AMI	802.7.2
☐ Fastening per **T20**	802.2
☐ > 5:1 (2×10) dimension rafters & joists req blocking at bearing points	802.8
☐ > 6:1 (2×10) dimension rafters or joists req solid blocking, diagonal bridging, or 1×3 backer at max 8-ft. intervals	802.8.1
☐ Roof assembly attachment to walls req's uplift resistance	802.11

Ceiling Joists

	15 IRC
☐ Spans per **T21,23** EXC	802.4[39]
• Use **T11** for attics w/ fixed stairs	502.3.1
☐ 3-in. lap over partitions or butted & toenailed to bearing member	802.3.2
☐ Joists acting as rafter restraint nailed to each other per **T20**	802.3.2
☐ Joists not restraining rafters OK to nail per **T20**	802.3.2
☐ Butted joists acting as rafter restraint req ties	802.3.2
☐ End cuts max ¼ joist depth at inside bearing face of wall **F37**	802.7.1.2[46]

FIG. 37

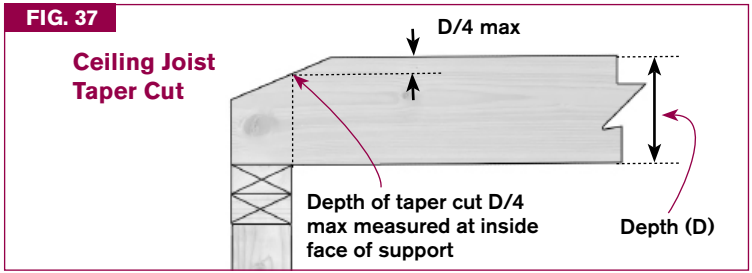


TABLE 20 FASTENER SCHEDULE [602.3(1)]

Connection	Fastener*	Method
FLOORS		
Joist to sill, plate, or girder	4-8d box or 3-8d common or 3-10d box or 3-3 in. shot	Toenail
Rim joist or blocking to sill or top plate (also roof)	8d box	4 in. o.c.
	10d box or 3 in. shot	6 in. o.c.
1 × 6 subfloor to joist	3-8d box or 2-8d common or 3-10d box	Face nail
2-in. subfloor to joist/girder	3-16 box or 2-16 common	Blind & face nail
2-in. planks (also roof)	3-16 box or 2-16 common	Each bearing, face nail
Band or rim joist to joist	3-16d common or 4-10d box or 4-3 in.	End nail
Built-up girders & beams, 2-in. lumber layers	20d common	32 in. o.c. top & bottom & staggered
	10d box or 3 in. shot	24 in. o.c. face top & bottom & staggered on opposite sides
Ends & splices of built-up girders and beams	2-20d common or 3-10d box or 3-3 in. shot	Face nail
Ledger strip supporting joists or rafters	4-16d box or 3-16d common or 4-10d box or 4-3 in. shot	At each joist or rafter, face nail
Bridging to joist	2-10d	Each end, toenail

Connection	Fastener*	Method
ROOF		
Blocking between ceiling joists or rafters to top plate	4-8d box or 3-8d common or 3-10d box or 3-3 in. shot	Toenail
Ceiling joist to top plate	4-8d box or 3-8d common or 3-10d box or 3-3 in. shot	Per joist, toenail
Ceiling joist not attached to parallel rafter, laps over partitions	4-10d box or 3-16d common or 4-3 in. shot	Face nail
Ceiling joist to parallel rafter	See T802.5.1(9)	Face nail
Collar tie to rafter	4-10d box or 3-10d common or 4-3 in. shot	Face nail
Rafter or roof truss to plate	3-16d box or 3-10d common or 4-10d box or 4-3 in. shot	2 toenails on one side and 1 toenail on opposite side of each rafter or truss
Roof rafters to ridge, valley or hip rafters or roof rafter to min 2-in. ridge beam	4-16d or 3-10d common or 4-10d box or 4-3 in. shot	Toenail
	3-16d box or 2-16d common or 3-10d box or 3-3 in. shot	End nail

WSP or COMBINATION SUBFLOOR TO FRAMING			
Material Thickness	**Nailing**	**Edges**	**Intermediate**
3/4 in. & less	6d deformed or 8d common	6	12
7/8 – 1 in.	8d common or 8d deformed	6	12
1 1/8 – 1 1/4 in.	10d common or 8d deformed	6	12

* See IRC table R602.3(2) for alternate attachments.

TABLE 20 FASTENER SCHEDULE [602.3(1)]

Connection	Fastener*	Method
WALLS		
Stud to stud (other than BWPs)	16d common	24 in. o.c. face nail
	10d box or 3-in. shot	16 in. o.c. face nail
Stud-stud at BWPs or intersecting wall corners	16d box	12 in. o.c. face nail
	16d common	16 in. o.c. face nail
Built-up header (2×s w/ ½ in. spacer)	16d common	16 in. o.c. face nail each edge
	16d box	12 in. o.c. face nail each edge
Continuous header to stud	5-8d box or 4-8d common or 4-10d box	Toenail
Top plate to top plate	16d common	16 in. o.c. face nail
	10d box or 3-in. shot	12 in. o.c. face nail
Double top plate splice when BWL spacing < 25 ft.	8-16d common or 12-16d box or 12-10d box or 12-3-in. shot	Face nail each side of end joint (min 24-in. lap splice length each side of joint)
Bottom plate to joist, rim joist, or blocking (not at BWP)	16d common	16 in. o.c. face nail
	16d box or 3-in. shot	12 in. o.c. face nail
Bottom plate to joist, rim joist, or blocking at BWPs	3-16d box or 2-16d common or 4-3-in. shot	Face nail
Top or bottom plate to stud	4-8d box or 3-16d box or 4-8d common or 4-10d box or 4-3 in.-shot	Toenail
	3-16d box or 2-16d common or 3-10d box or 3-3-in. shot	End nail
Top plates, laps at corners & intersections	3-10d box or 2-16d common or 3-3-in. shot	Face nail
1-in. brace to each stud & plate	3-8d box or 2-16d common or 2-10d box	Face nail
1 × 6 sheathing to each bearing	3-8d box or 2-8d common or 2-10d box	Face nail
1 × 8 sheathing to each bearing	3-8d box or 3-8d common or 3-10d box	Face nail
> 1 × 8 sheathing to each bearing	4-8d box or 3-8d common or 3-10d box	Face nail

WSP or SHEATHING TO SUBFLOOR, INTERIOR WALL, OR ROOF FRAMING			
Material Thickness	**Nailing**	**Edges**	**Intermediate**
3/8 – ½ in.	6d common (subfloor, wall) 8d common (roof)	6	12
19/32 – 1 in.	8d common	6	12
1 1/8 – 1 ¼ in.	10d common or 8d deformed	6	12
½-in. structural cellulose fiberboard wall sheathing	1½-in. galvanized roof nail w/ 7/16-in. head diameter or 1-in. crown staple 16 ga., 1¼ in. long	3	6
25/32 structural cellulose fiberboard wall sheathing	1¾-in. galvanized roof nail w/ 7/16-in. head diameter or 1-in. crown staple 16 ga., 1¼ in. long	3	6

* See IRC table R602.3(2) for alternate attachments.

TABLE 21 CEILING JOIST SPANS FOR 10-PSF LIVE LOAD T802.4(1) (IN FEET-INCHES) (UNINHABITABLE ATTICS WITHOUT STORAGE)

Size	Douglas Fir-Larch #2				Hem-Fir #2			
	Spacing (in. o.c.)				Spacing (in. o.c.)			
	12	16	19.2	24	12	16	19.2	24
2×4	12–5	11–3	10–7	9–10	11–7	10–6	9–11	9–2
2×6	19–6	17–8	16–8	15–0	18–2	16–6	15–7	14–5
2×8	25–8	23–4	21–4	19–1	24–0	21–9	20–6	18–6
2×10	A	A	26–0	23–3	A	A	25–3	22–7
Size	**Southern Pine #2**				**Spruce–Pine–Fir #2**			
	Spacing (in. o.c.)				**Spacing (in. o.c.)**			
	12	**16**	**19.2**	**24**	**12**	**16**	**19.2**	**24**
2×4	11–10	10–9	10–2	9–3	11–10	10–9	10–2	9–5
2×6	18–8	16–11	15–7	13–11	18–8	16–11	15–11	14–9
2×8	24–7	21–7	19–8	17–7	24–7	22–4	21–0	18–9
2×10	A	25–7	23–5	20–11	A	A	25–8	22–11

A. The allowed span exceeds 26 ft.

TABLE 22 RAFTER SPANS[A] FOR 10-PSF DEAD LOAD T802.5(1) (LIVE LOAD 20 PSF, CEILING NOT ATTACHED TO RAFTERS)[B]

Size	Douglas Fir-Larch #2				Hem-Fir #2			
	Rafter Spacing (in. o.c.)				Rafter Spacing (in. o.c.)			
	12	16	19.2	24	12	16	19.2	24
2×4	10-10	9-10	9-1	8-2	10-1	9-2	8-8	7-11
2×6	16-10	14-7	13-3	11-11	15-11	14-2	12-11	11-7
2×8	21-4	18-5	16-10	15-1	20-8	17-11	16-4	14-8
2×10	26-0	22-6	20-7	18-5	25-3	21-11	20-0	17-10
2×12	C	26-0	23-10	21-4	C	25-5	23-2	20-9
Size	**Southern Pine #2**				**Spruce-Pine-Fir #2**			
	Rafter Spacing (in. o.c.)				**Rafter Spacing (in. o.c.)**			
	12	**16**	**19.2**	**24**	**12**	**16**	**19.2**	**24**
2×4	10–4	9–0	8–2	7–4	10–4	9–5	8–10	8–0
2×6	15–7	13–6	12–3	11–0	16–3	14–4	13–1	11–9
2×8	19–8	17–1	15–7	10–11	21–0	18–2	16–7	14–10
2×10	23–5	20–3	18–6	16–6	25–8	22–3	20–3	18–2
2×12	C	23–10	21–9	19–6	C	25–9	23–6	21–0

A. Multiply by **T19** adjustment factor if joists or rafter ties not at bottom of attic space.
B. See full tables in code for 20-psf dead load & for greater snow loads.
C. The allowed span exceeds 26 ft.

TABLE 23 CEILING JOIST SPANS FOR 20-PSF LIVE LOAD T802.4(2) (IN FEET-INCHES) (UNINHABITABLE ATTICS WITH LIMITED STORAGE)

Size	Douglas Fir-Larch #2				Hem-Fir #2			
	Spacing (in. o.c.)				Spacing (in. o.c.)			
	12	16	19.2	24	12	16	19.2	24
2×4	9–10	8–11	8–2	7–3	9–2	8–4	7–10	7–1
2×6	15–0	13–0	11–11	10–8	14–5	12–8	11–7	10–4
2×8	19–1	16–6	15–1	13–6	18–6	16–0	14–8	13–1
2×10	23–3	20–2	18–5	16–5	22–7	19–7	17–10	16–0
Size	**Southern Pine #2**				**Spruce-Pine–Fir #2**			
	Spacing (in. o.c.)				Spacing (in. o.c.)			
	12	16	19.2	24	12	16	19.2	24
2×4	9–3	8–0	7–4	6–7	9–5	8–7	8–0	7–2
2×6	13–11	12–0	11–0	9–10	14–9	12–10	11–9	10–6
2×8	17–7	15–3	13–11	12–6	18–9	16–3	14–10	13–3
2×10	20–11	18–1	16–6	14–9	22–11	19–1	18–2	16–3

TABLE 24 RAFTER SPANS[A] FOR 10-PSF DEAD LOAD T802.5(2) (IN FEET–INCHES) (LIVE LOAD 20 PSF, CEILING ATTACHED TO RAFTERS)[B]

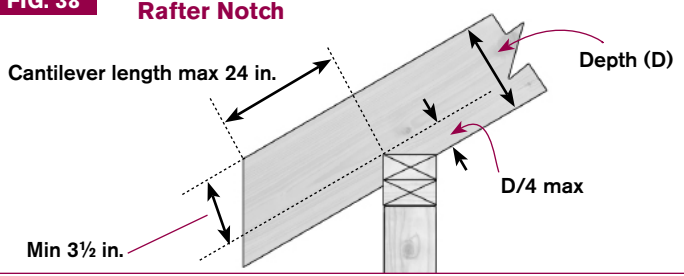
Size	Douglas Fir–Larch #2				Hem–Fir #2			
	Rafter Spacing (in. o.c.)				Rafter Spacing (in. o.c.)			
	12	16	19.2	24	12	16	19.2	24
2×4	9–10	8–11	8–5	7–10	9–2	8–4	7–10	7–3
2×6	15–6	14–1	13–3	11–11	14–5	13–1	12–4	11–5
2×8	20–5	18–5	16–10	15–1	19–0	17–3	16–3	14–8
2×10	26–0	22–6	20–7	18–5	24–3	21–11	20–0	17–10
2×12	C	26–0	23–10	21–4	C	25–5	23–2	20–9
Size	**Southern Pine #2**				**Spruce–Pine–Fir #2**			
	Rafter Spacing (in. o.c.)				Rafter Spacing (in. o.c.)			
	12	16	19.2	24	12	16	19.2	24
2×4	9–5	8–7	8–1	7–4	9–5	8–7	8–1	7–6
2×6	14–9	13–5	12–3	11–0	14–9	13–5	12–8	11–9
2×8	19–6	17–1	15–7	13–11	19–6	17–9	16–7	14–10
2×10	23–5	20–3	18–6	16–6	24–10	22–3	20–3	18–2
2×12	C	23–10	21–9	19–6	C	25–9	23–6	21–0

A. Multiply by **T19** adjustment factor if joists or rafter ties not at bottom of attic space.
B. See full tables in code for 20-psf dead load & for greater snow loads.
C. The allowed span exceeds 26 ft.

Rafters

	15 IRC
☐ Ridges, valleys & hips design as beams if slope < 3:12	802.3
☐ Rafter horizontal spans per **T22**,**24** EXC	802.5[39]
• Rafter span can be measured from purlin support	802.5.1
☐ Purlins' min dimension same as rafters they support **F39**	802.5.1
☐ Purlin braces (kickers) min 2×4, max spacing 4 ft. o.c. **F39**	802.5.1
☐ Purlin supports min 45° from horizontal **F39**	802.5.1
☐ Max unbraced length of braces 8 ft.	802.5.1
☐ Ridge min 1× material & full depth of cut rafter ends	802.3
☐ Rafters opposed at ridge–max 1½-in. offset allowed	802.3[47]
☐ Valleys & hip rafters min 2× material & full depth of cut rafter ends	802.3
☐ Hip & valley rafters adequate to support load: max deflection 1/180	802.3
☐ Cantilevered eave rafters ≤ 2 ft. max notch ¼ depth **F38**	802.7.1.1[48]

FIG. 38 **Rafter Notch**



Openings

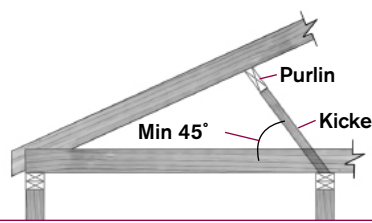
	15 IRC
☐ Openings to be framed w/ header & trimmer joists/rafters	802.9
☐ Single-member header OK up to 4 ft.	802.9
☐ Single trimmer OK for single header within 3 ft. of trimmer bearing	802.9
☐ Doubled header & trimmer joists req'd if header > 4 ft.	802.9
☐ Hangers req'd for header-trimmer connections if header > 6 ft.*	802.9
☐ Hangers or ledger strips req'd at header for tail joists > 12 ft.*	802.9

**Note: All joists & rafters require min 1½ in. bearing on wood or 3 in. on masonry or concrete. The section on rafter & ceiling openings did not change in 2015, though the section on floor joist openings did change. Best practice is to use hangers at all joints of openings.*

Roof Sheathing

	15 IRC
☐ Lumber sheathing min 5/8 in. net thickness at 24 in. o.c. supports	T803.1
☐ Min 1½ in. net thickness at > 24 in. o.c. supports	T803.1
☐ Spaced lumber sheathing not allowed in SDC D_2	803.1
☐ WSP req's grade mark from approved agency **F30**	803.2.1
☐ WSP spans per **T13**	803.2.2
☐ WSP sheathing OK to be permanently exposed on underside (such as eaves) if identified as Exposure 1	803.2.1.1
☐ Fire-retardant treated plywood req's grade mark	803.2.1.2
☐ Values for fire-retardant treated plywood must consider humidity & temperature by approved method of investigation	803.2.1.2

FIG. 39 **Purlins & Kickers**



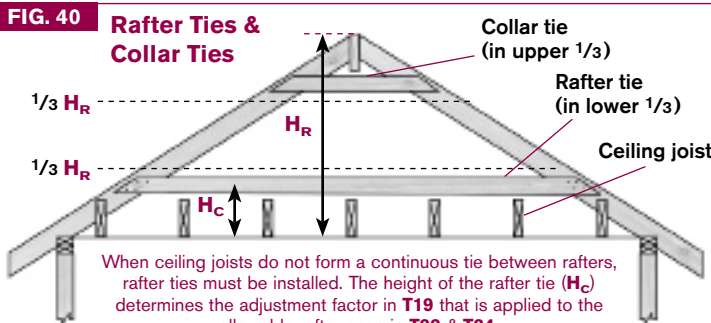
Purlin must be at least the same dimensions as the rafters they support.

Purlins must be supported by braces (kickers) at least every 4 ft. Braces longer than 8 ft. req mid-span support.

Rafter Ties & Collar Ties

	15 IRC
☐ Rafter ties req'd if joists not tied to parallel rafters EXC	802.3.1
• Not req'd if ridge supported per accepted engineering practice	802.3.1
☐ Rafter ties min 2×4 & located in lower 1/3 of attic **F40**	802.3.1
☐ Span tables must be adjusted per **T19** if HC ÷ HR > 0.133 **F40**	802.3.1
☐ Rafter tie & ceiling joist nailing to rafters per T802.5.1(9)	802.3.1
☐ Collar ties to resist wind uplift req'd in upper 1/3 of attic **F40**	802.3.1
☐ Collar ties min 1×4 max spacing 4 ft. o.c.	802.3.1

FIG. 40 **Rafter Ties & Collar Ties**



When ceiling joists do not form a continuous tie between rafters, rafter ties must be installed. The height of the rafter tie (H_C) determines the adjustment factor in **T19** that is applied to the allowable rafter span in **T22** & **T24**.

TABLE 19 **RAFTER SPAN ADJUSTMENT FACTORS [T802.5.1]**

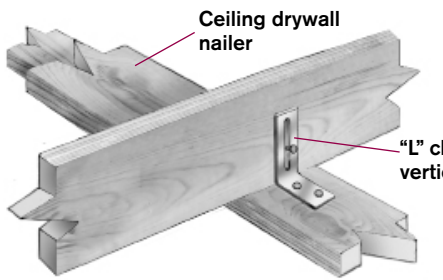
HC / HR	Adjustment	HC / HR	Adjustment
1/3	0.67	1/5	0.83
1/4	0.76	1/6	0.90

Trusses

	15 IRC
☐ Design drawings must be approved by BO prior to installation	802.10.1
☐ Design drawings must be included w/ truss shipment at job site	802.10.1
☐ Where not otherwise specified, bracing per BCSI	802.10.3
☐ Consult BCSI 1-03 for handling procedures & temporary bracing	802.10.3
☐ No alterations w/o approval of registered design professional	802.10.4
☐ No added loads (such as HVAC) w/o verification of capacity	802.10.4

Truss design drawings are typically in a booklet that includes the reaction forces & direction, bracing locations, top & bottom chord live & dead loads & other information. The booklet should be specific on the placement & fastening of each truss. Most trusses have 2 bearing points & do not bear weight on interior walls. Because of seasonal truss movement, connections to interior walls are made with hardware that allows vertical movement **F41**.

FIG. 41 **Slotted "L" clip**



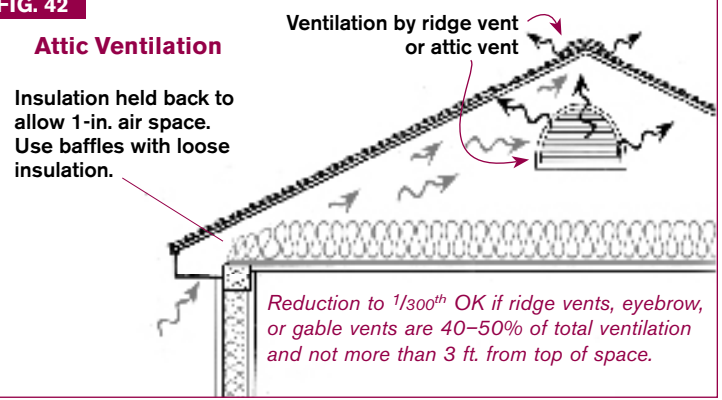
ATTICS

Access	15 IRC
☐ Access req'd if attic area is both ≥ 30 sq. ft. & ≥ 30 in. for that area	807.1[49]
☐ Measure height from top of ceiling framing to underside of roof framing	807.1
☐ Rough-framed opening min 22×30 in. in readily accessible area	807.1
☐ Attic opening in wall min 22 in. wide × 30 in. high	807.1
☐ Attic opening in ceiling min 30-in. headroom at some point above the opening as measured from bottom of ceiling framing	807.1
☐ Opening must be large enough to remove mechanical equipment	1305.1.3
☐ Access not req'd in noncombustible construction (steel frame & roof)	807.1

Ventilation	15 IRC
☐ Vent each enclosed attic & rafter bay	806.1
☐ Openings least dimension 1/16 in., max dimension 1/4 in.	806.1
☐ Openings > 1/4 in. protected w/ screening 1/16 – 1/4 in.	806.1
☐ Min 1-in. clearance between insulation & roof sheathing	806.3
☐ Min 1-in. clearance between insulation and vent opening	806.3
☐ Total area of ventilation 1/150th of vented space EXC	806.2
• Reduction to 1/300th OK if 40–50% of venting provided by openings in upper portion of space min 3 ft. below highest point & balance from eave or cornice vents **F42**	806.2
• Reduction to 1/300th OK if Class I or II vapor retarder on warm-in-winter side of ceiling in climate zones 6, 7 & 8	806.2

FIG. 42

Attic Ventilation



EXTERIOR DECKS

The IRC has greatly expanded its requirements for decks, including new tables. The American Wood Council publishes DCA 6–Prescriptive Residential Wood Deck Construction Guide, and it is a free download on its website: www.awc.org/codes-standards/publications/dca6. See www.codecheck.com/cc/CCBuilding4th for the tables listed below.

General

	15 IRC
☐ Decks shall be decay-resistant	507.3.3[50]
☐ Max allowable joist spacing per T507.4	507.4[51]
☐ Max allowable joist span per T507.5	507.5[52]
☐ Max spans for wood beams per T507.6	507.6[53]

FIG. 43 Deck Ledger

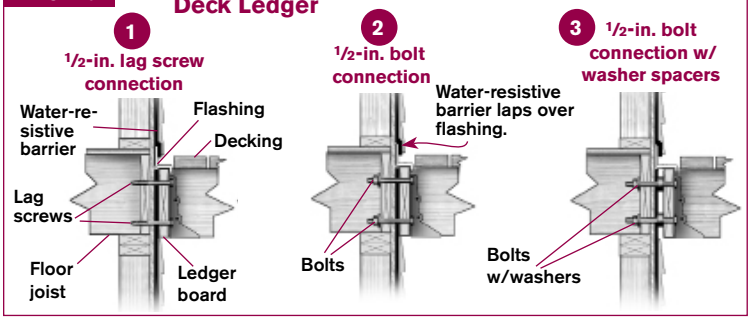


TABLE 25 DECK LEDGER ATTACHMENT & DETAILS [T507.2]

Joist Span (ft.)	≤6	≤8	≤10	≤12	≤14	≤16	≤18
Connection Details	On-center Fastener Spacing (in.)						
½-in. lag screw **F43 – 1**	30	23	18	15	13	11	10
½-in. bolt **F43 – 2**	36	36	34	29	24	21	19
½-in. bolt w/ spacer washers **F43 – 3**	36	36	29	24	21	18	16

Note: Designs are based upon max 15/32-in. sheathing, #2 or better PT or naturally durable wood ledger & 2-in. nominal band joist. Min 1 × 9½-in. Douglas Fir laminated veneer lumber can substitute for band joist.

Almost all balcony deck collapses are not the result of exceeding the allowable live load. Rather, they are from failure of the attachment to the structure or from neglect and rot. All decks should be routinely inspected for deterioration, insect damage, fastener or connector corrosion & security of railings.

Ledgers & Attachment

	15 IRC
☐ Cantilevered framing backspan connections designed for uplift	507.1
☐ Max ratio of backspan to cantilever 2:1	T502.3.3(2)
☐ Landings, balconies, decks positively anchored or self-supporting	311.5.1
☐ Attachment not w/ toenails or nails subject to withdrawal	311.5.1
☐ Where positive connection not verifiable during construction, decks must be self-supporting	507.1
☐ Deck ledger min 2×8 PT or naturally durable wood	507.2.1
☐ Deck ledgers cannot be supported on masonry veneer	507.2.1
☐ Deck ledgers cannot support concentrated loads (girders, beams)	507.2.1
☐ Band joists must be supported by wall or sill if supporting ledger	507.2.2
☐ Deck ledger attachment w/ min ½-in. lag screws or bolts **T25**	507.2.3
☐ Lag screws & bolts hot-dipped galvanized or stainless steel **F43,44**	507.2.3
☐ Lag screws & bolts req washers **F43,44**	F507.2.1(2)
☐ Lag screws & bolts staggered **F45**	F507.2.1(1)
☐ Lag screws & bolts min 2 in. from top of ledger & min 2 in. from bottom of band joist **F45**	T507.2.1 & F507.2.1(2)
☐ Lateral connection can be done with horizontal hold-downs	507.2.4
☐ Hold-downs either 2-1,500-lb. capacity through-bolted to floor joists & max 24 in. from each end of deck, or 4-750-lb. capacity hold-downs AMI to bottom of joists, evenly spaced & max 24 in. from each end of ledger	F507.2.3(1&2)

FIG. 44

Deck Ledger Attachment Distances

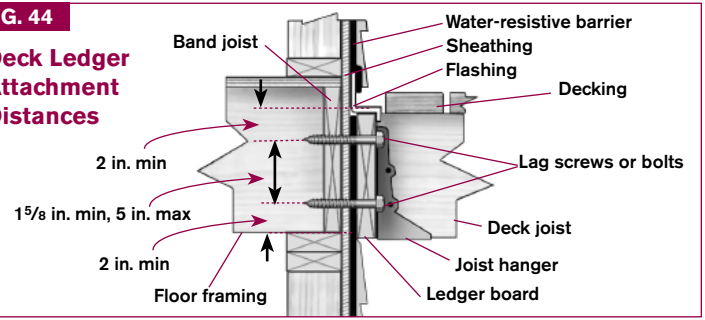
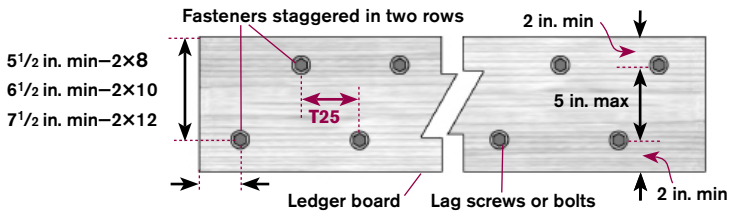


FIG. 45

Ledger Board Attachment Distances



EXTERIOR WALL COVERS

Materials that are sensitive to moisture should not be stored or installed until the roof and exterior water-resistive barriers (WRB) are complete and doors and windows are in place. To reduce the possibility of mold growth and other moisture-related problems, best practice is to not cover the interior of framing until it has a moisture content less than 19%.

General — 15 IRC

- ☐ No products sensitive to weather until protection in place ____ 701.2
- ☐ Exterior sheathing must be dry before installing exterior cover ____ 701.2
- ☐ Wall coverings must resist wind loads ____ 703.1.2
- ☐ Fasteners for exterior wall coverings corrosion-resistant ____ 703.3.2
- ☐ Fasteners must be into studs unless AMI for siding type ____ 703.3.2

Water-Resistive Barriers (WRB) & Flashings — 15 IRC

- ☐ WRB & means of draining to exterior req'd at all exterior walls EXC __ 703.1.1
  - Masonry or concrete walls w/ proper flashings at penetrations __ 703.1.1X1
- ☐ WRB req'd over studs or sheathing at all exterior walls ____ 703.2
- ☐ WRB = min No. 15 asphalt felt complying w/ ASTM D 226 ____ 703.2
- ☐ Install shingle fashion (upper over lower) to prevent water entry into wall 703.2
- ☐ Min 2-in. horizontal lap, 6-in. lap at vertical joints ____ 703.2
- ☐ Window/door flashings must extend to WRB or to exterior ____ 703.4
- ☐ Self-adhered flashing must comply w/ AAMA 711 (note: caulking must be compatible w/ the self-adhered flashing) ____ 703.4
- ☐ Liquid flashings must comply with AAMA 714 ____ 703.4
- ☐ Req'd locations of flashing: ____ 703.4
  - Exterior door & window openings **F50**
  - Intersections of chimneys w/ frame or stucco walls
  - Under & at ends of masonry, wood, or metal copings & sills
  - Continuously above all projecting wood trim
  - Where porches, decks, or stairs attach to a wood-framed wall or floor **F43**
  - At wall & roof intersections **F56**
  - At built-in gutters

Wood, Hardboard & Wood Panel Siding — 15 IRC

- ☐ Vertical joints must be over framing members or WSP ____ 703.5.2
- ☐ Horizontal joints of panel siding over solid blocking or WSP ____ 703.5.2
- ☐ Horizontal joints lapped 1 in., shiplapped, or Z-bar flashing ____ 703.5.2
- ☐ Manufactured horizontal lap siding must be installed AMI ____ 703.5.3

Exterior Insulation Finish Systems (EIFS) — 15 IRC

- ☐ All EIFS systems to comply w/ ASTM E 2568 ____ 703.9.1&2
- ☐ Drainage plane-type EIFS req'd over all wall assemblies EXC ____ 703.9.2
  - Over concrete or masonry walls when EIFS installed AMI ____ 703.9.1
- ☐ WRB req'd between EIFS & wall sheathing ____ 703.9.2
- ☐ Terminate min 6 in. above finished ground level ____ 703.9.1&2

Stucco — 15 IRC

- ☐ Must comply w/ ASTM C 926 & ASTM C 1063 **T26** ____ 703.7
- ☐ Lath fastener spacing max 6 in. or as approved (ASTM = 7 in.) ____ 703.7.1
- ☐ Min 3-coat system over metal or wire lath, 2-coat over masonry **F46** ____ 703.7.2
- ☐ Proportions per **T26** ____ T702.1(3)
- ☐ Intervals between coats **T26** ____ 703.7.5
- ☐ Maintain moist min 48 hrs before subsequent coats ____ 703.7.4

TABLE 26	3-COAT STUCCO (VERTICAL SURFACES) [703.6]			
Coat	Thickness	Lime-to-Cement Volume Ratio	Sand-to-Cement Volume Ratio[A]	Interval after Previous Coat[B]
Scratch	3/8 in.	3/4 to 1½[C]	2½ to 4	n/a
Brown	3/8 in.	3/4 to 1½[C]	3 to 5[D]	Min 48 hrs
Finish	1/8 in.	3/4 to 2	1½ to 3	Min 7 days

A. Ratio of sand to combined volume of cement and lime.
B. ASTM C 926 allows lesser curing times depending on climate.
C. Max 3/4 over low-absorption surfaces such as clay tile or brick.
D. Same or greater proportion of sand in 2nd coat as used in 1st coat.

FIG. 46

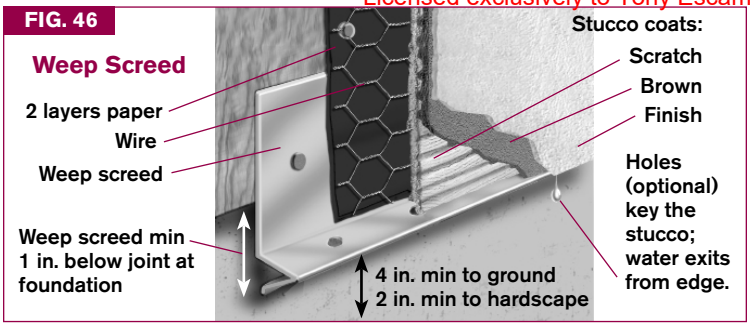


FIG. 47

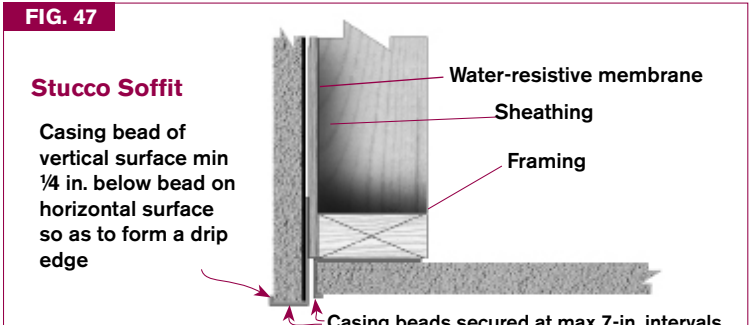


TABLE 27	ASTM C 926 & ASTM C 1063 REQUIREMENTS
C 926	**Summary of Requirement**
7.1.5	Install each coat without interruption or cold joints.
8.1	Continuously hydrate between coats.
8.1	Time between coats depends on climatic & job conditions.
12.3.2	Apply when ambient temperature > 40°F.

TABLE 27	ASTM C 926 & ASTM C 1063 REQUIREMENTS (CONT.)
C 926	**Summary of Requirement**
A2.2.3	Vertical-to-horizontal intersections req casing beads both surfaces, with vertical ¼ in. below horizontal to provide drip edge. Horizontal casing bead held back min ¼ in. **F47**.
A2.3.1.2	Control joints to be included in plans & specifications.
C 1063	**Summary of Requirement**
7.10.1.4	Lath stopped & tied each side of control joints.
7.10.1.5	Ceilings (soffits) req casing bead at intersections to walls or columns (no cornerite).
7.10.1.6	Load-bearing walls req casing bead or similar (no cornerite) at wall ends abutting structural walls or columns.
7.10.2.1	Lath must attach to framing members, not just to sheathing.
7.10.2.2	Diamond-mesh lath to horizontal framing w/ min 1½-in. nails.
7.11.1.1	Flanges of accessories secured at max 7-in. intervals.
7.11.2	Install corner beads, corner reinforcement, or wrap lath around corners for min 1 support.
7.11.3	Casing beads to isolate nonload-bearing members from load-bearing.
7.11.4	Control joint separation spacing min ⅛ in.
7.11.4.1	Control joints to delineate areas not > 144 sq. ft.
7.11.4.2	Max 18-ft. distance between control joints.
7.11.4.2	Max 2½ to 1 ratio of length to width between control joints.
7.11.4.2	Control joint req'd where ceiling framing or furring changes direction.
7.11.4.4	Wall or partition height door frames considered control joints.
7.11.5	Weep screed req'd at bottom of all steel- or wood-framed walls **F46**.
7.11.5	Bottom edge of weep screed min 1 in. below joint between foundation & framing **F46**.
7.11.5	Nose of screed min 4 in. above earth or 2 in. above paving **F46**.

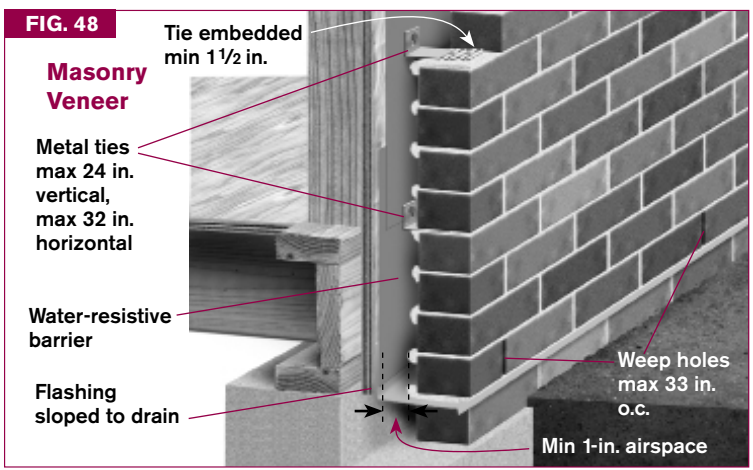
EXTERIOR WALL COVERS (CONTINUED)

Refer to IRC section 703.8 for the prescriptive requirements for masonry veneer support & bracing, and height limitations based upon SDC.

Masonry Veneer Attachment & Flashing F48 — 15 IRC

- ☐ Ties min 1 1/2 in. embedded in veneer mortar — 703.8.4
- ☐ Min 5/8-in. mortar cover over ties from face of veneer — 703.8.4
- ☐ Air space req'd behind veneer EXC — T703.8.4
  - • Grout fill OK over WRB over studs — 703.8.4.2
- ☐ Air space nominal 1 in. for ties, 1–4 1/2 in. for metal strand tie wire — T703.8.4
- ☐ Ties max 24 in. o.c. vertical & 32 in. o.c. horizontal — 703.8.4.1
- ☐ Max supported wall area of each tie 2.67 sq. ft. EXC — 703.8.4.1
  - • Max 2 sq. ft. SDC D (Townhouse C), wind pressure > 30 PSF — 703.8.4.1X
- ☐ Flashing req'd beneath first course above ground — 703.8.5
- ☐ Flashing req'd at other points of support such as lintels — 703.8.5
- ☐ Min 3/16-in. weep holes immediately above flashing max 33 in. o.c. — 703.8.6

FIG. 48



Anchored Stone & Masonry Veneer - Height & Support — 15 IRC

- ☐ SDC A, B & C max thickness 5 in., max height 30 ft. + 8 ft. gable — T703.8(1)
- ☐ SDC $D_{1,2}$ max thickness 4 in., SDC D_2 max thickness 3 in. — T703.8(2)
- ☐ SDC D max thickness max height 20 ft. + 8 ft. gable — T703.8(2)
- ☐ Not OK to support additional loads on masonry veneer — 703.8.3

Adhered Masonry or Stone Veneer — 15 IRC

- ☐ Install lath as per stucco or AMI — 703.12
- ☐ Weep screed req'd 4 in. above earth, 2 in. above hardscape, or 1/2 in. above walking surfaces supported by same foundation as wall F46 — 703.12.1&2

Vinyl Siding — 15 IRC

- ☐ Must be labeled by approved agency to ASTM D 3679 — 703.11
- ☐ Insulated vinyl siding labeled for conformity to ASTM D 7793 — 703.13
- ☐ Install AMI — 703.11.1
- ☐ No decorative trim face-nailed through EIFS — 703.9.1&2

INTERIOR WALL SURFACES

See p. 6 for fire-resistant standards for interior wall and ceiling surfaces.

Gypsum Board (GB) — 15 IRC

- ☐ Protect from adverse weather during construction — 701.2
- ☐ Do not install interior GB where exposed to weather or water — 702.3.5
- ☐ Install only after all rough inspections complete — 109.1.2
- ☐ Edges & ends over framing unless perpendicular to framing — 702.3.5
- ☐ Fastening per **T28** — 702.3.5
- ☐ Min screw penetration into wood 5/8 in., steel stud 3/8 in. — 702.3.5.1

Wall Tile — 15 IRC

- ☐ Install per ANSI A108: *Standard for the Installation of Ceramic Tile* — 702.4.1
- ☐ Backer = fiber-cement board, fiber-mat reinforced cement board, glass-mat gypsum, fiber-reinforced gypsum backers — 702.4.2
- ☐ Backer must meet ASTM C 1178, C1278, C 1288, or C 1325 — 702.4.2

Water-Resistant Gypsum Backing Board (Purple Board) — 15 IRC

- ☐ OK on ceilings — 702.3.7[54]
- ☐ OK as tile backer in areas w/ limited water exposure such as toilet or sink areas or ceilings above tile — 702.3.7
- ☐ Not OK with direct exposure to water or high humidity — 702.3.7.1
- ☐ Not OK over vapor retarder in tub or shower compartment — 702.3.7

TABLE 28 GYPSUM BOARD FASTENING SCHEDULE [T702.3.5]

Thickness (inches)	Location	Orientation to Framing	Max Frame Spacing	Fastener Spacing	
				Nails[A]	Screws
3/8	Ceiling[B]	Perpendicular	16	7	12
3/8	Wall	Either	16	8	16
1/2	Ceiling	Either	16	7	12
1/2	Ceiling	Perpendicular	24	7	12
1/2	Wall	Either	24	8	12
1/2	Wall	Either	16	8	16
5/8	Ceiling	Either	16	7	12
5/8	Ceiling	Perpendicular	24	7	12
5/8	Garage Ceiling[C]	Perpendicular	24	6	6
5/8	Wall	Either	24	8	12
5/8	Wall	Either	16	8	16

A. Min nail length for 3/8-in. GB 1 1/4 in., 1/2-in. GB 1 3/8 in., and 5/8-in. GB 1 7/8 in.
B. 3/8-in. GB is not allowed on ceilings supporting insulation or where water-based texture to be applied.
C. Type X drywall and min 1 7/8-in. nails.

MASONRY FIREPLACES & CHIMNEYS

Masonry fireplaces are declining in popularity due to energy and environmental issues and the rising popularity of gas-burning appliances, covered in *Code Check Plumbing & Mechanical*.

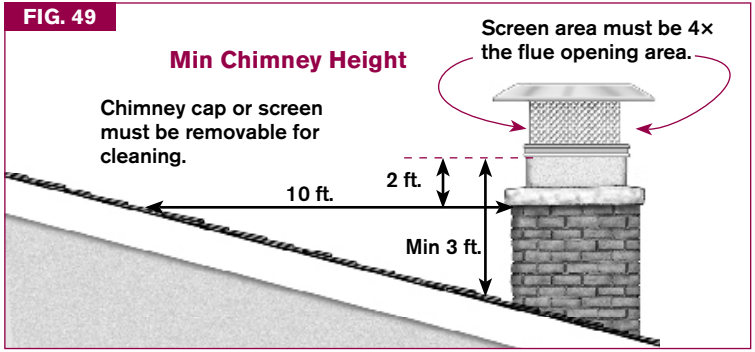
Fireplace & Chimney Construction — 15 IRC

- ☐ Footing min 12 in. thick & 6 in. beyond sides _____ 1001.2 & 1003.2
- ☐ Framing min 2-in. clearance from chimney & front & sides of fireplace & 4 in. from back of fireplace EXC _____ 1001.11 & 1003.18
  - • Combustible trim, siding, flooring & sheathing can touch if 12 in. from firebox or flue liner _____ 1001.11X3 & 1003.18X3
- ☐ Combustible trim cannot overlap chimney corners > 1 in. _____ 1003.18X3
- ☐ Clear air space not filled except for fireblocking _____ 1001.11 & 1003.18
- ☐ Chimneys not to support loads other than their own weight _____ 1003.8

Flues F49 — 15 IRC

- ☐ Terminate min 3 ft. above roof & 2 ft. above building within 10 ft. _____ 1003.9
- ☐ Spark arresters net free area min 4× flue opening size _____ 1003.9.2
- ☐ Screening mesh > 3/8 in. & < 1/2 in. & removable for cleaning _____ 1003.9.2

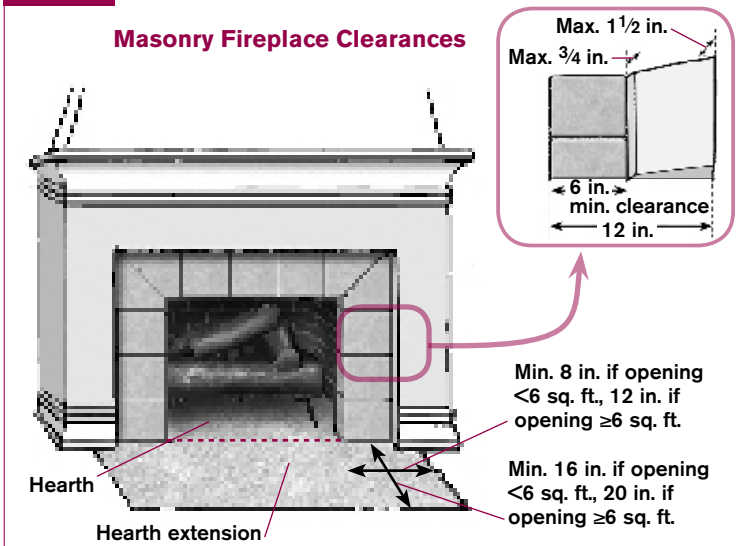
FIG. 49



Masonry Fireplaces F50 — 15 IRC

- ☐ Remove all combustible material from under hearth & extension _____ 1001.9
- ☐ Extension depth min 16 in. front, 8 in. side, if opening < 6 sq. ft. _____ 1001.10
- ☐ Extension depth min 20 in. front, 12 in. side, if opening ≥ 6 sq. ft. _____ 1001.10
- ☐ No combustible material within 6 in. of opening _____ 1001.11X4
- ☐ Combustible material < 12 in. from opening limited to projection of 1/8 in. for each inch distance from opening _____ 1001.11X4

FIG. 50



WINDOWS & EXTERIOR DOORS

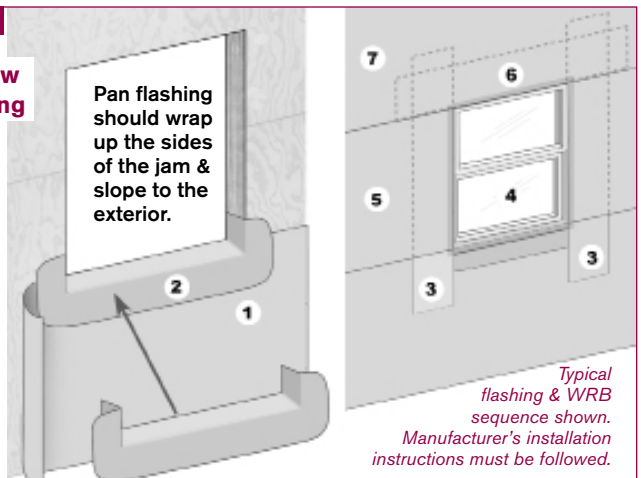
The American Architectural Manufacturer's Association (AAMA) provides standards for performance and installation of new and retrofit windows. There are different standards for each siding and climate type and for special wind regions. Always follow the installation instructions.

Performance, Installation & Labeling — 15 IRC

- ☐ Windows & doors, including garage doors, req design for wind _____ 609.2
- ☐ Windows & sliding doors req labeling from approved agency to indicate compliance w/ AAMA standards _____ 609.3
- ☐ Written installation instructions req'd for each window & door _____ 609.1
- ☐ Window & door openings req flashing installed AMI **F51** _____ 609.1
- ☐ Window & glass door assemblies must be anchored AMI _____ 609.7.1
- ☐ Pan flashing req'd **F51** _____ 703.4#1.1

FIG. 51

Window Flashing



Typical flashing & WRB sequence shown. Manufacturer's installation instructions must be followed.

Child Fall Prevention — 15 IRC

- ☐ Openable windows w/ top of sill < 24 in. above floor & > 72 in. above finished grade or surface below req protection as follows: __ 312.2.1[55]
  - • Will not allow passage of 4-in. sphere in fully open position _____ 312.2.1#1
  - • Window fall-prevention devices per ASTM F 2090 _____ 312.2.1#2
  - • Opening control device (such as quick-release security bar) ____ 312.2.1#3
- ☐ Window-opening limiting devices may not reduce net clear area req'd for escape & rescue **T4,5** _____ 312.2.2

SKYLIGHTS

- ☐ Skylight = glazing at ≥ 15° from vertical _____ 308.6.1
- ☐ May be laminated, fully tempered, heat-strengthened, or wired glass, or approved rigid plastics _____ 308.6.2
- ☐ Unit skylights req labeling from approved independent laboratory ___ 308.6.9
- ☐ Any glass OK in greenhouses w/o screens if ≤ 20 ft. above grade __ 308.6.6
- ☐ Unit skylights min 4 in. curb in roof w/ < 3:12 slope or AMI _____ 308.6.8
- ☐ Cricket or saddle req'd if > 30-in.-wide opening unless allowed AMI 903.2.2

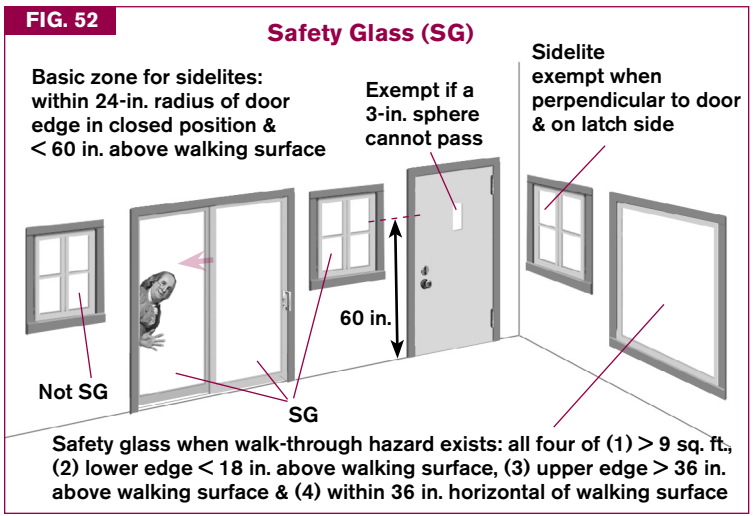
SAFETY GLASS

Safety glass can be laminated or fully tempered. Most tempered glass is labeled CPSC category II; category I glass is allowed in panes smaller than 9 sq. ft. in doors and in glazing next to doors (sidelites).

Identification — 15 IRC

- ☐ Safety glass reqs permanent etched label EXC _____ 308.1
  - • Non-tempered safety glazing OK to provide certificate to BO _____ 308.1X1
  - • Tempered spandrel glass may have removable paper label _____ 308.1X2
- ☐ Glass panes ≤ 1 sq. ft. in multipane assemblies 1 label per above, others can state only CPSC 16 CFR 1201 or ANSI Z97.1 _____ 308.1.1
- ☐ Glazing not associated w/ doors or tubs or showers OK to have ANSI Z97.1 Category A label w/o a CPSC label _____ 308.3.1X

FIG. 52



Human Impact Loads & Hazardous Locations — 15 IRC

- ☐ Safety glazing req'd in locations per **T29**, **F52**,**53** EXC _____ 308.3&4
  - • Louvered windows & jalousies _____ 308.3X1
  - • Glass unit masonry (glass block) _____ 308.3X3
  - • Mirrors mounted on continuous backing support (typically vinyl) are exempt from impact test standards _____ 308.3X2

FIG. 53

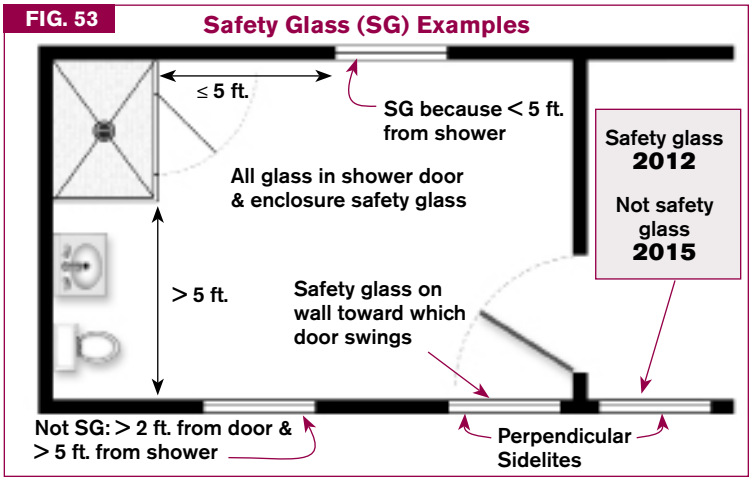


TABLE 29	REQUIRED SAFETY GLAZING LOCATIONS [308.4]	
	Location	**Exceptions**
1	Glazing in doors **F52,53**	1. Openings that would prevent passage of a 3-in. sphere 2. Decorative glass
2	Sidelites where any part of glass within 24-in. arc of the door in closed position & < 60 in. above floor or standing surface **F52**	1. Decorative glass 2. When protected by intervening barrier 3. Glass perpendicular to door other than on hinge side toward which door swings[56] **F53** 4. When door only serves closet ≤ 3 ft. deep 5. Glass adjacent to fixed side of patio doors
3	Walk-through hazard: > 9 sq. ft. & lowest edge < 18 in. from walking surface & upper edge > 36 in. above walking surface & ≤ 3 ft. horizontal from walking surface **F52**	1. Decorative glass 2. When protected by min 1½-in.-high horizontal rail, 34–38 in. above walking surface w/ rail able to resist 50-lb. force w/o contacting glass 3. Outboard panes ≥ 25 ft. above grade, roof, or other surface below
4	Railings, including infill	None
5	Wet surface areas: Glass < 60 in. above standing or walking surfaces & in walls, enclosures, or fences facing or containing pools, spas, hot tubs, tubs, showers, saunas, or steam rooms **F53**	Glazing > 60 in. horizontally from water's edge or edge of shower, sauna, or steam room **F53**
6	Glass adjacent to stairways, landings & ramps within 36 in. horizontally of walking surface & < 36 in. above walking surface	1. When protected by min 1½-in.-high horizontal rail 34–38 in. above walking surface w/ rail able to resist 50-lb. force w/o contacting glass 2. When > 18 in. horizontally from a railing meeting req's of an open-stair guard
7	Glass within 60 in. horizontal 180° arc of bottom tread of stairway when glass < 36 in. above landing	When > 18 in. horizontally from a railing meeting req's of an open-stair guard

ROOFS

General

	15 IRC
☐ Roof materials must be installed AMI	903.1 & 904.1
☐ Materials req conformity to recognized standards	904.3
☐ Materials req identification & test agency labels	904.4
☐ Materials must resist design wind loads per **T2**	905.1

Fire Ratings

	15 IRC
☐ Class A, B, or C req'd per local laws or if < 3 ft. of LL	902.1
☐ Roof-integrated photovoltaic shingles or roof-mounted PV panels req fire classification listing if < 3 ft. from LL or in area where classified roofing req'd	902.3&4[57]
☐ Class A, B, or C listed & tested per UL 790 or ASTM E 108 EXC	902.1
• Roofs automatically considered Class A:	902.1X
1. Coverings of brick, masonry, or exposed concrete	
2. Metal, tile, or slate installed over noncombustible decks	
3. 16 oz. per sq. ft. copper sheets over combustible decks	
4. Slate over underlayment over combustible decks	
☐ Fire-retardant treated wood roofs req test agency label each bundle	902.2

Flashing & Drainage

	15 IRC
☐ Flashing req'd to prevent moisture from entering the roof & walls	903.2
☐ Flashing req'd at wall & roof intersections, changes of roof slope, or direction & around roof openings	903.2.1
☐ Metal flashing corrosion-resistant min 26-ga. galvanized steel	903.2.1
☐ Crickets req'd on ridge side of penetrations > 30 in. wide EXC	903.2.2
• Unit skylights installed & flashed AMI	903.2.2X
☐ Parapet walls req noncombustible coping ≥ thickness of parapet	903.3
☐ Drains at each low point of roof unless designed to run over edges	903.4
☐ If roof traps water, overflow drains inlets req'd 2 in. above low points	903.4.1
☐ Overflow can be min 4-in.-high scupper 3X drain size in parapet wall	903.4.1
☐ Overflow drains must discharge separately from main roof drains	903.4.1
☐ Size of roof drains & leaders to comply w/ plumbing code	903.4.1

Ice Barriers

	15 IRC
☐ In areas with history of ice forming along eaves causing backup of water, ice barrier req'd for asphalt shingles, metal roof shingles, mineral-surfaced roll roofing, slate & slate shingles, wood shingles & shakes EXC	905.1.2
• Detached accessory structures w/ no conditioned area	905.1.2X
☐ Ice barrier = 2 layers underlayment cemented together or self-adhering polymer mod bit sheet to 24 in. inside exterior wall line	905.1.2

Asphalt Shingles

	15 IRC
☐ Roof deck req's solid sheathing **T15**	905.2.1
☐ Min slope 2:12, double underlayment if < 4:12	905.2.2
☐ Underlayment for slopes < 4:12 installed shingle fashion, 19 in. starter strip & successive 36-in.-wide sheets lapped 19 in.	T905.1.1(2)
☐ Underlayment for slopes ≥ 4:12 lapped min 2 in., end laps 4 in.	T905.1.1(2)
☐ Underlayment type per wind speed & tables 905.1.1(1&2)	905.2.3
☐ Shingle type per wind speed & table 905.2.4.1	905.2.4.1
☐ Fastener penetration min 3/4 in. or through if sheathing < 3/4 in. **F55**	905.2.5
☐ Fasteners min 12 ga w/ min 3/8-in.-diameter head (no staples) **F55**	905.2.5[58]
☐ Fasteners AMI & min 4 per strip, or 2 per individual shingle **F54**	905.2.6

FIG. 54

Asphalt Shingle Nail Zone

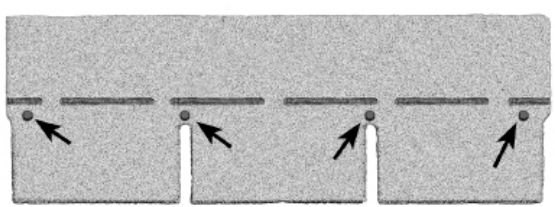
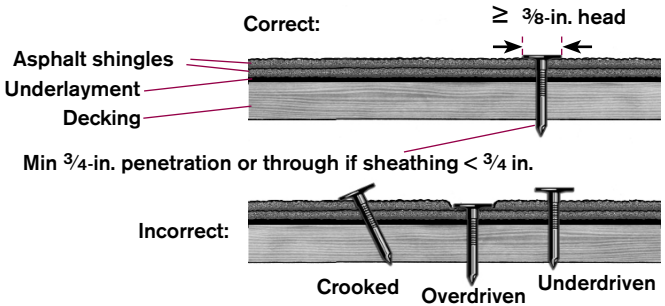


FIG. 55

Asphalt Shingle Nailing Method



Asphalt Shingle Flashing — 15 IRC

- ☐ Drip flashing below underlayment, rake flashing above **F56** _____ 905.2.8.5[59]
- ☐ Drip edge min 1/4 in. below sheathing, 2 in. onto roof deck **F56** ___ 905.2.8.5[59]
- ☐ Underlayment over eave drip edge, under rake drip edge **F56** ____ 905.2.8.5[59]
- ☐ Open valleys metal 24 in. wide or 2 layers rolled mineral w/ top 36 in. 905.2.8.2
- ☐ Closed valleys req min 36-in. rolled mineral liner or AMI _____ 905.2.8.2
- ☐ Wall & pipe jack flashings AMI _____ 905.2.8.4
- ☐ Sidewall step flashing min 4 in. high & 4 in. wide, length AMI _____ 905.2.8.3
- ☐ Sidewall to masonry veneer must have steel angle iron supported on min 3-2×6 rafters, masonry counterflash below weep holes & brought to roof surface to act as base flashing _____ 703.8.2.2
- ☐ Sidewall flashings must terminate in kickout flashing **F57** _____ 905.2.8.3

FIG. 56

Roof Edge Flashing

Underlayment laps over drip flashing; rake edge flashing laps over underlayment.

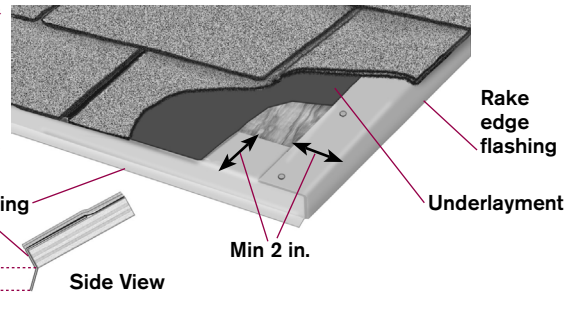
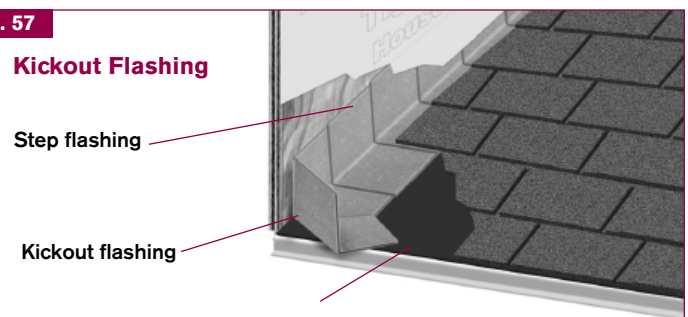


FIG. 57

Kickout Flashing



Clay & Concrete Tile — 15 IRC

Manufacturers' requirements are typically more stringent than the IRC for membranes and underlayment. The Tile Roofing Institute publishes several installation guides: Tile Roofing Manual, TRI Design Criteria for Cold & Snow Regions, and Tile Installation Manual for Florida (High Wind Areas). These can be downloaded from: ***http://tileroofing.org/resources/installation-guides/***

- ☐ Application AMI based on climate, slope, underlayment & tile type __ 905.3.7
- ☐ Min slope 2½:12, double underlayment if < 4:12 _____ 905.3.2
- ☐ Roof-to-wall flashings AMI, if metal min 26-ga. corrosion-resistant __ 905.3.8
- ☐ Valley flashing min 11 in. each way from centerline _____ 905.3.8

Slate Roofing — 15 IRC

- ☐ Min slope 4:12, sheathing solid _____ 905.6.1&2
- ☐ Underlayment AMI (ASTM D 226 or D 4869 Type I, II, III, or IV) ____ 905.6.3
- ☐ Min headlap 4 in. if < 8:12 slope, 3 in. if ≥ 8:12 & < 20:12 _____ 905.6.5

Wood Shingles — 15 IRC

- ☐ Bundles to include label of approved grading bureau _____ 905.7.7
- ☐ Min slope 3:12, sheathing solid or spaced _____ 905.7.1&2
- ☐ Solid sheathing under areas with ice-dam protection _____ 905.7.1.1
- ☐ Underlayment, if installed, min ASTM D 226 Type I _____ 905.7.3
- ☐ Sidelap min 1½ in., no aligned keyways any 3 adjacent courses **F58** _ 905.7.5
- ☐ Keyways min ¼ in., max ⅜ in. **F58** _____ 905.7.5
- ☐ Exposure per shingle grade & length **T30** _____ 905.7.5
- ☐ 2 fasteners per shingle, min fastener penetration ¾ in. **F58** _____ 905.7.5
- ☐ Fasteners ¾ in. max from edge & 1 in. above exposure line **F58** ____ 905.7.5
- ☐ Fastening in accordance w/ **T30** _____ 905.7.5[60]

FIG. 58 **Wood Shingle Application**

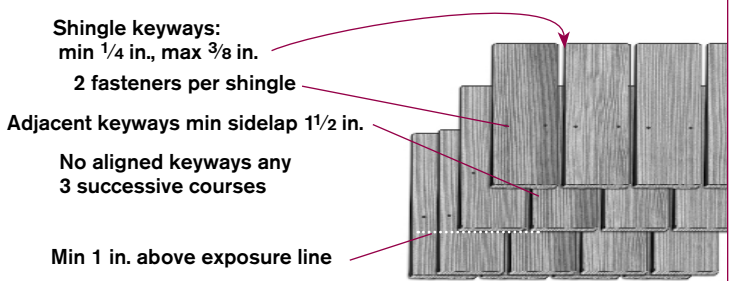


TABLE 30 **WOOD SHINGLE & WOOD SHAKE NAILING[A,B,C,D] T905.7.5(2)**

Material		Type & Length	Min Diameter
Shingles	16 or 18 in.	3d box 1¼ in.	0.080 in.
	24 in.	4d box 1½ in.	0.080 in.
Shakes	18 in. straight split	5d box 1¼ in.	0.080 in.
	18 & 24 in. handsplit & resawn	6d box 2 in.	0.0915 in.
	24 in. taper-split	5d box 1¾ in.	0.080 in.
	18 & 24 in. tapersawn	6d box 2 in.	0.0915 in.

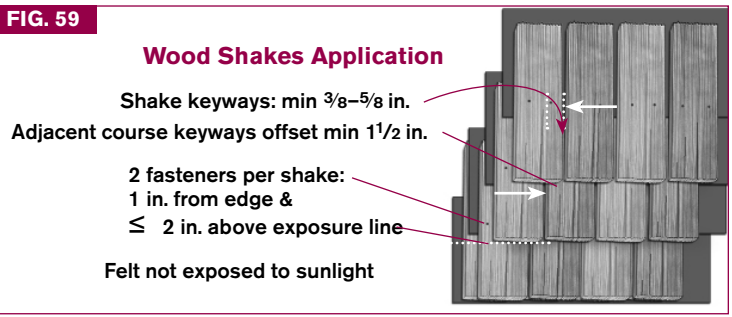
A. Nails hot-dipped galvanized or stainless steel.
B. Stainless staples OK w/ crown with min 7/16 in., max ¾ in.
C. Stainless fasteners req'd in fire-retardant treated roofs or ≤ 15 miles of salt water coastal areas.
D. Min head size for all nails 0.19 in.

Wood Shakes — 15 IRC

- ☐ Bundles to include label of approved grading bureau — 905.8.9
- ☐ Solid sheathing under areas with ice-dam protection — 905.8.1.1
- ☐ Min slope 3:12, sheathing solid or spaced EXC — 905.8.2
  - • Spaced lumber sheathing not allowed in SDC D_2 — 803.1
- ☐ Interlayment min No. 30 felt (ASTM D 226, Type II) — 905.8.7
- ☐ Interlayment strips 18 in. wide & no felt exposed to sun — 905.8.7
- ☐ Sidelap min 1½ in., keyways min ⅜ in., max ⅝ in. **F59** — 905.8.6
- ☐ Exposure per shake grade & length **T30** — 905.8.6
- ☐ Max exposure standard #1 grade shake 10 in. at 4:12 slope — 905.8.6
- ☐ 2 fasteners per shake, min fastener penetration ¾ in. **F59** — 905.8.6

FIG. 59

Wood Shakes Application



Metal Roof Panels — 15 IRC

- ☐ Deck solid or spaced sheathing unless AMI for spaced supports — 905.10.1
- ☐ Min slope 3:12 for lapped nonsoldered seam w/o lap sealant — 905.10.2
- ☐ Min slope ½:12 (4%) w/ lap sealant installed AMI — 905.10.2
- ☐ Min slope for standing seam ¼:12 (2%) — 905.10.2
- ☐ Materials req'd to be corrosion resistant — 905.10.3
- ☐ Fasteners AMI; if not specified, use the following: — 905.10.4
  - • Galvanized or stainless-steel fasteners for steel roofs
  - • Copper, brass, bronze, or 300 series stainless for copper roofs
- ☐ Underlayment AMI — 905.10.5

Roll Roofing — 15 IRC

- ☐ Mineral-surface roll roofing only on solid sheathing — 905.5.1
- ☐ Mineral-surface roll roofing AMI & min 1:12 slope (8%) — 905.5.2

Low-Slope Roofs — 15 IRC

Note: In the 3 code citations below, the letter X substitutes for the specific code number of the roofing material as follows: BUR = 9, modified bitumen = 11, EPDM = 12, TPO = 13, sprayed polyurethane foam = 14.

- ☐ Min slope ¼ in. per ft. (2% slope) EXC — 905.X.1
  - • Coal tar BUR OK at ⅛ in. per ft. (1% slope) — 905.9.1
- ☐ Install in compliance w/ applicable ASTM standards — 905.X.2
- ☐ Install AMI — 905.X.3

FIG. 60

3-Ply Built-Up Roof (BUR)

Inter-ply bitumen must be installed in a continuous firmly bonded film with no voids between the plies of material. Approximately 25 lbs. of asphalt per square are required. The temperature must be maintained at the proper range for the specific type of asphalt.

RE-ROOFING

Re-Roofing **15 IRC**

- ☐ Same requirements as for new roofs EXC _____ 908.1
  - • Low slope OK < 2% if providing positive drainage _____ 908.1X1
  - • Adding secondary drains not req'd for roof w/ positive drainage ___ 908.1X2
- ☐ Remove all existing layers of old roofing if two or more layers present of any type of roofing or if roof will not provide adequate base for new or if existing roof waterlogged _____ 908.3.1.1#3
- ☐ Metal panel, metal shingle, or tile OK over existing shake roof ____ 908.3.1#3
- ☐ Sprayed polyurethane foam new protective coat OK over old _____ 907.3X3
- ☐ Replace rusted or damaged flashings _____ 908.6
- ☐ Prime flashings prior to application of bituminous materials _____ 908.6

Check with the local jurisdiction to determine its policy on what permits and inspections are req'd for re-roofing. When removing roofs such as shakes or shingles over skip sheathing and re-covering with asphalt shingles, solid underlayment or lumber infill is req'd, and the jurisdiction will likely req a nailing inspection in addition to any other inspections.

NRCA Recommendations & ASTM Requirements for BUR F60

- Store rolls on ends, not sides, to prevent deformation
- Protect water-based materials from freezing prior to installation
- Protect insulation from moisture
- Do not install roofing while ice, rain, or snow is present
- Use cant strips to limit bends to 45° at horizontal-to-vertical intersections
- Sample temperature (typical 350°F to 425°F for Type I asphalt)
- Aggregate must be clean & dry to adhere to hot bitumen

FIRE SPRINKLER SYSTEMS

Fire sprinklers significantly improve survival rates in fires. The building section of the IRC tells us when we need to install fire sprinklers. The installation methods are in the plumbing section of the code. The IRC reqs systems to comply w/ NFPA 13D or P2904, which offers alternative methods of compliance. These systems slow fire progression enough to allow occupants to escape. The purpose is to protect the occupants, not the building. Local rules will vary on the extent of additions or remodels that will trigger a need for compliance.

Required Locations — 15 IRC

- ☐ Required in new townhouses & 1- & 2-family dwellings EXC _____ 313.1&2
  - • Additions or alterations of buildings w/o automatic sprinklers __ 313.1X&2X
- ☐ Must protect all areas of dwelling unit EXC _____ 2904.1.1
  - • Attics, crawlspaces, etc. w/o fuel-fired appliances _____ 2904.1.1X1
  - • Attics, crawlspaces, etc. w/ fuel-fired appliances only req sprinklers directly over appliance, not elsewhere in that space _____ 2904.1.1X1
  - • GB-surfaced closets ≤ 24 sq. ft w/ smallest dimension ≤ 3 ft. __ 2904.1.1X2
  - • Bathrooms ≤ 55 sq. ft. _____ 2904.1.1X3
  - • Garages, carports, exterior porches, unheated entries (mudrooms) that are adjacent to an exterior door _____ 2904.1.1X4

Methods — 15 IRC

- ☐ May be multipurpose system or stand-alone system w/o additives ___ 2904.1
- ☐ Comply w/ IRC 2904 or w/ NFPA 13D _____ 2904.1
- ☐ Design flow rate, piping & coverage per either of above standards ___ 2904.1

Inspections — 15 IRC

- ☐ Preconcealment: req'd areas, coverage at obstructions, ratings, pipe size & length, listing, manufacturer's instructions & testing _____ 2904.8.1
- ☐ Final: Heads not painted or obstructed, pumps (if applicable) automatically start, no impairments to flow such as added filters, owners manual present & warning sign installed **F61** _____ 2904.8.2
- ☐ Certificate of Occupancy must state if fire sprinklers req'd & installed _ 110.3

FIG. 61

Required Fire Sprinkler Warning Sign

SMOKE ALARMS

The 2015 IRC restricts the locations that ionization alarms are allowed to be installed. Studies show that ionization alarms account for the majority of nuisance trips or false activations. They are also proven to be much slower to respond to smoldering fires than photoelectric alarms. The majority of residential fire deaths occur in homes where the smoke alarms were either disconnected due to nuisance alarms or they failed to respond quickly enough in a smoldering fire. A growing number of cities and states now require photoelectric technology alarms in residential occupancies. Many states have more stringent rules than the IRC – check with your local jurisdiction. The 2015 IRC req's compliance w/ NFPA 72, which includes additional prescriptive requirements for smoke alarms and their locations.

Where Req'd — 15 IRC

- ☐ In each sleeping room **F62** _____ 314.3#1
- ☐ Outside each sleeping area in vicinity of bedrooms **F62** _____ 314.3#2
- ☐ Req'd on each story, habitable attics & basements EXC _____ 314.3
  - • Split-level open rooms OK on upper level if lower level < 1 full story below upper level & no intervening door _____ 314.3#3
- ☐ Min 3 ft. from door opening of bathroom w/ bath or shower unless no other way to comply w/ 314.3#2 **F62** _____ 314.3#4[61]
- ☐ Ionization min 20 ft. from installed cooking appliance EXC _____ 314.3.1[62]
  - • 10 ft. OK if alarm has silencing button **F62** _____ 314.3.1[62]
- ☐ Photoelectric min 6 ft. from installed cooking appliance **F62** _____ 314.3.1[62]

Power Source & Interconnection — 15 IRC

- ☐ Primary power from building wiring + battery backup EXC _____ 314.6
  - • Battery-only OK for alterations, repairs & additions _____ 314.6X2[63]
- ☐ No disconnecting switch allowed other than circuit breaker _____ 314.6
- ☐ Alarms must be interconnected so that activation of one alarm triggers all others EXC _____ 314.4
  - • Alterations or repairs that do not include removal of finish surfaces & no attic, basement, or crawlspace available to provide wiring _____ 314.4X
- ☐ Listed wireless interconnection OK _____ 314.4

Existing Buildings — 15 IRC

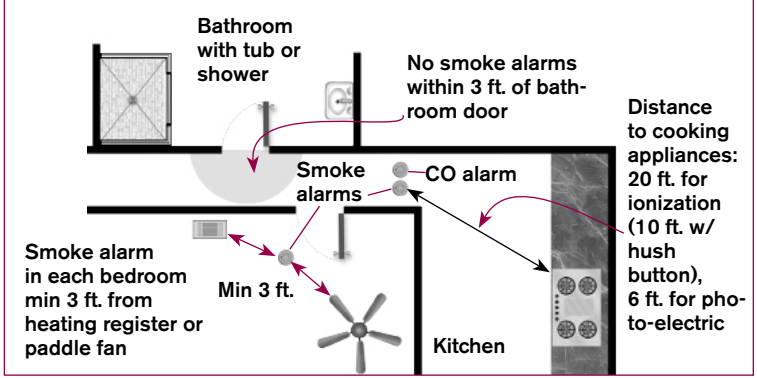
- ☐ Alterations, repairs & additions that req permit trigger requirement for same locations as new construction EXC _____ 314.2.2
  - • Work only on exterior (roofing, windows, deck, siding) _____ 314.2.2X1
- ☐ Scope of work limited to plumbing or mechanical _____ 314.2.2X2

Fire Alarm Systems — 15 IRC

- ☐ NFPA 72 fire alarm system OK in lieu of smoke alarms _____ 314.7[64]
- ☐ Systems become permanent fixture of the property _____ 314.7.3

FIG. 62

Smoke Alarm Distances



NFPA 72 REQUIREMENTS

The following additional location requirements are from NFPA 72, the National Fire Alarm Code. These rules are required by IRC 314.1[65]. Many states also require alarms that are solely battery-powered to have 10-year non-replaceable batteries.

- Alarms outside sleeping areas must be within 21 ft. of each sleeping room.
- When the interior floor area of a given level is > 1,000 sq. ft., all points on the ceiling req an alarm within 30 ft. or that level req's min 1 alarm per 500 sq. ft.
- For peaked or sloped ceilings, alarms must be within 36 in. horizontally of the high side of the ceiling or the adjoining wall & not closer than 4 in. to the peak or wall.
- Where mounting surface can become considerably colder or hotter than room (such as below uninsulated attic), mount alarm on wall.
- Wall-mounted detectors not more than 12 in. from adjoining ceiling.
- Not to be located where ambient conditions exceed manufacturer's rating.
- Not in unfinished attics or garages or other spaces where temperatures can be < 40°F or > 100°F.
- Min 3 ft. horizontal clearance from supply register of forced air. **F62**
- Min 3 ft. horizontal distance from ceiling-suspended paddle fan. **F62**
- For stairs leading up from basement, locate on basement ceiling near entry to stairs.
- Locate on highest portion of coffered ceiling or on slope portion within 12 in. of highest point.

CARBON MONOXIDE ALARMS

Many states have carbon monoxide alarm laws that supersede or supplement the requirements of the IRC. Check with your local jurisdiction.

When Req'd	**15 IRC**
☐ New construction dwelling units with a fuel-fire appliance or an attached garage with an opening to the dwelling	315.2.1[66]
☐ Existing dwellings w/ alterations, repairs, or additions EXC	315.2.2
• Not req'd if work is only on exterior or for alterations or repairs limited in scope to plumbing or mechanical	315.2.2X[67]
Where Req'd	**15 IRC**
☐ Outside each sleeping area in vicinity of bedrooms **F62**	315.3
☐ In bedrooms w/ fuel-burning appliances	315.3
☐ In bedrooms w/ fuel-burning appliance in attached bath	315.3
Alarm Types	**15 IRC**
☐ Must be listed to UL 2034	315.1.1
☐ Combination smoke and CO OK w/ UL 217 & 2034 listing	315.4[68]
☐ Can be part of CO detection system (central monitoring)	316.6[69]
☐ Detection systems become permanent fixture	316.6.3
Power Source	**15 IRC**
☐ Primary power from building wiring + battery backup EXC	315.5[70]
• Battery-only OK for alterations, repairs or additions	315.5X2
☐ No disconnecting switch allowed other than circuit breaker	315.5

TABLE 31 70 SIGNIFICANT CHANGES IN THE 2012–2015 IRC CODE CYCLE

#	Page	Code	Description
1	6	106.1.4	Now req's ID of bottom of lowest horizontal member in Coastal A Zones as well as V Zones.
2	6	106.1.3	BO may req BWLs to be shown on plans.
3	6	301.7	Gypsum board ceilings allowed greater deflection than ceilings with brittle finishes.
4	7	105.3.1.1	The 2012 code referred such cases to the board of appeals; the 2015 code specifies these exceptions.
5	7	301.2.1	"Ultimate" wind speed replaced "basic" for consistency w/ IBC & ASCE-7.
6	7	301.2.1.2	Modifications specified to ASTM 1996.
7	7	301.2.1.2X	Prescriptive protection changed from 33 to 45 ft. height.
8	8, 37	301.3	Resolved inconsistencies between allowed floor framing height & story height.
9	8	304.1	Min of 1 room w/ 120 sq. ft. no longer required.
10	8	305.1	Min 7-ft. ceiling height lowered to 6 ft. 8 in. for these rooms.
11	9	T302.1(1&2)	Exemption from fire rating if eaves fireblocked.
12	9	T302.1(2)	Exemption for gable projection if no gable vent opening.
13	9	T302.1(2)	(2012) Unprotected eaves OK w/ 3-ft. setback if sprinklered.
14	9	T302.1(2)	(2012) 3-ft. setback to unrated OK for sprinklered buildings.
15	9	T302.1(2)	(2012) Unlimited openings at 3 ft. OK for sprinklered buildings.
16	9	T302.1(2)	(2012) Allows for unprotected zero lot line clearance in fully sprinklered subdivisions w/ 6-ft. adjacent setback.
17	10	302.2	The exception in the 2012 IRC is now the rule. Townhouse common walls are not assumed to be structurally independent & the presence of fire sprinklers determines whether the wall is 1-hr or 2-hr.
18	11	302.5.1	(2012) Door from garage to house must be self-closing.
19	12	302.13	Clarified that penetrations are allowed through floor.
20	14	311.1	Req'd egress door must open to public way or yard or court open to public way.
21	15	311.7.3	Max vertical distance between landings was 12 ft.
22	15	311.7.10.1	The 6¾-in. measurement at the walkline is equivalent to the previous method of measuring 7½ in. perpendicular to the nosing. Beyond a 24½-in. walkline, the stair becomes a winding stairway, not a spiral stairway.
23	16	303.7&8	Removed exceptions for illumination at landings.
24	16	311.8.1	Basic req for all ramps was 1:12. 1:8 now OK for ramps not serving req'd egress door.
25	17	312.1.2	Req'd height of guards no longer measured from top of adjacent fixed seating.
26	18	310.2.2	Height now measured from floor to top of sill rather than floor to clear opening.
27	18	310.5&6	Clarification on when additions trigger req'd escape & rescue openings.
28	20	404.4	Height at which design is req'd changed from 24 in. to 48 in.
29	20	404.4	Clarification that such retaining walls are not foundations.
30	22	403.1.2	Req'd under all exterior walls, not just at braced panels.

TABLE 31 — 70 SIGNIFICANT CHANGES IN THE 2012–2015 IRC CODE CYCLE

#	Page	Code	Description
31	22	403.1.1	Footing table now distinguishes between slab, crawlspace, and basement foundation types.
32	23	404.1.1	Specifies conditions under which design req'd.
33	25	403.1.6	Bolts now req'd to be in middle 1/3 of plate.
34	27	506.2.3X1	(2012) Attached garages also not req'd to have vapor retarder.
35	28	606.3.5.1	Masonry sections of code reorganized. Max height for low-lift grouting changed to 64 in.
36	28	606.3.5.2	Cleanouts & special inspections now req'd at 64 in.
37	31, 22	T602.3(1)	Built-up girder method with 20d nails added, table has been expanded & includes specifics for gun nails.
38	31	502.6	Defines condition under which member can be considered bearing on wood rather than concrete/masonry.
39	31, 43	502.3.1&2 802.4&5	The span tables have been updated to reflect new data on capacities for each of the four wood species shown.
40	32	502.10	Requirement for hardware at headers > 6 ft. or tail joists > 12 ft. deleted since ALL joists req bearing support.
41	37	602.1.2	(2012) End-jointed lumber in rated wall req's heat-resistant adhesive labeling.
42	37	602.3.2X	New table for single top plate connection details.
43	39	602.7.1	New specifications for nailing on single-member headers.
44	42	602.1.1	(2012) New method of BWL measure at angled corners.
45	42	602.12	Allowed areas for simplified wall bracing have expanded.
46	43	802.7.1.2	(2012) Figure supplied to illustrate max taper cut on joist end.
47	48	802.3	Rafters can be offset 1½ in. at ridge (end nail through ridge).
48	48	802.7.1.1	(2012) Figure in code to illustrate max birdsmouth on rafter tail.
49	50	807.1	Attic req's access only if ≥ 30 sq. ft. of area w/ 30-in. height.
50	51	507.3.3	Decks must be decay-resistant.
51	51	507.4	New joist spacing table for decks.
52	51	507.5	New joist span table for decks.
53	51	507.6	New beam span table for decks.
54	56	702.3.7	Water-resistant gypsum board previously req'd 12 in. o.c. framing for ½ in. & 16 in. o.c. for 5/8 in.
55	58	312.2.1	Measurement now to sill height, not clear opening height.
56	60	308.4	Perpendicular sidelite away from door swing not req'd to be safety glass.
57	61	902.3&4	Roof-integrated PV shingles req fire classification.
58	61	905.2.5	Asphalt shingle fastener specifications new–min 3/8-in. head.
59	62	905.2.8.5	Specifications on drip edge flashing.
60	29	905.7.5	Stainless fasteners for fire-retardant treated shingles/shakes or within 15 miles of salt-water coast.

TABLE 31 70 SIGNIFICANT CHANGES IN THE 2012–2015 IRC CODE CYCLE

#	Page	Code	Description
61	67	314.3#4	Separation from tub/shower to prevent nuisance alarms.
62	67	314.3.1	Distances from cooking appliances to prevent nuisance alarms.
63	67	314.6X2	Battery-only alarms OK for remodels, repairs & additions.
64	67	314.7	Central station monitoring no longer req'd for NFPA 72 fire alarms.
65	68	314.1	NFPA 72 now part of IRC.
66	68	315.2.1	(2012) Req'd if attached garages w/o openings to dwelling.
67	68	315.2.2X	New exemptions for certain types of work.
68	68	315.4	Combination smoke and CO alarms recognized.
69	68	316.6	Recognition of CO detection devices incorporated into alarm systems.
70	68	315.5	CO alarms in new construction to be hard-wired.