

GUIDE TO THE 2019 CALIFORNIA GREEN BUILDING STANDARDS CODE RESIDENTIAL



CALGreen®



Guide to the 2019 California Green Building Standards Code (Residential)

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ABBREVIATIONS AND ACRONYMS

(This list is provided for user convenience. Terms defined or explained further in *CALGreen* and in this guide are not included in this list.)

AB	Assembly Bill (legislation) followed by a number; approved bills often followed by a Chapter (Ch.) number and year of statutes (Stat.)
ACCA	Air Conditioning Contractors of America
ACM	Alternative Calculation Method as used by the California Energy Commission
ANSI	American National Standards Institute
ARB/CARB	California Air Resources Board
ASME	American Society of Mechanical Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASTM	American Society for Testing and Materials
BSC-CG-CBSC	California Building Standards Commission, <i>CALGreen</i>
California Climate Zones	Shown on California Energy Commission Climate Zone Map
<i>CALGreen</i>	<i>California Green Building Standards Code</i>
Cal/EPA	California Environmental Protection Agency
CalRecycle	California Department of Resources Recycling and Recovery (formerly California Integrated Waste Management Board and Department of Conservation)
CBC	<i>California Building Code</i> (CCR, Title 24, Part 2)
CCR	<i>California Code of Regulations</i> (includes Title 24, the <i>California Building Standards Code</i>)
C & D	Construction and demolition as used for construction waste
CEC*	California Energy Resources Conservation and Development Commission (aka California Energy Commission); *Also refers to <i>California Energy Code</i> (CCR, Title 24, Part 6)
CRC	<i>California Residential Code</i> (CCR, Title 24, Part 2.5)
CWMP	Construction Waste Management Plan
DWR	Department of Water Resources

ABBREVIATIONS AND ACRONYMS (continued)

(This list is provided for user convenience. Terms defined or explained further in *CALGreen* and in this guide are not included in this list.)

EPA	U.S. Environmental Protection Agency
GPM/gpm	Gallons per minute related to liquid flow
HCD	California Department of Housing and Community Development
HERS	Home Energy Rating System Program (administered by the California Energy Commission)
HR or [HR]	HCD “banner” designating provisions applicable for high-rise residential buildings.
HVAC	Heating, ventilating and air conditioning
MWEL0	Model Water Efficient Landscape Ordinance, located in the <i>California Code of Regulations</i> , Title 23, Division 2, Chapter 2.7.
NSF	NSF International (formerly National Sanitation Foundation)
PSI/psi	Pounds per square inch as related to pressure
SB	Senate Bill (legislation) followed by a number; approved bills often followed by a Chapter (Ch.) number and year of statutes (Stat.)
SCAQMD	South Coast Air Quality Management District
SWRCB	State Water Resources Control Board
TITLE 17	Public Health regulations in the <i>California Code of Regulations</i> (CCR)
TITLE 20	Public Utilities and Energy regulations in the <i>California Code of Regulations</i> (CCR)
TITLE 23	The Department of Water Resources (DWR) regulations in the <i>California Code of Regulations</i> (CCR), located in Division 2.
TITLE 24	<i>California Building Standards Code</i> , as included in the <i>California Code of Regulations</i> (CCR)
VOC	Volatile organic compounds as defined in <i>CALGreen</i> , Chapter 2

CONTACT AND PURCHASING INFORMATION

California Green Building Standards for Residential Buildings

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Division of Codes and Standards

State Housing Law Program

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Sacramento, CA 95826-2582

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Fax: (916) 854-2551

Website: www.hcd.ca.gov

Questions: See “Questions, Comments, Feedback” on website. Use “Leave Us a Comment” form.

California Residential Energy Efficiency Standards

California Energy Efficiency Hotline

Telephone: (916) 654-5106; 1-800-772-3300 (toll free in CA)

E-mail: title24@energy.state.ca.us

California Green Building Standards for Nonresidential Buildings

California Building Standards Commission

2525 Natomas Park Drive, Suite 130

Sacramento, CA 95833

Telephone: (916) 263-0916

Fax: (916) 263-0959

Website: www.dgs.ca.gov/bsc

E-mail: cbsc@dgs.ca.gov

Purchasing Information for “Guide to the 2019 California Green Building Standards Code – Residential” and the 2019 *CALGreen* (loose-leaf or eCode)

International Code Council

3060 Saturn Street, Suite 100

Brea, CA 92821

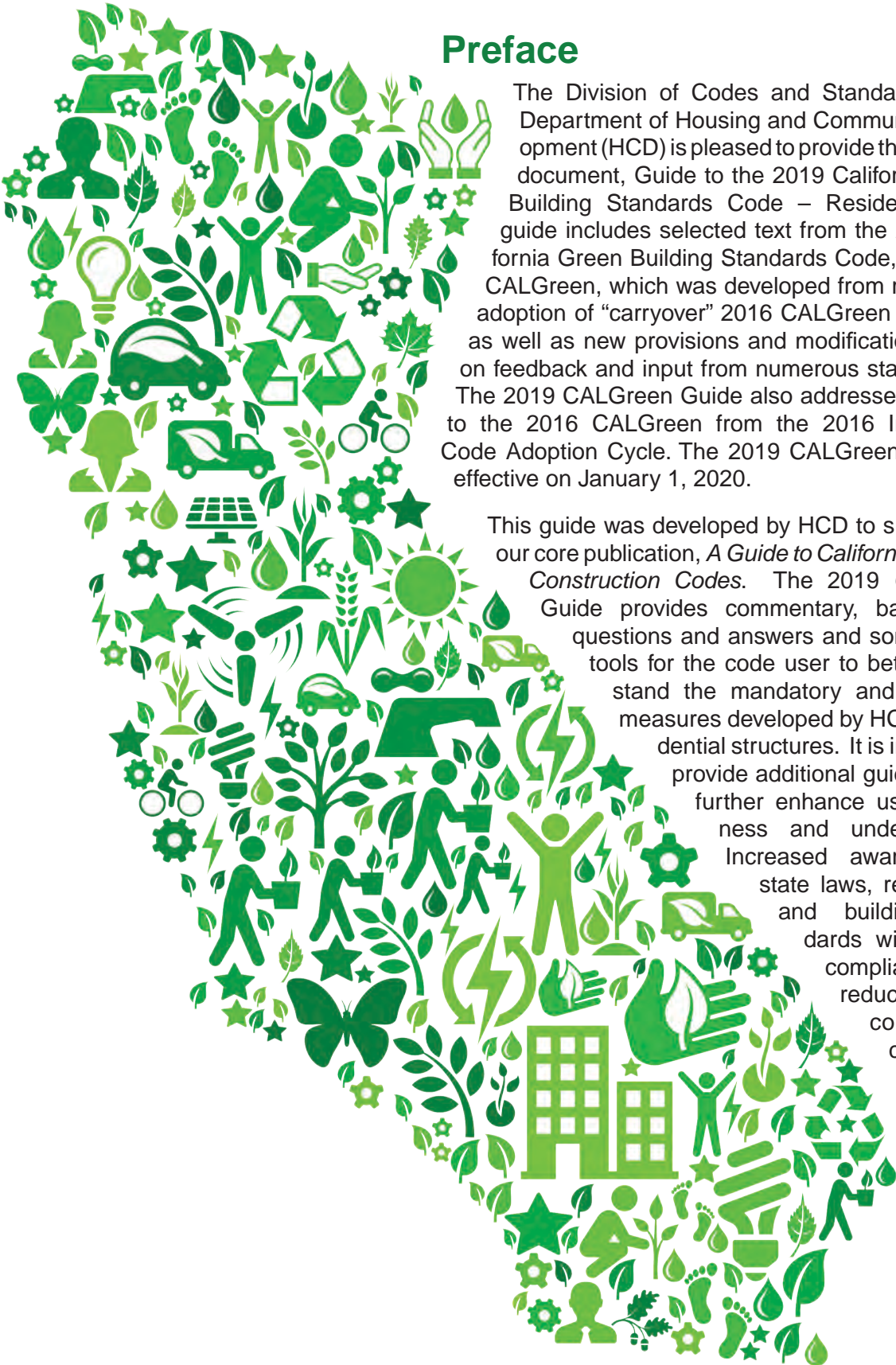
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Preface

The Division of Codes and Standards in the Department of Housing and Community Development (HCD) is pleased to provide the following document, Guide to the 2019 California Green Building Standards Code – Residential. This guide includes selected text from the 2019 California Green Building Standards Code, known as CALGreen, which was developed from review and adoption of “carryover” 2016 CALGreen provisions as well as new provisions and modifications based on feedback and input from numerous stakeholders. The 2019 CALGreen Guide also addresses changes to the 2016 CALGreen from the 2016 Intervening Code Adoption Cycle. The 2019 CALGreen becomes effective on January 1, 2020.

This guide was developed by HCD to supplement our core publication, *A Guide to California Housing Construction Codes*. The 2019 CALGreen Guide provides commentary, background, questions and answers and some helpful tools for the code user to better understand the mandatory and voluntary measures developed by HCD for residential structures. It is intended to provide additional guidance and further enhance user awareness and understanding. Increased awareness of state laws, regulations, and building standards will improve compliance and reduce housing construction costs and delays.

HCD encourages homeowners, design and industry professionals and building department personnel involved in the construction, maintenance, and use of residential buildings to read this guide as a complement to the mandatory measures and enhanced voluntary tiers in the 2019 *CALGreen*. Further, users of the 2019 *Guide to the California Green Building Standards Code – Residential* should always utilize the most current version of *CALGreen*, including amendments from the Intervening Code Adoption Cycle, emergency regulations, other supplements or ERRATA that are published for that specific edition of the code. Users should also check for any local amendments applicable to structures for specific jurisdictions.

Note: Readers new to California laws, regulations, building standards development or HCD's role may find it beneficial to read *A Guide to California Housing Construction Codes*, available at <http://www.hcd.ca.gov/>.

Acknowledgements

HCD appreciates and acknowledges the time, effort and technical expertise so many participants provided during the initial development and subsequent versions of *CALGreen*. Participants were comprised of other state agencies, model code organizations, building officials, the construction industry, the environmental community and green building industry.

HCD expresses special thanks to the California Building Industry Association, which provided additional assistance, time and resources to facilitate timely completion of the first edition in June 2010.

Introduction to CALGreen

CALGreen is California's first green building code and a first-in-the-nation state-mandated green building code. It is formally known as the *California Green Building Standards Code*, Title 24, Part 11, of the *California Code of Regulations*.

This guide will provide helpful tools and information about *CALGreen's* mandatory measures, voluntary tiers, and other regulations, laws and construction codes related to green building standards, which are applicable to residential construction in California. It is recommended that the reader be familiar with California building standards development, adoption and implementation processes as discussed in HCD's *A Guide to California Housing Construction Codes*, which provides general information on California building codes. It is also recommended that the reader have the current edition of *CALGreen* for reference while reading this guide.

It is important that code users reference the appropriate version of *CALGreen*, including any errata or supplements from emergency or intervening code adoption cycles. Additionally, code users should be aware of lawfully enacted local amendments such as ordinances or resolutions requiring additional and/or more restrictive green building standards.

The complete *CALGreen* may be viewed on HCD's website at www.hcd.ca.gov or on the California Building Standards Commission's website at www.dgs.ca.gov/bsc. It is also available for purchase from the International Code Council (www.iccsafe.org).

Background

Development of California green building standards was originally approached from a legislative or statutory approach. Several Assembly Bills (AB 35, AB 888, and AB 1058) were introduced during the 2007–2008 legislative session to require green building standards for state-owned or leased buildings, commercial buildings, and residential buildings, respectively. Although the broad intent for implementing green building measures was supported by the Governor's Office, after much consideration, these bills were ultimately vetoed. Governor Arnold Schwarzenegger's veto message stated:

- Building standards should not be statutory. The California Building Standards Commission (BSC) was created to ensure an open public adoption process allowing experts to develop building standards, including periodic updates to the building codes.
- Allowing private entities to dictate California's building standards usurps the state's authority to develop and adopt those standards and could compromise the health and safety of Californians.
- State agencies were encouraged to review all nationally recognized programs and glean from those programs, standards that promote greener construction, energy and water conservation, and reduce greenhouse gas emissions.
- The need to expedite the greening of California's building standards was emphasized and BSC was directed to work with specified state agencies on the adoption of green building standards for residential, commercial, and public building construction for the 2010 code adoption process.

Development of *CALGreen* began in 2007 when the BSC Commissioners directed its staff to develop green building standards for new construction of buildings within its authority and to submit those regulations for adoption during the 2007 Annual Code Adoption Cycle. The Commissioners also requested and encouraged HCD, the Division of the State Architect (DSA), and the Office of Statewide Health Planning and Development (OSHPD) to develop green building standards for new buildings under their areas of authority. Through the rulemaking process, HCD collaborated with BSC, stakeholder groups, other state agencies, considered public input and reviewed existing green building standards, best practices, guidelines and other published references. This initial effort was successful and resulted in BSC's adoption of the 2008 *California Green Building Standards Code*.

Introduction of the 2008 *California Green Building Standards Code* was supplemented by clarifying information that local enforcing agencies have the option to adopt local amendments or even adopt the 2008 *California Green Building Standards Code* prior to its effective date (see BSC Building Standards Bulletin 08-02). It was acknowledged that the initial 2008 *California Green Building Standards Code* would provide a framework and first step toward establishing mandatory green building standards for residential structures and would be enhanced and/or expanded in the future. This vision came to fruition during the Triennial Code Adoption Cycle for the 2010 *California Building Standards Codes*.

As new materials, technology, and designs are developed and become available, and as needs become apparent, *CALGreen* will continue to proactively move California forward to a more sustainable and environmentally responsible future.

2013 California Green Building Standards Code (*CALGreen*)

The 2010 *CALGreen* was evaluated for updates during the 2012 Triennial Code Adoption Cycle. HCD evaluated stakeholder input, changes in technology, implementation of sustainable building goals in California, and changes in statutory requirements. As such, the scope of *CALGreen* was increased to include both low-rise and high-rise residential structures, additions and alterations.

The 2012 Triennial Code Adoption Cycle also involved the California Energy Commission as an active participant and proposing agency in development of green building standards. The BSC adopted and approved HCD's proposed changes and existing 2010 amendments (as brought forward from the 2010 *CALGreen*) during its regular business meeting on December 11, 2012.

During the 2012 Triennial Code Adoption Cycle, HCD also placed "pointers" in various parts of Title 24 to direct code users to *CALGreen*. This was done for several reasons:

- 1) To familiarize code users with the requirements of *CALGreen*;
- 2) To refer code users to relevant provisions contained in *CALGreen*; and
- 3) To locate appropriate sections in other parts of Title 24 for consistency.

2013 *CALGreen* Emergency Regulations

Governor Edmund "Jerry" Brown's Executive Order B-29-15 (April 1, 2015) provided a summary of the ongoing drought conditions in California starting with declarations for a State of Emergency (January 17, 2014) and Continued State of Emergency (April 25, 2014); evidence of a record low snowpack, decreased water levels in reservoirs, reduced river flows, and declining supplies in underground water basins. In addition, the Governor acknowledged that a distinct possibility existed for drought conditions to continue. Further, the Executive Order found that conditions of extreme peril to the safety of persons and property continue to exist due to water shortage and drought conditions with which local authority is unable to cope. To address these concerns, the Executive Order specified that strict compliance with identified statutes and regulations would prevent, hinder, delay or mitigate the effects of the drought. In view of the urgency to conserve California's water resources, as deemed essential by the Governor's Executive Order and prior proclamations, HCD proposed the adoption of these building standards through an emergency adoption process.

The 2015 emergency regulatory action made critically needed changes to the 2013 *CALGreen*, Sections 4.303, 4.304, and A4.304, as related to reduction of indoor and outdoor residential potable water use. These emergency regulations were approved as permanent regulations in the 2013 *CALGreen*, effective January 26, 2016.

2013 CALGreen Intervening Code Adoption Cycle

HCD brought forward the voluntary Electric Vehicle (EV) provisions as new mandatory EV requirements in the 2013 Intervening Code Adoption Cycle. The new mandatory requirements were applicable to one- and two-family and townhouses with attached private garages. HCD also added new requirements for new multifamily projects with 17 or more dwellings.

New one- and two-family dwellings and townhouse with attached private garages were required to have sufficient space and capacity to accommodate a 40-ampere minimum dedicated branch circuit, including overcurrent protective devices, and a raceway. The raceway literally provides a conduit for supporting appropriately sized conductors when EV charging becomes a need for the resident. In addition, the conduit also facilitates easy replacement of any conductors that have been installed if the conductors are damaged or need to be upgraded. A raceway-only installation eliminates concerns for live unused wires or wasted copper wiring. The service panel or subpanel requirements ensure that the panel or subpanel will have sufficient space for the overcurrent protective devices and ampacity to support future EV charging of at least 40-ampere minimum.

New multifamily projects with 17 or more dwelling units were required to provide 3 percent of the total parking spaces as EV spaces. The EV spaces are to be provided in addition to the number of parking spaces required by local parking regulations. Parking space provisions may also be addressed in local zoning ordinances, development agreements or other similar local policies.

It is important to note that the EV requirements did not mandate construction of the electric vehicle charging station (EVCS) or installation of an EV charger. The primary intent was to provide infrastructure to facilitate EV charging as a service to multifamily dwellings. Multifamily dwellings accommodate 34 percent of Californians and are faced with unique criteria related to EV charging including parking access, electrical service access, installation and operation costs and agreements between property owners/managers and tenants.

One in every 25 EV charging spaces, but not less than one space, shall be a wider location than the “standard” EV charging space capable of being used by all users. For this EV charging space, an adjacent 5-foot aisle was required, making the total EV charging space width, including the aisle, 14 feet. This universal EV charging space, including the aisle, has a slope of not greater than 2.083 percent, which is capable of being used by all users. This EV charging space would provide persons with or without disabilities the same opportunity to use the EV charger.

2016 CALGreen (effective January 1, 2017)

The 2013 *CALGreen* was evaluated for updates during the 2015 Triennial Code Adoption Cycle. HCD took into consideration the existing mandatory and voluntary measures, stakeholder input, changes in technology, implementation of sustainable goals in California, changes in statutory requirements, and the emergency standards, adopted by BSC as part of the 2013 *CALGreen*. As such, the scope of *CALGreen* remained the same, and only a few significant regulatory changes were adopted.

2016 CALGreen Intervening Code Adoption Cycle

The 2016 Intervening Code Adoption Cycle resulted in changes to the 2016 *CALGreen* effective July 1, 2018. These changes included new requirements for EV infrastructure for hotels and motels. The flow rate for showerheads was reduced from 2.0 to 1.8 gallons per minute at 80 psi. Requirements for recycled water systems were also introduced.

CALGreen is not an isolated code and must be used in conjunction with other parts of Title 24 to achieve code compliance and ensure minimum standards for public health and safety. Awareness of energy and performance standards in Part 6, the *California Energy Code*, is also essential. Additionally, changes resulting from recent legislation, federal or state agency regulations, local building code amendments or court rulings must also be recognized and implemented. For these reasons, it is important that the current versions of the building standards code and any local amendments be referenced for application to construction projects.

See *A Guide to California Housing Construction Codes* for further details on California statutes and regulations.

The balance of this guide will provide discussions regarding administration of the code, definitions, provisions contained in *CALGreen* and information regarding referenced organizations and standards. This guide will also provide a detailed discussion of mandatory and voluntary measures for residential structures, installer and special inspector qualifications, and access to associated forms and worksheets.

Note: *CALGreen* also addresses green building standards for nonresidential structures. Those provisions are outside the scope of HCD's authority and application and are not discussed in this guide. BSC has authority for nonresidential structures and has developed a guide for the nonresidential portions of *CALGreen*.

2019 CALGreen (effective January 1, 2020)

The 2016 *CALGreen* was evaluated for updates during the 2018 Triennial Code Adoption Cycle. HCD took into consideration the existing mandatory and voluntary measures, stakeholder input, changes in technology, implementation of sustainable goals in California, and changes in statutory and regulatory requirements. The scope of the 2019 *CALGreen* remained the same. The most significant changes are to the EV charging infrastructure requirements. These will be discussed in detail later in this guide.

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CHAPTER 1 ADMINISTRATION



ADMINISTRATION

CALGreen Chapter 1, “Administration,” is similar in style and format to Chapter 1 of other parts of the *California Building Standards Code*. The following discussion covers some basic provisions. Users should reference the actual code language in *CALGreen* for purposes of implementation and compliance.

TITLE

The official name and citation for *CALGreen* is the “*California Green Building Standards Code*,” *California Code of Regulations*, Title 24, Part 11.

PURPOSE

The purpose of *CALGreen* is to improve public health, safety and general welfare through enhanced design and construction of buildings using concepts that reduce negative impacts and promote those principles that have a positive environmental impact and encourage sustainable construction practices. *CALGreen* was adopted to address five divisions of building construction:

- Planning and design.
- Energy efficiency.
- Water efficiency and conservation.
- Material conservation and resource efficiency.
- Environmental quality.



APPLICATION

CALGreen applies to the planning, design, operation, construction, use and occupancy of every newly constructed building or structure on a statewide basis unless otherwise indicated. Additions and alterations to existing residential buildings that increase the building's conditioned area, interior volume or size are also covered by the scope of *CALGreen*. (See discussion for Chapter 3.)

CALGreen also specifies requirements for applications regulated by BSC, California Energy Commission (CEC), Division of the State Architect (DSA), California Department of Public Health (CDPH), Office of Statewide Health Planning and Development (OSHPD), and the California Department of Water Resources (DWR).

Consistent with other parts of Title 24, the Matrix Adoption Tables at the front of each chapter are to aid the code user in determining which sections or chapters are applicable to buildings under the authority of a specific state agency; however, they are for information only and are not considered regulatory.

SCOPE

CALGreen provisions under the jurisdiction of the California Department of Housing and Community Development (HCD) are for newly constructed residential structures, as well as additions and alterations to existing buildings that increase the building's "conditioned area, interior volume or size." Therefore, for the purposes of HCD, *CALGreen* applies to the following types of residential structures:

- Hotels, motels, lodging houses.
- Apartments, condominiums.
- One- and two-family dwellings, townhouses.
- Dormitories, shelters for homeless persons, congregate residences, employee housing.
- Other types of dwellings containing sleeping accommodations with or without common toilets or cooking facilities.
- Factory-built housing (mandatory provisions only).
- Accessory dwelling units (ADUs) built in accordance with the California Building Standards Code.
- Live/work units.
- Accessory structures serving residential buildings.

USE OF APPENDICES

CALGreen appendix chapters are not mandatory unless specifically adopted by a local enforcing agency.

REFERENCED CODES AND STANDARDS

CALGreen is not a stand-alone document and cannot be used solely for building construction. *CALGreen* must be used in conjunction with other codes adopted in California. The following parts of the *California Code of Regulations*, Title 24, are applicable to new building construction:

- Part 1 *California Administrative Code*
- Part 2 *California Building Code*

- Part 2.5 *California Residential Code*
- Part 3 *California Electrical Code*
- Part 4 *California Mechanical Code*
- Part 5 *California Plumbing Code*
- Part 6 *California Energy Code*
- Part 9 *California Fire Code*
- Part 11 *California Green Building Standards Code (CALGreen)*

The CEC's Appliance Efficiency Regulations in Title 20 of the California Code of Regulations and appliance efficiency database should also be referenced to ensure the installation of regulated appliances is in compliance with state regulations.

ORDER OF PRECEDENCE AND USE

When there are any differences between *CALGreen* and standard reference documents, the text of *CALGreen* shall govern. If requirements in *CALGreen* conflict with requirements in any other parts of the *California Building Standards Code*, the most restrictive requirements prevail. If local enforcing agencies amend *CALGreen*, the local amendment, when legally adopted, shall govern.

LOCAL AMENDMENTS

CALGreen establishes mandatory minimum green building standards. *CALGreen* also contains voluntary "tiers," which may be adopted by a city, county, or city and county, consistent with adoption of local amendments for other building standards. (See Division A4.6 for additional information on *CALGreen* Tier 1 and Tier 2.)

CALGreen does not limit the authority of local agencies to make necessary changes based on climatic, topographical or geological conditions. Consistent with other building standards, these locally adopted changes must be reasonably necessary and may be more restrictive as allowed by the State Housing Law. Generally, building standards cannot be applied retroactively. Pursuant to the California Health and Safety Code, in order to be legally enforceable, local amendments must be formally adopted by the local agency and filed with BSC in accordance with Section 101.7 of *CALGreen*.

Local amendments addressing energy efficiency standards require a somewhat different process. The local jurisdiction is required to make a determination that the local energy ordinance is cost effective and at least as stringent as the state energy standards. The "cost effectiveness determination," stringency analysis, and the local ordinance must be formally adopted by the local agency and submitted to the CEC for approval. Only those local ordinances related to energy efficiency that have been approved by the CEC are legally enforceable.

See *Health and Safety Code* Sections 17958.5, 17958.7 and 18941.5 regarding local building standard amendments; *Public Resources Code* Section 25402.1(h)2 and *Administrative Code* Section 10-106 for energy efficiency amendments; and *Water Code* Section 14877.3 regarding amendments related to graywater standards. Information is available on the BSC's website addressing filing of local amendments, including related Information Bulletins; and on the CEC's website addressing local ordinances exceeding the requirements in the *California Energy Code*. Additional information is also included in the "Frequently Asked Questions" section at the end of this chapter.

ALTERNATE MATERIALS, DESIGNS AND METHODS OF CONSTRUCTION

Consistent with the *Health and Safety Code*, and other parts of Title 24, *CALGreen* also allows the use of any approved alternate material, appliance, installation, device, arrangement, design or method of construction not specifically addressed by the code. The alternates are required to be evaluated on a case-by-case basis and shall be at least equivalent to the prescriptive requirements of the code. See *Health and Safety Code* Section 17923 and *CALGreen* Section 101.8 for further details and references.

EFFECTIVE USE OF THE CODE

CALGreen provides a step-by-step approach to determining whether or not the code is applicable to a project. When considering *CALGreen* requirements for residential structures, the following questions should be considered:

1. Is the project a residential use or occupancy pursuant to the *California Building Code* or *California Residential Code*?
 2. Is the project considered “new construction”?
 3. Does the project involve additions to or alterations of existing residential buildings? If so, does it increase the building’s “conditioned area” (square feet), interior volume (cubic feet) or size?
- **If Questions 1 and 2 are answered “yes,”** then *CALGreen* Chapter 4 and Appendix A4 (if adopted at the local level) will specifically apply to the structure. Energy provisions in Chapter 5 and Appendix A5 (if adopted at the local level) will specifically apply to high-rise residential, and hotel and motel structures. In addition, Chapters 1–3, and 6–8 will be used for administration and implementation.
 - **If Questions 1 and 3 are answered “yes,”** then *CALGreen* Chapter 4 and Appendix A4 (if adopted at the local level) will specifically apply to portions of the structure that have been added or altered pursuant to Section 301.1.1. (See the note in Section 4.303.1 addressing mandatory replacement of noncompliant plumbing fixtures.) Energy provisions in Appendix A5 (if adopted at the local level) will specifically apply to high-rise residential and hotel and motel additions.

It is always important to use the most current version of *CALGreen* and check for local amendments that have been lawfully enacted. Building standards are subject to change due to recent legislation, court cases, or updates. Also, local amendments may be more restrictive than the statewide provisions in *CALGreen*.

Note: *CALGreen* Chapter 5 and Appendix A5 may also apply to the applicable portions of mixed occupancy buildings (e.g., commercial use combined with residential use). Live/work units built in compliance with Section 419 of the California Building Code are not to be considered mixed occupancies for the purposes of *CALGreen* and shall comply with Chapter 4 and Appendix A4, as applicable.

CONSTRUCTION DOCUMENTS AND INSTALLATION VERIFICATION

CALGreen requires that construction documents and other data be submitted in one or more sets with a permit application. Documents must provide information in sufficient detail to demonstrate

compliance with *CALGreen* and other codes. *CALGreen* provides the local enforcing agencies discretion to require additional construction documents or to waive construction documents, as specified. *CALGreen* also allows alternate methods of documentation demonstrating substantial conformance when satisfactory to the enforcing agency.

HCD has modified the language in Section 102.3 to require submission of a completed Residential Occupancies Application Checklist to the local enforcing agency for all residential projects under HCD's authority. Currently, the documentation justifying compliance with *CALGreen* is not consistent. While many jurisdictions require a checklist to be submitted for projects at the time of permit, the use of a checklist is not universal nor is the content of the checklist consistent. HCD has developed a variety of useful forms and tools to aid in documentation and compliance. Mandatory requirement of a Residential Occupancies Application Checklist with minimum reporting criteria will lead to better documentation in three ways: better consistency, streamlined reviews, and enhanced compliance. Additionally, builders will benefit from more consistent documentation statewide. The new amendment also allows alternate methods of documentation acceptable to the enforcing agency.

Frequently Asked Questions

Q: Are any documents available that compare *CALGreen* with established third-party rating systems?

A: HCD is aware that more than one *CALGreen* comparison document exists. Those comparison documents may analyze all or just a portion of *CALGreen*. Some of these comparative analyses may be accessed through the Internet and others may be proprietary or internal documents.

HCD has been involved in the review and development of some of these documents and has determined that it is not possible to accurately compare the contents of a mandatory code to a voluntary program. HCD expressed this opinion and provided input to the developers of some of these documents; however, HCD cannot endorse the usability or accuracy of the comparative analysis documents that are currently being circulated.

Q: The definition of “Residential building” in Section 202 provides a reference to “low-rise residential building.” “Low-rise residential building” is further defined to include R occupancy buildings, three stories or less, or a one- or two-family dwelling or townhouse. Does this mean that four-story and taller apartment and condominium buildings are classified as nonresidential? Is this the intent of the code?

A: No. Residential buildings taller than three stories are considered high-rise residential buildings, as noted in the amended definition, and are subject to *CALGreen* requirements. The 2019 *CALGreen* applies to all residential occupancies, including hotels and motels, regardless of height or stories (see Section 101.3.1, No. 3).

Q: How does *CALGreen* apply to residential buildings that include a parking garage or other use below the residential stories?

A: *CALGreen* applies to all residential structures and accessory structures to the residential use. In the case of an apartment building that has a parking garage for use only by the residents, Chapter 4 and Appendix A4 would apply to both the residential structure and the parking garage (accessory structure).

For example, a five-story building with a parking garage on the first level has four stories of residential construction above it. *CALGreen* residential provisions (except energy provisions) would apply to the residential portion of the building and to the parking garage since the parking garage is an accessory structure to the four stories of residential above.

Q: Does *CALGreen* apply to attached or detached garages?

A: The residential provisions of *CALGreen* apply to residential buildings and accessory structures serving residential buildings. This includes attached or detached private garages.

Q: If a local agency already has a green building ordinance, will it get “grandfathered” in when the 2019 *CALGreen* becomes effective? If not, how does the local ordinance retain its enforceability?

A: *CALGreen* standards do not necessarily replace existing local green building ordinances; however, *CALGreen* does include provisions that are mandated on a statewide basis. Every local agency is required to enforce the mandatory provisions of *CALGreen*. In cases where a local green building ordinance exists, the provisions in the local ordinance need to be equivalent to, or more restrictive than, requirements in *CALGreen*. These ordinances need to be updated to reflect *CALGreen* and the other new codes that are effective on January 1, 2020, and approved statewide amendments to these codes. In addition, an adopted local ordinance and supporting findings are required to be filed with the BSC to be enforceable.

Q: Can a local jurisdiction adopt building standards, including “green building standards,” that are more stringent than those adopted by the State?

A: Yes. *Health and Safety Code* Sections 17958.5 and 18941.5 were amended by Assembly Bill 210 (Hayashi, Chapter 89, Statutes of 2009) to clarify this issue. *Health and Safety Code* Section 17958.5 provides for cities, counties, and cities and counties to make changes or modifications to building standards, including green building standards, due to local climatic, geological or topographical conditions. Section 18941.5 clarifies that Building Standards Law cannot limit local establishment of more restrictive building standards, including green building standards, reasonably necessary due to local climatic, geological or topographical conditions. The local jurisdiction must follow procedural requirements, including making of findings, to formally adopt building standard modifications.

Q: Can local jurisdictions apply local amendments retroactively?

A: No. *Health and Safety Code* Sections 17912 and 18938.5 (a) and (b) require that only building standards effective at the local level at the time of permit application apply to the plans and specifications and construction performed under that permit. Similarly, additions or modifications to the *California Building Standards Code* (residential occupancies) apply only to building permit applications submitted after the effective date of the local ordinance.

There are some exceptions to this general requirement. SB 407 (Chapter 587/Statutes of 2009) mandates water conserving plumbing fixtures for existing residential and commercial real property built and available for use or occupancy on or before January 1, 1994. This legislation became effective in 2009. (For more details, see “Informative Notes” after Section 4.303.2.)

The requirements for carbon monoxide alarms (Section 915 of the *California Building Code*;

Section R315 of the *California Residential Code*) are another example of a retroactive standard.

SB 969 (Chapter 621, Statutes of 2018), which requires a battery backup for garage door openers so that the automatic garage door is operational without interruption during an electrical outage, is also an example of a retroactive standard. This legislation became effective January 1, 2019.

Q: When adopting local amendments, do the local climatic, geological or topographical conditions have to be unique to that local jurisdiction?

A: No. There are several Attorney General Opinions and related court findings that make it clear the local jurisdictions have a great deal of latitude in making the determination of what constitutes “local climatic, geological or topographical conditions.”

Q: Is it true that “environmental” justification is now allowed in addition to the local conditions of climatic, geographical and topographical justification?

A: Yes. *CALGreen* Section 101.7.1 allows consideration of environmental conditions when adopting local amendments.

Q: How would a jurisdiction use the “environmental” justification and does it differ from a climatic justification?

A: There is no difference; this allows local cities and counties to address their specific needs. The environmental justification is based on the local environment and its needs, and used in conjunction with climatic, geological or topographical conditions.

Q: Are there any limitations or restrictions that apply to adoption of local ordinances related to green building standards? (Also see the next question regarding local modifications related to energy efficiency building standards.)

A: Yes. There are several (administrative) limitations.

- According to state law, the local jurisdiction shall make express findings that amendments are reasonably necessary due to local conditions. The findings shall be made available as a public record. An ordinance must be adopted using the established proceedings and processes of the local government.
- The local jurisdiction cannot begin to enforce its local modifications to *CALGreen* until the ordinance and the local finding have been formally filed with the BSC. The BSC serves as a central filing point or statewide database for local amendments. Although the BSC does not review local amendments for adequacy, it may reject a local amendment if not supported by findings. Local modifications for energy requirements are approved by the CEC and filed with the BSC. (See the following question.)
- Local ordinances apply to the version of the code as specified in the local ordinance and applicable findings. Local ordinances need to be refiled to ensure or maintain applicability to new versions of the *California Building Standards Code*.
- Additional information on local amendments is available in *CALGreen* Section 101.7, *Health and Safety Code* Section 17958.7, and on the BSC website addressing local amendments (www.bsc.ca.gov).

The BSC has also published information bulletins to address local amendments to the *California Building Standards Code* and *CALGreen*.

Q: Are there any special administrative requirements that apply if the local modification includes revisions to the energy efficiency standards adopted by the CEC?

A: Yes. The local jurisdiction is required to make a determination that the local energy ordinance is cost effective and at least as stringent as the state energy standards. The “cost effectiveness determination,” stringency analysis, and the local ordinance must be adopted using the local public ordinance adoption process allowing for public review and comment. Local energy ordinances must be approved by the CEC and filed with the BSC. Further information on this process is available on the CEC website (www.energy.ca.gov), addressing local ordinances exceeding the 2019 *California Energy Code*.

CHAPTER 2 DEFINITIONS



The 2019 *CALGreen* Chapter 2 provides definitions for terms that are used throughout the code. This is consistent with the format in other parts of the *California Building Standards Code*, which moved definitions from individual chapters or sections into Chapter 2.

CALGreen Chapter 2 also provides clarification of scope, interchangeability of terms, use of terms defined in other documents and circumstances where terms are not defined in *CALGreen*.

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CHAPTER 3 GREEN BUILDING



This chapter provides general information regarding the scope of subsequent *CALGreen* chapters. It also provides an introduction to voluntary tiers, and guidance and direction for mixed occupancy buildings or when the project is completed as a phased development.

SCOPE

CALGreen applies to all residential structures — both low-rise and high-rise. *CALGreen* also applies to additions and alterations to residential structures that increase the building's conditioned area, volume or size.

301.1.1 Additions and alterations. [HCD] The mandatory provisions of Chapter 4 shall be applied to additions or alterations of existing residential buildings where the addition or alteration increases the building's conditioned area, volume, or size. The requirements shall apply only to and/or within the specific area of the addition or alteration.

301.2 Low-rise and high-rise residential buildings. [HCD] The provisions of individual sections of *CALGreen* may apply to either low-rise residential buildings, high-rise residential buildings, or both. Individual sections will be designated by banners to indicate where the section applies specifically to low-rise only (LR) or high-rise only (HR). When the section applies to both low-rise and high-rise buildings, no banner will be used.

MIXED OCCUPANCY BUILDINGS

CALGreen requires that each portion of a mixed occupancy building comply with the specific green building measures applicable to that occupancy. Therefore, if a building's design includes commercial and residential uses, both nonresidential and residential provisions apply to appropriate portions of the building.

PHASED PROJECTS

CALGreen provisions generally apply to a newly constructed building. As a result, when a building is constructed as a shell, only certain mandatory measures may be pertinent or applicable at the initial construction phase. However, required *CALGreen* provisions still apply and other mandatory measures are required of the initial tenant or occupancy improvements to achieve full compliance with *CALGreen*. Phased residential construction may occur in multifamily, mixed use or live/work developments; however, it is less common with single-family buildings.

VOLUNTARY TIERS

Voluntary tiers and the checklist of measures, located in Appendix A4 of *CALGreen*, can be used by enforcing agencies that wish to exceed the mandatory minimum requirements of this code. During the development of *CALGreen*, stakeholders expressed concern that there was a lack of consistent and streamlined methods for local governments to use to further enhance their local green building requirements. State agencies supported this concern and the tier concept was viewed as a vehicle to increase the use and acceptability of advanced technology, which could ultimately translate to significant reduction in the impact to resources and the amount of construction waste entering landfills, increase indoor air quality, and reduce energy consumption. These tiers may serve to raise mandatory requirements in the future on a statewide basis.

304.1.1 Tiers. The provisions of Divisions A4.6 and A5.6 outline means, in the form of voluntary tiers, for achieving enhanced construction levels by incorporating additional measures for residential and nonresidential new construction. Voluntary tiers may be adopted by local governments and, when adopted, enforced by local enforcing agencies. Buildings complying with tiers specified for each occupancy contain additional prerequisite and elective green building measures necessary to meet the threshold of each tier. See Section 101.7 of this code for procedures and requirements related to local amendments, additions or deletions, including changes to energy standards.

[BSC & HCD] Where there are practical difficulties involved in complying with the threshold levels of a tier, the enforcing agency may grant modifications for individual cases. The enforcing agency shall first find that a special individual reason makes the strict letter of the tier impractical and that modification is in conformance with the intent and purpose of the measure. The details of any action granting modification shall be recorded and entered in the files of the enforcing agency.

HCD has adopted language that allows modification of *CALGreen* tier requirements based on feedback that there have been practical difficulties with the adoption of more stringent local ordinances and green building standards in some jurisdictions. This "adjustment" in the regulatory text recognizes the many variables existing in the housing market and ensures that local agencies are not discouraged from adopting the voluntary tiers and are able to achieve compliance with the tiers to the greatest extent possible.



CHAPTER 4 RESIDENTIAL MANDATORY MEASURES



This chapter discusses select mandatory requirements in the 2019 *CALGreen*. Sections and items that include general information (e.g., scope, definitions, and informational notes) are omitted.

The 2019 *CALGreen* becomes effective on January 1, 2020.

Division 4.1 – PLANNING AND DESIGN

SECTION 4.106 SITE DEVELOPMENT

4.106.1 General. Preservation and use of available natural resources shall be accomplished through evaluation and careful planning to minimize negative effects on the site and adjacent areas. Preservation of slopes, management of storm water drainage and erosion controls shall comply with this section.

4.106.2 Storm water drainage and retention during construction. Projects which disturb less than one acre of soil and are not part of a larger common plan of development which in total disturbs one acre or more, shall manage storm water drainage during construction. In order to manage storm water drainage during construction, one or more of the following measures shall be implemented to prevent flooding of adjacent property, prevent erosion and retain soil runoff on the site.

1. Retention basins of sufficient size shall be utilized to retain storm water on the site.
2. Where storm water is conveyed to a public drainage system, collection point, gutter, or similar disposal method, water shall be filtered by use of a barrier system, wattle or other method approved by the enforcing agency.



3. Compliance with a lawfully enacted storm water management ordinance.

Note: Refer to the State Water Resources Control Board for projects which disturb one acre or more of soil, or are part of a larger common plan of development which in total disturbs one acre or more of soil.

(Website:http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml)

COMMENTARY

PURPOSE

Implementation of this standard is intended to help prevent flooding, damage to adjacent property and pollution from storm water runoff, by retaining soil on-site or by providing soil containment methods to prevent sediment from reaching storm water drainage systems and receiving creeks, streams, rivers, and lakes or the ocean.



Figure 1 State Housing Law Program staff photo: Notification sign for projects one acre or larger and addressed by a Storm Water Pollution Prevention Plan (SWPPP).

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Retention basins sized and shown on the site plan.
- Filtering storm water and routing to a public drainage system.
- Compliance with local storm water ordinances.
- Develop and implement additional best management practices (BMPs), including, but not limited to:
 - Silt fencing.
 - Hay bales/mulch.

- Cutback curbs.
- Erosion control matting.
- Inlet protectors.
- Stabilized entrances.
- Sand/gravel bags.
- Fiber rolls/wattles.

BACKGROUND

Currently, the California State Water Resources Control Board (SWRCB) issues permits to ensure a Storm Water Pollution Prevention Plan (SWPPP) in compliance with applicable state regulations is issued and implemented for projects that are larger than 1 acre. This section applies only to construction projects less than 1 acre, which are outside the scope of SWRCB.

Storm water runoff and the sediment and pollutants it may contain have been identified as one of the biggest polluters to water bodies and their health. Construction sites that continually receive heavy equipment and truck traffic, utility excavation and exposure to storm water often experience compaction and topsoil loss which, unless contained, can allow soil and contaminants to migrate into downstream water bodies.

The goal of storm water management is to create an effective combination of erosion and sediment controls. Erosion control is the practice of keeping soil from dislodging and migrating from its resting place. Sediment control refers to trapping and containing soil particles after they have been dislodged by storm water or water used during construction. Erosion can be considered the process and sediment as the result.

BMPs continually evolve as on-site activities change from land development to homebuilding. During land development the site perimeter is the main focus of protection. As activities move to homebuilding the interior streets and catch basins become the main focus of protection. BMPs should be implemented to prevent soil erosion, prevent pollution from mixing with storm water, and to trap pollutants before they can be discharged.

HCD added a “note” to Section 4.106.2 that refers the code user to the State Water Resources Control Board’s website for construction storm water regulations.

4.106.3 Grading and paving. Construction plans shall indicate how the site grading or drainage system will manage all surface water flows to keep water from entering buildings. Examples of methods to manage surface water include, but are not limited to, the following:

1. Swales
2. Water collection and disposal systems
3. French drains
4. Water retention gardens
5. Other water measures which keep surface water away from buildings and aid in groundwater recharge.

Exception: Additions and alterations not altering the drainage path.

COMMENTARY

PURPOSE

This section provides protection from unintended entry of surface water and requires construction plans to show how surface water will be managed. Site design and proper installation of drainage systems will help builders protect structures from the dangers of flooding or subsurface water infiltration. This is especially important in areas where setbacks or obstacles interfere with proper surface drainage.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Develop and implement control methods to address groundwater flow both above and below the surface to ensure water flow away from the building.
- Channel rain gutter discharge away from the building during large or intense rain events. Builders should consider site design mimicking water flows similar to the natural environment.
- Additional design strategies that can be considered are:
 - Sloped ground surfaces.
 - Properly placed drains.
- This section does not apply to additions and alterations that do not alter the drainage path of the existing building.

BACKGROUND

During large rain events the ground can become saturated causing runoff and/or ponding in low-lying areas, which can cause water to migrate into buildings. It is critically important to channel rain gutter discharge away from the building during these events. Builders should consider site design that mimics water flows similar to the natural environment and incorporate methods as described in this section.

In order to keep a site well drained and stable, designers and contractors should consider both storm water from the roof and rainwater penetrating into the area around the site. Groundwater can flow above or below the surface. Control methods should be developed and implemented which allow for both types of groundwater flow to ensure water can continually flow away from the building.

Frequently Asked Questions

Q: Do local storm water ordinances require findings and filings with the state?

A: Sometimes. It is best to check with a specific local municipality about the local ordinance adoption process and required resolutions, findings and filings. Local charters typically address procedures for adopting, amending and rescinding ordinances. Local ordinances typically require or prohibit certain actions under specified circumstances and include statements of intent, findings, specific actions required or prohibited, and an adoption clause. Approved ordinances are subsequently incorporated into the county or city codes.

The State Water Resources Control Board (SWRCB), through the Municipal Storm-water Program, regulates storm water discharges from municipal separate storm sewer systems (MS4s). Although not a formal finding, changes in local ordinances which are helpful to or enhance the local storm water program will need to be reported in the local agency's annual report to the SWRCB. For further information, visit the State Water Resources Control Board website at: https://www.waterboards.ca.gov/water_issues/programs/stormwater/municipal.html

Q: CALGreen Section 4.106.2 requires storm water retention and filtering during construction. Does this requirement apply year-round even though construction will occur during nonrainy season months?

A: No. This section provides three methods for compliance; however, more than one method may be required. The third method involves compliance with a local lawfully enacted storm water management ordinance. In addition, the local enforcing agency has the discretion to determine whether these measures are needed based on the potential for storm water impacts during the construction period of the project. However, if there is potential for construction to be postponed or extended beyond the initial planned construction phase, the local enforcing agency may consider requirements for storm water drainage and retention as permit requirements for the project.

The regulatory text for this section has been amended as of July 1, 2018, and for the 2019 code.

4.106.4 Electric vehicle (EV) charging for new construction. New construction shall comply with Section 4.106.4.1, 4.106.4.2, or 4.106.4.3, to facilitate future installation and use of EV chargers. Electric vehicle supply equipment (EVSE) shall be installed in accordance with the *California Electrical Code*, Article 625.

Exceptions

1. On a case-by-case basis, where the local enforcing agency has determined EV charging and infrastructure are not feasible based upon one or more of the following conditions:
 - 1.1. Where there is no commercial power supply.
 - 1.2. Where there is evidence substantiating that meeting the requirements will alter the local utility infrastructure design requirements on the utility side of the meter so as to increase the utility side cost to the homeowner or the developer by more than \$400.00 per dwelling unit.
2. Accessory Dwelling Units (ADU) and Junior Accessory Dwelling Units (JADU) without additional parking facilities.

COMMENTARY

Note: For purposes of discussion, sections related to multifamily dwellings and hotels/motels will be discussed separately from detached one- and two-family dwellings, and townhouses with attached private garages.

PURPOSE

- To encourage and support use of electric vehicles (EVs) as an alternate means of transportation.
- To help reduce the amount of greenhouse gas emissions released into the environment.
- Provide common-sense preinstallation methods with listed raceways or other approved methods dedicated to future expansion and installation of electric vehicle supply equipment (EVSE).
- Two exceptions are provided to address case-by-case situations where EV charging may not be practical: structures without commercial power supply; and where the out-of-pocket cost to the homeowner or developer for additional infrastructure costs (on the utility side of the meter) exceeds \$400 per dwelling unit. The second exception addresses cases in which costs are prohibitive and contrary to HCD's mission to safeguard housing affordability and to reduce obstacles to EV use. The third exception is for new Accessory Dwelling Units (ADUs) and Junior Accessory Dwelling Units (JADUs) without parking facilities. Recent changes in ADU and JADU law (Government Code Section 65852.2) do not allow local jurisdictions to require parking for newly constructed ADUs and JADUs if certain conditions are met. Therefore, there is no reason for a requirement for EV spaces to be enforced for new dwelling units without associated parking facilities.



FIGURE 2 State Housing Law Program staff photo: electric vehicle charging station at multifamily residential complex.

BACKGROUND

2010 CALGreen

The 2010 *CALGreen* provisions for EV charging were initially developed as voluntary standards in Section A4.106.6. These voluntary standards were developed in response to numerous requests by stakeholders to provide building standards that meet current and future demands for installation of EVSE in single-family residences and in parking facilities of multifamily dwellings. HCD's

initial proposal was largely based upon language provided by the California Air Resources Board (CARB), which favored mandating a 240V/40A hardwired dedicated branch circuit installed in every home for future installation of EVSE. After considerable internal research, additional comment and discussion with other state agencies, stakeholders, manufacturers, enforcing agencies, and the building industry, HCD chose to provide a more reasoned approach offering greater flexibility and consumer choice. This was largely due to market uncertainties, questions regarding utilities infrastructure and not wishing to substantially increase housing costs with rapidly evolving EVSE technology.

CALGreen's voluntary provisions for EVSE were intended to provide low-cost strategies that offer choice and savings in design for the future use of EVs and for homeowners wishing to purchase an electric vehicle necessitating retroactive installation of higher capacity electrical wiring and supply equipment for charging electric vehicles. It was also HCD's intent to monitor and revisit its voluntary EV requirements as more vehicles enter the market in the coming decade and EV charging technology evolves.

2013 *CALGreen* Supplement (effective July 1, 2015)

The 2013 *CALGreen* included “carryover” of voluntary provisions for EV charging from the 2010 *CALGreen*. As part of the 2013 Intervening Code Adoption Cycle, HCD proposed continued adoption of the EV provisions; however, HCD amended the provisions to mandatory measures. This was, in part, to support implementation of the Governor's Executive Order B-16-2012 to achieve a benchmark for having over 1.5 million zero-emission vehicles on California roadways by 2025, and the Governor's October 2013 announcement of an initiative to put 3.3 million zero-emission vehicles on the roadways within a dozen years. (The initiative was a memorandum of understanding signed by the governors of California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island and Vermont. These states comprise nearly 25 percent of the U.S. vehicle market and the initiative demonstrates commitment to support a successful and growing market for electric vehicles, an important influence on climate change, and to support reducing dependence on oil.) In addition, the Governor's Interagency Working Group on Zero-Emission Vehicles, “2013 ZEV Action Plan,” designates HCD as the lead agency for considering amendments to the *California Building Standards Code* to ensure new residential buildings are ZEV-ready and requiring multiunit buildings to dedicate a portion of their parking lots for EV charging.

2016 *CALGreen*

As part of the 2015 Triennial Code Adoption Cycle (2016 *CALGreen*), HCD replaced the term “EV charging stations” with “EV charging spaces,” since the term “EV charging space” better described a space available for future installation of EVSE, but with no EV charger installed. This modification in terminology aligned with the terminology used by the Division of State Architect in Chapter 11B of the *California Building Code*. HCD also eliminated the requirement for identification of EV charging spaces on the construction documents because the same requirement was addressed in Section 4.106.4.2.1. There was no reason for the same requirement to be duplicated. These modifications did not change the regulatory effect.

2016 *CALGreen* Supplement (effective July 1, 2018)

The 2016 *CALGreen* included “carryover” of provisions for EV charging infrastructure from the 2013 *CALGreen*. As part of the 2016 Intervening Code Adoption Cycle, HCD included new mandatory EV charging requirements for hotels and motels. The number of parking spaces required to have capability for EV charging mirrored the requirement for non-residential structures in Section 5.106.5.2. The space dimensions, identification and design was similar to the requirements for multifamily charging infrastructure.

2019 CALGreen (effective January 1, 2020)

As part of the 2018 Triennial Code Adoption Cycle (2019 *CALGreen*), HCD removed the threshold of 17 or more multifamily dwellings and increased the required number of EV spaces from 3 percent of the total number of parking spaces to 10 percent. HCD also made significant changes to the voluntary provisions for EV charging. Tiers 1 and 2 were separated. Tier 1 increased the required number of EV spaces from 5 percent to 15 percent; Tier 2 increased from 5 percent to 20 percent.

HCD's provisions facilitate EV charging capability at residences to further encourage purchase and use of EVs as a reliable and economical source of transportation and assist in reducing impediments such as lack of access to EV charging. These provisions will result in significant cost savings for homeowners who choose to use EVs for transportation and need to retroactively install higher capacity electrical wiring and supply equipment for charging EVs. The provisions also provide cost savings for state agencies that may need to offer incentive funding, such as the CEC's Alternative and Renewable Fuel and Vehicle Technology Program for accommodating user needs for electrical upgrades for purposes of EV charging.

Charging Levels

The amount of time required to fully charge an electric vehicle is a function of battery size and the amount of kilowatts (kW) that an electrical circuit can deliver to the battery. Larger circuits, as measured by voltage and amperage, will deliver more kW. EV charging is performed at three voltage and current levels. The levels are defined to meet the current EVs and anticipated future technology needs, and to provide compatibility with the nation's electric transmission and distribution system. Following are general descriptions of EV charging levels; however, it is expected that technology will be changing over the next several years. (For purposes of discussion, the terms "electric vehicle supply equipment" or "EVSE" are used interchangeably with "off-board charger.")

Level 1 (AC Level 1)

This method uses a standard 120V branch circuit, which is the lowest common voltage level found in both residential and commercial buildings. Typical ratings for these circuits and circuit breakers are 15A or 20A. Level 1 EVSE typically uses a standard 3-prong electrical outlet to connect to premises wiring. Most, if not all, EVs are supplied with a Level 1 cord-connected portable charger with a J1772 standard connector to the EV. The charging time with Level 1 EVSE can be very long—more than 20 hours for some batteries needing a full charge.

Level 2 (AC Level 2)

Level 2 is typically described as the "primary" or "preferred" method for both private and publicly available facilities. Level 2 uses a single-phase 240V branch circuit and appropriate receptacle (as per the current). The J1772 connector allows for current as high as 80A (100A rated circuit). The higher voltage and current of Level 2 allows for a much faster battery charge. There are many specifics affecting the charging time—such as size of the battery, size of the charging equipment, efficiency of the charging equipment, etc. Typically, the charging time for most vehicles currently on the market with a standard Level 2 charger is between 6 and 8 hours.

DC (Direct Current) Fast Charging

DC fast charging is designed for commercial and public applications and is intended to perform in a manner similar to a commercial gasoline service station—which is rapid recharge. Typically, DC fast charge would provide 50–80 percent recharge in 10 to 15 minutes. DC fast charge uses an off-board charger to provide the AC to DC conversion. The vehicle's on-board battery management system controls the off-board charger to deliver DC directly to the battery. This off-board charger is serviced by a three-phase circuit at 208, 240V, 480, or 600V. DC fast

charging requires a specialized coupler (connector and inlet) in order to connect to the EV. The inlet is shown below (left-side inlet). (The right side shows the Level 2 J1772 inlet.)



FIGURE 3 Photo shows a standard J1772 inlet on the right for use with Level 1 and Level 2 chargers; and a CHAdeMO inlet on the left. Photo from U.S. Dept. of Energy Energy, Efficiency and Renewable Energy Website: (http://www.afdc.energy.gov/fuels/electricity_infrastructure.html).

Wireless Charging

Inductive, or “wireless” charging requires appropriate wiring and energy transfer equipment to a ground-based transmitting coil/charging pad to transfer energy to an EV with capability for receiving energy wirelessly. Charging occurs when the EV is aligned over the charging pad and the vehicle is automatically charged. Wireless charging may be used by vehicles installed or adapted with wireless charging capability. Wireless charging rates are similar to Level 2 chargers.

Location of EV Spaces

Section 4.106.4 requires the raceway to terminate in close proximity to the proposed location of the EV charger. It does not specify the exact location. Installation and proper location of EV chargers are also dictated by the *California Electrical Code* (CEC), Article 625. In addition to the CEC, location may also be governed by the public utility provider. Consideration such as owner and/or developer preference or choice must also be taken into account.

New One- and Two-family Dwellings, and Townhouses with Attached Private Garages

4.106.4.1 New one- and two-family dwellings and townhouses with attached private garages. For each dwelling unit, install a listed raceway to accommodate a dedicated 208/240-volt branch circuit. The raceway shall not be less than trade size 1 (nominal 1-inch inside diameter). The raceway shall originate at the main service or subpanel and shall terminate into a listed cabinet, box or other enclosure in close proximity to the proposed location of an EV charger. Raceways are required to be continuous at enclosed, inaccessible or concealed areas and spaces. The service panel and/or subpanel shall provide capacity to install a 40-ampere minimum dedicated branch circuit and space(s) reserved to permit installation of a branch circuit overcurrent protective device.

4.106.4.1.1 Identification. The service panel or subpanel circuit directory shall identify the overcurrent protective device space(s) reserved for future EV charging as “EV CAPABLE”. The raceway termination location shall be permanently and visibly marked as “EV CAPABLE”.

COMMENTARY

PURPOSE

- Facilitates ease of future EV charger installation after initial construction. The requirement for only a raceway (no wiring) provides for relatively easy installation of conductors for energizing an EV charger when the charger is installed and available for use. The minimum size (1 inch) ensures that conductors (wiring) rated up to 80 amperes (Level 2) may be accommodated if desired by the EV user.
- Facilitates ease of replacing conductors to accommodate different chargers.
- Saves costs related to installation of unused copper wiring and wasted copper resources.
- The service panel or subpanel requirements ensure that the panel or subpanel will have sufficient space for the overcurrent protective devices and capacity to support future EV charging of at least 40 amperes.
- Required identification in the panel for overcurrent protective devices will ensure that the service panel is capable of accommodating a dedicated branch circuit for the EV charger. (EV chargers are considered as “continuous loads.”)
- *CALGreen* requirements are minimum requirements. *CALGreen* does not prohibit installation of larger conduits or panel sizing for greater capacity.
- It is important to note that installation of an EV charger is not a *CALGreen* requirement; *CALGreen* requires the installation of infrastructure only for future installation of an EV charger.

BACKGROUND

The mandatory EV charging requirement for one- and two-family dwellings, and townhouses with attached private garages is substantially the same as the voluntary standard formerly in the original 2013 *CALGreen* Section A4.106.8.1. As part of the adoption of the voluntary standard, additional language was added to clarify application to townhouses since most of these types of dwellings have garages that are dedicated to the resident of the townhouse and not available to nonresidents.

HCD determined that a prewired, dedicated 40-ampere branch circuit, while sufficient for charging some electric vehicles currently available on the market, did not provide enough flexibility and potentially limited consumer choice in the purchase of a new electric vehicle based on current charging system capability. In addition, a requirement for a prewired, 40-ampere dedicated branch circuit could create increased or unnecessary expenses. For instance, several load calculations were performed by HCD where the California Electrical Code would generally require upgrade of the electrical service panel in homes 2,000 square feet and larger. Installation of a trade size 1 (1-inch inside diameter) raceway was preferred as an economical alternative; it allowed the consumer or builders more available options without expensive service panel upgrades. A trade size 1 (1-inch inside diameter) raceway is not only adequate for installation of a 40-ampere branch circuit but also allows for branch circuits larger than 40-ampere. The currently approved Level 2 EVSE charging connector (J1772) allows for electrical circuits as high as 80 amperes. In the near future, all major automotive manufacturers plan to launch plug-in EVs equipped with higher capacity and/or more efficient batteries. HCD recognizes the potential for future changes in EVs such as EV range, battery technology and consumer needs and will continue to evaluate the evolution of EVs and related building standards.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Installation of not less than a listed trade size 1 (1-inch inside diameter) raceway secured at the panel terminating in an easy-to-use location.
- Other approved wiring methods with sufficient conductors sizing, ampacity and service capacity to install Level 2 EVSE. An example would be a dedicated 240 volts/40 amperes branch circuit.
- A label or marking stating “EV CAPABLE” posted in a conspicuous place at the service panel (or subpanel) and at the EV charging space.
- Electrical load calculations including potential loads for future EV charging.
- Prior to construction during the planning phase, consult with the electric utility and the local enforcing agency to determine any special conditions, additional requirements, rate structure, infrastructure capability, or requirements or options for a second meter. This is not required for a conduit-only installation, however, is recommended to ensure capacity for future EV charging.

New Multifamily Dwellings

The regulatory text for this section has been amended for the 2019 code.

4.106.4.2 New multifamily dwellings. If residential parking is available, ten (10) percent of the total number of parking spaces on a building site, provided for all types of parking facilities, shall be electric vehicle charging spaces (EV spaces) capable of supporting future EVSE. Calculations for the required number of EV spaces shall be rounded up to the nearest whole number.

Notes:

1. Construction documents are intended to demonstrate the project’s capability and capacity for facilitating future EV charging.
2. There is no requirement for EV spaces to be constructed or available until EV chargers are installed for use.

COMMENTARY

PURPOSE

- Provide infrastructure for 10 percent of parking spaces to facilitate future EV charging, as a service, to multifamily dwellings.
- *CALGreen* requirements are minimum requirements. *CALGreen* does not prohibit installation of larger conduits, wiring, electrical panels, chargers with greater capacity, larger size EV spaces, or additional EV spaces.
- It is important to note that construction of an electric vehicle charging station or installation of an EV charger is not a *CALGreen* requirement; *CALGreen* requires the installation of infrastructure only for future installation of an EV charger.

BACKGROUND

The mandatory EV charging requirements for multifamily dwelling units have been carried forward from the voluntary standard formerly in the 2013 *CALGreen* Section A4.106.8.2 with revisions. In the voluntary measure, multifamily buildings that require multiple charging spaces warranted additional consideration such as ownership, infrastructure, location, number and type of charging spaces and adequacy of the electrical system for simultaneously charging all EVs at all designated EV charging spaces. HCD considered those complexities and subsequently required plans indicating the location of future EV charging spaces and justification that the electrical system had sufficient capacity. In addition, HCD required that all underground raceways and/or other concealed or related underground equipment be installed at initial construction.

The elevation of voluntary EV charging measures to mandatory measures also resulted from approval of Assembly Bill 1092 (Chapter 410/Statutes of 2013). AB 1092 directed HCD to propose mandatory building standards for installation of future EV charging infrastructure for parking spaces in multifamily dwellings and to use existing voluntary measures in *CALGreen* as a “starting point” for the mandatory measures. Although AB 1092 proposed adoption for the next triennial edition (2016 version effective January 1, 2017) of the building standards code; HCD proposed mandatory measures for EV charging in multifamily dwellings, provided opportunities for stakeholder input, revised the regulations according to viable comments and proposed the regulations for inclusion in the 2013 *CALGreen* supplement effective July 1, 2015. Therefore, HCD approved adoption of the mandatory Section 4.106.4.2 in advance of the statutory directive.

Multifamily dwellings accommodate 34 percent of Californians who are faced with unique criteria related to EV charging, including parking access, electrical service access, installation and operation costs and agreements between property owners/managers and tenants. (Source: November 2013, California Plug-In Electric Vehicle Collaborative, “Plug-in Electric Vehicle Charging Infrastructure Guidelines for Multi-unit Dwellings.”) HCD has adopted the multifamily EV charging regulations to accommodate these needs.

HCD has further revised the multifamily EV charging requirements for the 2019 *CALGreen* by removing the stipulation that they apply only to a site with 17 or more units. The required number of EV spaces was also increased from 3 percent to 10 percent of the total number of parking spaces.

The regulatory text for this section has been amended for the 2019 code.

4.106.4.2.1 Electric vehicle charging space (EV space) locations. Construction documents shall indicate the location of proposed EV spaces. Where common use parking is provided at least one EV space shall be located in the common use parking area and shall be available for use by all residents.

4.106.4.2.1.1 Electric vehicle charging stations (EVCS). When EV chargers are installed, EV spaces required by Section 4.106.4.2.2, Item 3, shall comply with at least one of the following options:

1. The EV space shall be located adjacent to an accessible parking space meeting the requirements of the California Building Code, Chapter 11A, to allow use of the EV charger from the accessible parking space.
2. The EV space shall be located on an accessible route, as defined in the California Building Code, Chapter 2, to the building.

Exception: Electric vehicle charging stations designed and constructed in compliance with the California Building Code, Chapter 11B, are not required to comply with Section 4.106.4.2.1.1 and Section 4.106.4.2.2, Item 3.

Note: Electric vehicle charging stations serving public housing are required to comply with the California Building Code, Chapter 11B.

COMMENTARY

- The first option locates the EVCS adjacent to an accessible parking space meeting the requirements in the *California Building Code*, Chapter 11A, Housing Accessibility. This means that the parking space next to the EV space would be fully accessible, signed for use by persons with disabilities, and have access to an EV charger, when installed. The minimum requirement, for a single EV charger, would result in a single charger being shared between the accessible parking space and the EVCS.
- The second option locates the EV space on an accessible route. This option meets the intent of the code for purposes of locating an EV charger and places it in a location that would be accessible to all users. However, this option may not allow for sharing of the EV charger from two or more adjacent spaces.
- The *California Building Code* defines “Accessible route” as follows:
A continuous unobstructed path connecting accessible elements and spaces of an accessible site, building or facility that can be negotiated by a person with a disability using a wheelchair, and that is also safe for and usable by persons with other disabilities. Interior accessible routes may include corridors, hallways, floors, ramps, elevators and lifts. Exterior accessible routes may include parking access aisles, curb ramps, crosswalks at vehicular ways, walks, ramps and lifts.
- The note refers to *California Building Code* (CBC), Chapter 11B, Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing as an option for compliance with the California accessibility requirements when EV charging equipment is installed. Currently, Section 4.106.4.2.1 mandates the location of EV spaces (1 in 25) when EV charging equipment is installed; however, the installed charging equipment is also required to comply with the applicable sections in the CBC, Chapter 11A, in order to provide access for persons with disabilities. The Division of State Architect (DSA) developed comprehensive standards for EVCS when EV charging equipment is installed. These standards, located in Chapter 11B, apply to public buildings (including public housing) and public accommodations. The proposed exception allows designers, developers, and owners to design and construct EVCS following the requirements in Chapter 11B, instead of *CALGreen* and Chapter 11A.

4.106.4.2.2 Electric vehicle charging space (EV space) dimensions. The EV spaces shall be designed to comply with the following:

1. The minimum length of each EV space shall be 18 feet (5486 mm).
2. The minimum width of each EV space shall be 9 feet (2743 mm).
3. One in every 25 EV spaces, but not less than one, shall also have an 8-foot (2438 mm) wide minimum aisle. A 5-foot (1524 mm) wide minimum aisle shall be permitted provided the minimum width of the EV space is 12 feet (3658 mm).
 - a. Surface slope for this EV space and the aisle shall not exceed 1 unit vertical in 48 units horizontal (2.083 percent slope) in any direction.

COMMENTARY

- It is not necessary to locate the required “ten (10) percent of the total number of parking spaces,” referenced in Section 4.106.4.2, in common use areas and make them available for all residents. This point is clarified in Section 4.106.4.2.1. *CALGreen* requires at least one EV space to be located in common use areas, if common use area parking is available. All others (the rest of the 10 percent) may be assigned to residents.
- When “ten (10) percent of the total number of parking spaces” is a fraction, calculations for the required number of EV spaces shall be rounded up to the nearest whole number.
- When “ten (10) percent of the total number of parking spaces” is less than one (1), at least one (1) EV space shall be capable of supporting EV charging. *CALGreen* requires calculations for the required number of EV spaces to be rounded up to the nearest whole number.
- Construction documents are required to demonstrate the potential for EV charging by showing future areas and spaces to be used for EV charging.
- Section 4.106.4.2.2 details the physical requirements for the EV spaces such as the length, width and slope. These requirements mirror the requirements for accessible parking spaces.
- Section 4.106.4.2.2 also requires that one in every 25 EV spaces have an 8-foot-wide aisle. If there are less than 25 EV spaces, there shall be at least one EV space with the 8-foot-wide aisle.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Identification (on the plans) of ten (10) percent of the total number of parking spaces to have the capability to support EV charging. At least one space identified to meet the requirement for EV charging shall be located in common use parking areas, when common use parking areas are provided, and shall be available for use by all residents. Additional spaces may be located in common use parking areas or assigned to specific residents, including private parking locations.
- Planning and design for accommodation of the required number of actual or future EV charging areas and spaces as shown on construction documents.
- Planning and design for sufficient electrical capacity to support the required actual or future EV charging areas and spaces as shown on construction documents.
- See Figure 4 for a possible design layout for an EV space available for use by all residents, located adjacent to a van accessible parking space.
- See Figure 5 for a possible design layout for an EV space available for use by all residents, located adjacent to a “standard” accessible parking space.
- See Figure 6 for a possible design layout for an EV space available for use by all residents located adjacent to a typical parking space.
- See Figure 7 for a possible design layout for two EV spaces located adjacent to an accessible route.

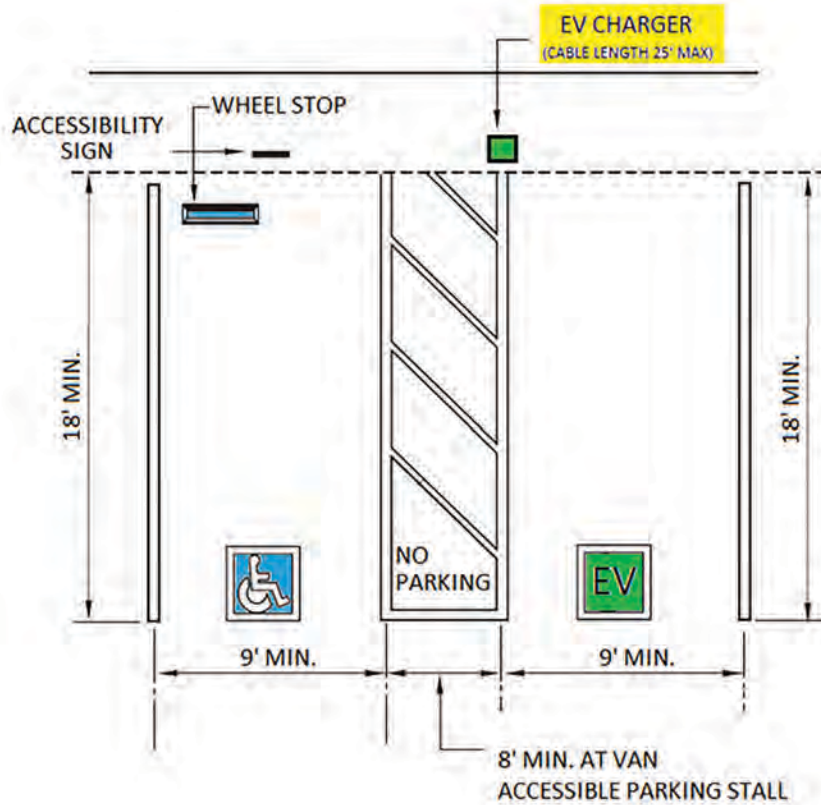


FIGURE 4 Nine-foot EV space adjacent to van accessible parking space

Notes:

1. EV charger may be installed on either side of the access aisle if the requirements of the *California Electrical Code*, Section 625, are met.
2. Maximum length of EVSE cable is 25 feet unless equipped with a cable management system that is part of a listed EVSE.
3. Surface slope for EV space and the aisle shall not exceed 1 unit vertical in 48 units horizontal (2.083-percent slope) in any direction if this is the only EV space or the designated “one in every 25 EV spaces.”

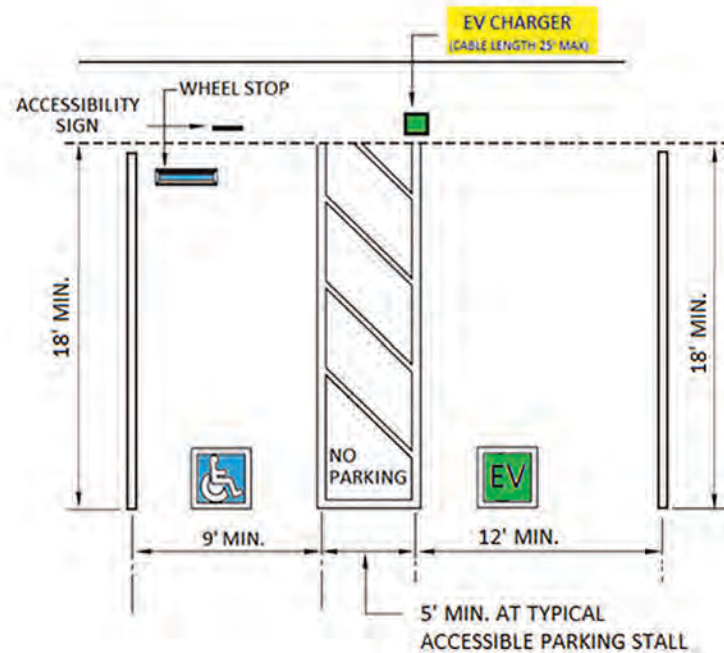


FIGURE 5 Twelve-foot EV space adjacent to standard accessible parking space

Notes:

1. EV charger may be installed on either side of the access aisle if the requirements of the *California Electrical Code*, Section 625, are met.
2. Maximum length of EVSE cable is 25 feet unless equipped with a cable management system that is part of a listed EVSE.
3. Surface slope for EV space and the aisle shall not exceed 1 unit vertical in 48 units horizontal (2.083-percent slope) in any direction if this is the only EV space or the designated “one in every 25 EV spaces.”

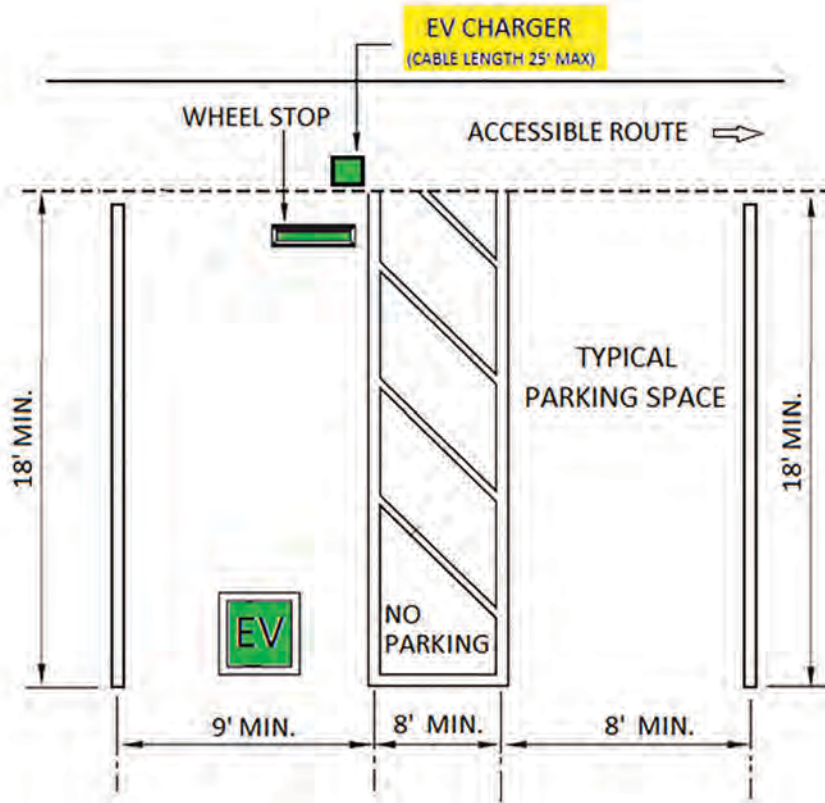


FIGURE 6 Nine-foot universal EV space adjacent to typical parking space and accessible route

Notes:

1. Maximum length of EVSE cable is 25 feet unless equipped with a cable management system that is part of a listed EVSE.
2. Surface slope for EV space and the aisle shall not exceed 1 unit vertical in 48 units horizontal (2.083-percent slope) in any direction if this is the only EV space or the designated “one in every 25 EV spaces.”

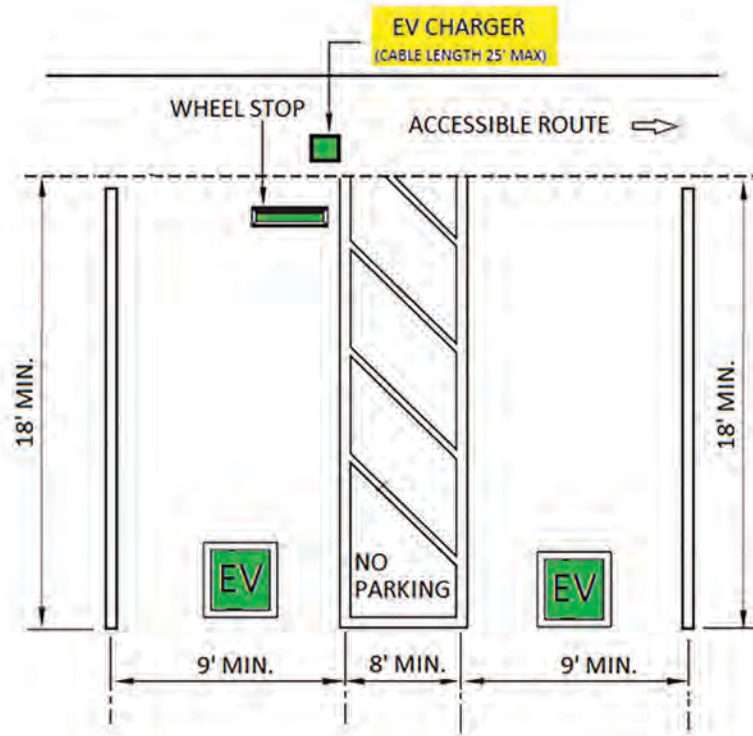


FIGURE 7 Two 9-foot universal ev spaces adjacent to accessible route

Notes:

1. Maximum length of EVSE cable is 25 feet unless equipped with a cable management system that is part of a listed EVSE.
2. Surface slope for EV space and the aisle shall not exceed 1 unit vertical in 48 units horizontal (2.083-percent slope) in any direction if this is the only EV space or the designated “one in every 25 EV spaces.”

4.106.4.2.3 Single EV space required. Install a listed raceway capable of accommodating a 208/240-volt dedicated branch circuit. The raceway shall not be less than trade size 1 (nominal 1-inch inside diameter). The raceway shall originate at the main service or subpanel and shall terminate into a listed cabinet, box or enclosure in close proximity to the proposed location of the EV space. Construction documents shall identify the raceway termination point. The service panel and/or subpanel shall provide capacity to install a 40-ampere minimum dedicated branch circuit and space(s) reserved to permit installation of a branch circuit overcurrent protective device.

COMMENTARY

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Installation of not less than a listed trade size 1 (1-inch inside diameter) raceway secured at the panel and terminating in an accessible location (where one EV space is required).
- Other approved wiring methods with sufficient conductors sizing, ampacity and service capacity to install Level 2 EVSE (where one EV space is required).
- A label stating “EV CAPABLE” posted in a conspicuous place at the service panel (or subpanel).
- Prior to construction, during the planning phase, consult with the electric utility and the local enforcing agency to determine any special conditions, additional requirements, rate structure, infrastructure capability, or requirements or options for a second meter.
- Locate the single EV space in a common use parking area in accordance with Section 4.106.4.2.1.

4.106.4.2.4 Multiple EV spaces required. Construction documents shall indicate the raceway termination point and proposed location of future EV spaces and EV chargers. Construction documents shall also provide information on amperage of future EVSE, raceway method(s), wiring schematics and electrical load calculations to verify that the electrical panel service capacity and electrical system, including any on-site distribution transformer(s), have sufficient capacity to simultaneously charge all EVs at all required EV spaces at the full rated amperage of the EVSE. Plan design shall be based upon a 40-ampere minimum branch circuit. Required raceways and related components that are planned to be installed underground, enclosed, inaccessible or in concealed areas and spaces shall be installed at the time of original construction.

4.106.4.2.5 Identification. The service panel or subpanel circuit directory shall identify the overcurrent protective device space(s) reserved for future EV charging purposes as “EV CAPABLE” in accordance with the *California Electrical Code*.

COMMENTARY

BACKGROUND

HCD removed the “notes” from multiple EV sections. The notes are pointers to other regulations and/or information that apply to EV signage including the following:

1. The California Department of Transportation, which provides uniform standards and specifications for official traffic control devices in California.
2. The California Vehicle Code for charging space signage and use of EV charging spaces.
3. The Governor’s Office of Planning and Research (OPR) which published, “Zero-Emission Vehicles in California: Community Readiness Guidebook,” a document providing helpful information for local governments, residents and businesses. Website: http://opr.ca.gov/docs/ZEV_Guidebook.pdf

Notes are not regulatory language and HCD believes that they should be contained in the guide rather than the code.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- For multiple EV spaces, only underground raceways and related underground equipment are required to be installed at the time of initial construction.
- Electrical load calculations, diagrams, schematics, and a site plan indicating the location(s) and type of each EV charging system. The construction documents should include all information necessary for the future installation of EV charging system, including location and dimensions of EV space(s), as well as location and type of charging equipment.
- A label stating “EV CAPABLE” posted in a conspicuous place at the service panel (or subpanel).
- Prior to construction, during the planning phase, consult with the electric utility and the local enforcing agency to determine any special conditions, additional requirements, rate structure, infrastructure capability, or requirements or options for a second meter.

Frequently Asked Questions

Q: Does *CALGreen* require electric vehicle charging spaces to be installed? Does *CALGreen* require electric vehicle chargers to be installed?

A: No. The intent of *CALGreen* at the mandatory level is to reduce costs and to remove barriers related to use of electric vehicles at residences. *CALGreen* does not require installation of EV charging equipment. *CALGreen* requires installation of infrastructure (conduit and/or electrical capacity) only. Installation of EV charging infrastructure helps reduce costs when retroactively installing chargers.

Q: If a charger is installed for the space available for all residents, does the charger need to meet accessibility requirements in the *California Building Code*, Chapters 11A and 11B?

A: Yes. If a charger is installed in a common use parking area, the EV charging space is a service located in a common use area, available for all residents. Therefore, the charger and the EV charging space need to meet requirements in Chapter 11A (accessible route, clear floor space, reach ranges, controls and operating mechanisms, etc.). EV charging stations constructed in compliance with Chapter 11B are also acceptable. *California Building Code* (CBC), Chapter 11B, is an option for compliance with the California accessibility requirements when EV charging equipment is installed. Currently Section 4.106.4.2.1 mandates the location of EV spaces (1 in 25) when EV charging equipment is installed; however, the installed charging equipment is also required to comply with the applicable sections in the CBC, Chapter 11A, in order to provide access for persons with disabilities. The Division of State Architect (DSA) developed comprehensive standards for EVCS when EV charging equipment is installed. These standards, located in Chapter 11B, apply to public buildings, including public housing, and to public accommodations. The proposed exception allows designers, developers, and owners to design and construct EVCS following the requirements in Chapter 11B, instead of *CALGreen* and Chapter 11A. Electric vehicle charging stations serving public housing are required to comply with the CBC, Chapter 11B.

Q: Do the chargers need to be usable by all residents?

A: Where there are common use parking areas, *CALGreen* requires at least one EV space. If charging equipment is installed, it would be required to be available for use by all residents.

New Hotels and Motels

This section was added for the 2016 code supplement. Effective July 1, 2018.

4.106.4.3 New hotels and motels. All newly constructed hotels and motels shall provide EV spaces capable of supporting future installation of EVSE. The construction documents shall identify the location of the EV spaces.

Notes:

1. Construction documents are intended to demonstrate the project's capability and capacity for facilitating future EV charging.
2. There is no requirement for EV spaces to be constructed or available until EV chargers are installed for use.

COMMENTARY

PURPOSE

- Provide infrastructure to facilitate EV charging, as a service, to hotels and motels.
- The construction documents ensure the project has the capability and capacity to support future EV chargers.
- *CALGreen* requirements are minimum requirements. *CALGreen* does not prohibit installation of larger conduits or panel sizing for greater capacity.
- It is important to note that installation of an EV charger is not a *CALGreen* requirement; *CALGreen* requires the installation of infrastructure only for future installation of an EV charger.

BACKGROUND

The number of parking spaces required to have capability for future EV charging mirrors the requirement for non-residential structures in Section 5.106.5.3. The space dimensions, identification and design are similar to the requirements for multifamily charging infrastructure.

According to ARB, EV charging infrastructure in *CALGreen* supports California's Zero Emission Vehicle Program, which aims to improve air quality and reduce greenhouse gas emissions. Although *CALGreen* has increased the required parking spaces, including EV charging infrastructure, from 3 percent (2013 *CALGreen*) to 6 percent (2016 *CALGreen*) for nonresidential uses, and requires EV charging infrastructure in 100 percent of new one- and two-family homes and 3 percent of multifamily homes, there was no requirement to facilitate EV charging for hotels and motels. The availability of EV charging (when installed) at hotels and motels provides charging service to EV users traveling between their homes and vacation or other travel locations. This will help reduce range anxiety for some EV users and also provide charging while in a safe and comfortable location or even overnight. This provides for infrastructure to accommodate the actual chargers when they are determined to be necessary and a needed service for the hotel/motel customers. There is no requirement for the installation of EV spaces or EV chargers; however, EV spaces and chargers may be installed depending on need. Providing this infrastructure at the time of construction is economical and avoids deconstruction and other more expensive changes, e.g., increasing electrical service, to accommodate EV charging retroactively.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Identification of the required number of parking spaces to have the capability to support future EV charging. Spaces identified to meet the requirement for future EV charging shall be shown on the construction documents.
- Demonstration of the project's capability and capacity to facilitate future EV charging on construction documents.

This section was added for the 2016 code supplement. Effective July 1, 2018.

4.106.4.3.1 Number of required EV spaces. The number of required EV spaces shall be based on the total number of parking spaces provided for all types of parking facilities in accordance with Table 4.106.4.3.1. Calculations for the required number of EV spaces shall be rounded up to the nearest whole number.

COMMENTARY

- The number of parking spaces required to have capability for future EV charging mirrors the requirement for non-residential structures in Section 5.106.5.3.

These sections were added for the 2016 code supplement. Effective July 1, 2018.

4.106.4.3.2 Electric vehicle charging space (EV space) dimensions. The EV spaces shall be designed to comply with the following:

1. The minimum length of each EV space shall be 18 feet (5486 mm).
2. The minimum width of each EV space shall be 9 feet (2743 mm).

4.106.4.3.3 Single EV space required. When a single EV space is required, the EV space shall be designed in accordance with Section 4.106.4.2.3.

4.106.4.3.4 Multiple EV spaces required. When multiple EV spaces are required, the EV spaces shall be designed in accordance with Section 4.106.4.2.4.

4.106.4.3.5 Identification. The service panels or subpanels shall be identified in accordance with Section 4.106.4.2.5.

4.106.4.3.6 Accessible EV spaces. In addition to the requirements in Section 4.106.4.3, EV spaces for hotels/motels and all EVSE, when installed, shall comply with the accessibility provisions for EV charging stations in the *California Building Code*, Chapter 11B.

COMMENTARY

- The space dimensions, identification and design are similar to the requirements for multi-family charging infrastructure.
- A reference to Chapter 11B of the California Building Code is also added to direct the code user to the accessibility provisions related to EV chargers and use.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Installation of not less than a listed trade size 1 (1-inch inside diameter) raceway secured at the panel and terminating in an accessible location (where 1 EV space is required).
- For multiple EV spaces, only underground raceways and related underground equipment are required to be installed at the time of initial construction.
- Electrical load calculations, diagrams, schematics, and a site plan indicating the location(s) and type of each EV charging system. The construction documents should include all information necessary for the future installation of EV charging system, including location and dimensions of EV space(s).
- A label stating “EV CAPABLE” posted in a conspicuous place at the service panel (or subpanel).
- Prior to construction, during the planning phase, consult with the electric utility and the local enforcing agency to determine any special conditions, additional requirements, rate structure, infrastructure capability, or requirements or options for a second meter.

Division 4.2 – ENERGY EFFICIENCY

SECTION 4.201 GENERAL

4.201.1 Scope. For the purposes of mandatory energy efficiency standards in this code, the California Energy Commission will continue to adopt mandatory standards.

COMMENTARY

PURPOSE

This section clarifies the California Energy Commission (CEC) as the ongoing authority for adopting statewide energy mandates. This purpose is also stated in Section 5.201 for nonresidential buildings, which for the California Energy Code, includes both high-rise residential buildings and hotel/motel buildings.

BACKGROUND

The CEC is the state’s primary energy policy and planning agency. As such, the CEC adopts regulations to establish the minimum level of energy efficiency a structure must meet or exceed.

For further information, please visit the California Energy Commission website at: <http://www.energy.ca.gov/>

Division 4.3 – WATER EFFICIENCY AND CONSERVATION

SECTION 4.303 INDOOR WATER USE

The regulatory text for these sections has been amended for the 2019 code.

4.303.1 Water-conserving plumbing fixtures and fittings. Plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall comply with Sections 4.303.1.1, 4.303.1.2, 4.303.1.3, and 4.303.1.4.

Note: All noncompliant plumbing fixtures in any residential real property shall be replaced with water-conserving plumbing fixtures. Plumbing fixture replacement is required prior to issuance of a certificate of final completion, certificate of occupancy, or final permit approval by the local building department. See Civil Code Section 1101.1, et seq., for the definition of a noncompliant plumbing fixture, types of residential buildings affected and other important enactment dates.

4.303.1.1 Water closets. The effective flush volume of all water closets shall not exceed 1.28 gallons per flush. Tank-type water closets shall be certified to the performance criteria of the U.S. EPA *WaterSense Specification for Tank-Type Toilets*.

Note: The effective flush volume of dual flush toilets is defined as the composite, average flush volume of two reduced flushes and one full flush.

4.303.1.2 Urinals. The effective flush volume of wall-mounted urinals shall not exceed 0.125 gallons per flush. The effective flush volume of all other urinals shall not exceed 0.5 gallons per flush.

Water Closets

Section 4.303.1.1 mandates the allowable flush volume for water closets, provides a prescriptive method for compliance, and clarifies that tank-type water closets shall be certified to the performance criteria of the U.S. EPA *WaterSense Specification for Tank-Type Toilets*.

Urinals

Section 4.303.1.2 mandates the allowable flush volume for residential urinals and provides a prescriptive method for compliance. The allowable flush volume was reduced from 0.5 to 0.125 gallons per flush during the 2015 Emergency Rulemaking; the text was further amended for the 2016 *CALGreen*. The new requirement was approved by the California Building Standards Commission (CBSC) on October 21, 2015; and became effective on January 1, 2016. This new requirement, including the terminology (“wall mounted” and “all other” urinals), is consistent with the flow rate adopted by the California Energy Commission (CEC) in CCR, Title 20 (Appliance Efficiency Regulations) on April 8, 2015.

4.303.1.3 Showerheads.

The regulatory text for these sections has been amended as of July 1, 2018 and for the 2019 code.

4.303.1.3.1 Single showerhead. Showerheads shall have a maximum flow rate of not more than 1.8 gallons per minute at 80 psi. Showerheads shall be certified to the performance criteria of the U.S. EPA *WaterSense Specification for Showerheads*.

4.303.1.3.2 Multiple showerheads serving one shower. When a shower is served by more than one showerhead, the combined flow rate of all showerheads and/or other

shower outlets controlled by a single valve shall not exceed 1.8 gallons per minute at 80 psi, or the shower shall be designed to allow only one shower outlet to be in operation at a time.

Note: A hand-held shower shall be considered a showerhead.

Showerheads

Sections 4.303.1.3.1 and 4.303.1.3.2 mandate a maximum flow rate of 1.8 gallons per minute for showerheads, and provide a prescriptive method of compliance. In addition, these sections require showerheads to be certified to the performance criteria of the U.S. EPA WaterSense Specification for Showerheads.

Section 4.303.1.3.1 adopts by reference performance criteria in the WaterSense Specification for Showerheads because of its importance. The WaterSense Program released its final specification for showerheads on July 26, 2018. The intent of this specification is to help consumers identify those products that meet EPA's criteria for water efficiency and performance. WaterSense incorporates performance requirements for showerheads seeking to earn the WaterSense label. These requirements address flow rates across a range of pressures, spray force, and spray coverage (three key attributes of showerhead performance according to consumer testing). The new requirements are designed to ensure a high level of performance and user satisfaction with high-efficiency showerheads.

By installing high-efficiency showerheads, the average household could save at least 2,700 gallons per year (data from U.S. EPA WaterSense Program). The corresponding reduced water use also decreases a household's energy demands.

Section 4.303.1.3.2 addresses multiple showerheads serving one shower. The specified flow rate of 1.8 gallons per minute at 80 psi also applies in situations where one or more valves supply multiple showerheads in a single shower enclosure or space. "Fixture types" or sources of water flow include, but are not limited to, showerheads, handshowers and bodysprayers.

The maximum flow rate provisions apply to the total amount of water flow resulting from each valve supplying the individual shower enclosure regardless of the number of attached showerheads (or similar fixture outlets or sprays). For example, if only one valve supplies a shower enclosure or shower area, the maximum water flow, regardless of the number of showerheads and other outlets, is 1.8 gpm at 80 psi. If two (or more) separate valves provide water to separate showerheads and other outlets, the maximum flow rate for each valve would be 1.8 gpm at 80 psi. If the operation of two or more showerheads and body sprays controlled by a single valve results in more than 1.8 gpm at 80 psi total water flow, then only one showerhead may operate at one time with a maximum flow rate of not more than 1.8 gpm.

4.303.1.4 Faucets.

4.303.1.4.1 Residential lavatory faucets. The maximum flow rate of residential lavatory faucets shall not exceed 1.2 gallons per minute at 60 psi. The minimum flow rate of residential lavatory faucets shall not be less than 0.8 gallons per minute at 20 psi.

4.303.1.4.2 Lavatory faucets in common and public use areas. The maximum flow rate of lavatory faucets installed in common and public use areas (outside of dwellings or sleeping units) in residential buildings shall not exceed 0.5 gallons per minute at 60 psi.

The regulatory text for this section has been amended for the 2019 code.

4.303.1.4.3 Metering faucets. Metering faucets when installed in residential buildings shall not deliver more than 0.2 gallons per cycle.

4.303.1.4.4 Kitchen faucets. The maximum flow rate of kitchen faucets shall not exceed 1.8 gallons per minute at 60 psi. Kitchen faucets may temporarily increase the flow above the maximum rate, but not to exceed 2.2 gallons per minute at 60 psi, and must default to a maximum flow rate of 1.8 gallons per minute at 60 psi.

Note: Where complying faucets are unavailable, aerators or other means may be used to achieve reduction.

Faucets

Section 4.303.1.4.1 mandates the maximum and minimum flow rates for residential lavatory faucets.

Section 4.303.1.4.2 mandates the allowable flow rate for lavatory faucets installed in common use and public use areas outside of dwellings or sleeping units.

The maximum flow rate for residential lavatory faucets in Section 4.303.1.4.1 was reduced to 1.2 gallons per minute at 60 psi (1.5 gpm in the 2013 *CALGreen*) during the 2015 Emergency Rulemaking; the text was further amended for the 2016 *CALGreen*. The new requirement was approved by the California Building Standards Commission (CBSC) on October 21, 2015; the mandate became effective on July 1, 2016. The new requirement for maximum flow rate is consistent with the flow rate adopted by the California Energy Commission (CEC) in CCR Title 20 (Appliance Efficiency Regulations) on April 8, 2015.

Nonresidential-type faucets, usually installed in public restrooms, have different use and performance expectations; that is, public restroom faucets are used almost exclusively for hand washing. As a consequence, the maximum flow rate for these public nonresidential fixtures can be set significantly lower than the flow rate for private faucets (0.5 gpm vs. 1.2 gpm at 60 psi) without negatively impacting user satisfaction. The flow rate mandated in this section is consistent with the required flow rate for nonresidential buildings.

While not explicitly stated, this section precludes the installation and use of some nonresidential-type lavatory faucets in residential dwellings or sleeping units. The allowable maximum flow rate of faucets, designed for installation in common and public use areas is 0.5 gpm at 60 psi, which does not comply with the requirement for minimum flow rate (0.8 gpm at 20 psi) for residential lavatory faucets.

Section 4.303.1.4.3 mandates the allowable flow volume for metering faucets that are installed in residential buildings. Although it is not explicitly stated, this section allows the installation and use of metering faucets in residential dwellings or sleeping units if specific conditions are met.

By definition, a metering faucet is a faucet that after actuation dispenses water of a predetermined volume or for a predetermined period of time. (The volume or cycle duration can be fixed or adjustable.) The 2019 *CALGreen* mandates the maximum flow volume (not flow rate) at 0.2 gallons per cycle (reduced from 0.25 gallons per cycle). This 0.2 gallon can be spread over 10 seconds at 1.2 gpm, 12 seconds at 1.0 gpm, 60 seconds at 0.2 gpm, or at other intermediate levels, based on the water flow allowed by the aerator used. When the metering faucet can maintain the volume at or below 0.2 gallons per cycle, this metering faucet complies with the requirements of *CALGreen* regardless of the water flow. Therefore, when a metering faucet discharges 0.2 gallons per cycle at maximum flow rate of 1.2 gpm at 60 psi (minimum 0.8 gpm at 20 psi), this metering faucet can be installed in dwellings and sleeping units.

Kitchen Faucets

Section 4.303.1.4.4 mandates the allowable flow rate for kitchen faucets and for the purposes of user satisfaction, provides an option for the kitchen faucets to temporarily increase the water flow above the maximum allowable flow rate.

Kitchen sink faucets have different user expectations, requiring other considerations to be made. One major performance consideration is the kitchen faucet's ability to effectively rinse dishes. Kitchen faucets also are commonly used for pot or container filling, and significantly increased waiting times (the result of the lower flow rate) might not be acceptable to most users. In order to maintain user satisfaction and ensure a high level of performance, the maximum flow rate is greater than what is suitable for lavatory faucets.

4.303.2 Standards for plumbing fixtures and fittings. Plumbing fixtures and fittings shall be installed in accordance with the *California Plumbing Code*, and shall meet the applicable standards referenced in Table 1701.1 of the *California Plumbing Code*.

Standards for Plumbing Fixtures and Fittings

Section 4.303.2 clarifies that, in addition to *CALGreen* requirements, plumbing fixtures and fittings shall be installed in accordance with the California Plumbing Code (CPC), and shall meet the applicable standards referenced in Table 1701.1 of the CPC. Table 1701.1 of the 2019 CPC contains the mandatory referenced plumbing standards, including the standards for fixtures and fittings regulated by *CALGreen*.

For more information on the U.S. EPA WaterSense program, visit <https://www.epa.gov/watersense/version-12-watersense-specification-tank-type-toilets>

COMMENTARY

PURPOSE

These provisions include prescriptive requirements to reduce indoor potable water use. Reducing the amount of indoor water use also results in a decrease in the amount of energy needed to transport, process, and treat water, thereby contributing to reduction of greenhouse gas emissions.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

Section 4.303 provides prescriptive levels (flow rates) for water closets, urinals, showerheads, and faucets in compliance with federal and state law.

BACKGROUND

The current federal standards for plumbing fixtures and fittings were mandated by the Energy Policy Act of 1992. On December 15, 2010, the U.S. Department of Energy (DOE) published a final rule waiving federal preemption for energy conservation standards under 42 U.S.C. 6297 (c) with respect to any state regulation concerning water use in faucets, showerheads, water closets and urinals. With the preemption waived, the State of California is able to mandate more stringent standards.

The 2015 emergency regulatory action made critically needed changes to the 2013 *California Green Building Standards Code (CALGreen)*, Section 4.303, as related to reduction of indoor residential potable water use. This action aligned the requirements for flush volume of urinals and flow rate of residential lavatory faucets in *CALGreen* with the recently modified requirements in the *California Code of Regulations (CCR)*, Title 20, Appliance Efficiency Regulations, approved by the California Energy Commission.

The emergency regulations became effective on October 22, 2015, after approval by the BSC on October 21, 2015, and subsequent filing with the Secretary of State. These regulations were adopted on an emergency basis to reconcile the conflict between the regulations for urinals and lavatory faucets in CCR, Title 20 (effective January 1, 2016 for urinals; July 1, 2016, for lavatory faucets), and building standards in the 2013 *CALGreen*.

Necessity for adoption of original emergency regulations

Governor Jerry Brown's Executive Order B-29-15 (April 1, 2015) provided a summary of the ongoing drought conditions in California, covering declarations for a State of Emergency (January 17, 2014) and Continued State of Emergency (April 25, 2014), evidence of a record low snow-pack, decreased water levels in reservoirs, reduced river flows and declining supplies in underground water basins. In addition, the Governor acknowledged that a distinct possibility exists for drought conditions to continue. Further, the Executive Order found that conditions of extreme peril to the safety of persons and property continue to exist due to water shortage and drought conditions with which local authority is unable to cope. To address these concerns, the Executive Order specified that strict compliance with identified statutes and regulations would prevent, hinder, delay, or mitigate the effects of the drought.

Given the extensive code adoption process, adherence to the 2015 Triennial Code Adoption Cycle schedule would make the proposed building standards effective at the local level on January 1, 2017. At that time, deadlines for proposed changes in the 2013 Intervening Code Adoption Cycle had already passed, and the approved changes, effective July 1, 2015, were already published.

A delay of nearly 12 months in the effective date for measures reducing indoor use of potable water in building standards created conflict with Title 20 appliance efficiency regulations, and did not address the Governor's declared emergency for the effective conservation of California's limited water resources. In view of the urgency to conserve California's water resources, as deemed essential by the Governor's Executive Order and prior proclamations, HCD proposed the adoption of these building standards through the emergency adoption process.

INFORMATIVE NOTES

AB 1953: Lead-Free Plumbing Law Effective January 1, 2010

Legislation redefining what constitutes "lead-free plumbing" took effect on January 1, 2010. Signed into law in 2006, AB 1953 effectively reduced the maximum amount of allowable lead content in plumbing pipes, fixtures and fittings used for potable (drinking) water to 0.25 percent.

When initially signed into law, there were no major manufacturers with compliant products. That situation has changed over the last several years. The Plumbing Manufacturers Institute (PMI), recently renamed Plumbing Manufacturers International, has announced that there is a substantial supply of compliant products now on the market. Further information regarding manufacturers and products can be found at PMI's website at www.pmihome.org.

Follow-up legislation, SB 1334 (Calderon) and SB 1395 (Corbett), requires all plumbing products, as defined, to be certified by an independent ANSI-accredited third party for compliance with

existing lead standards. This follow-up legislation should make it easier for homebuilders and purchasing agents to obtain documentation that they are indeed purchasing AB 1953-compliant products.

Reduction of Lead in Drinking Water Act Effective January 4, 2014

This Act was approved on January 4, 2011, by President Barack Obama, and modifies the Federal Safe Drinking Water Act to redefine “lead-free” and lead content to levels currently required by California statutes and building standards (California Plumbing Code). The Act also provides exemptions for pipes and plumbing fixtures used exclusively for nonpotable water services (manufacturing and industrial processing, outdoor irrigation); and specific plumbing fixtures and fittings (toilets, bidets, urinals, Flushometer valves, shower valves and water distribution main gate valves 2 inches or larger in diameter).

SB 407: Installation of Water Use Efficiency Improvements(Chapter 587/Statutes of 2009)

Legislation addressing requirements for water-conserving plumbing fixtures for existing residential and commercial real property built and available for use or occupancy on or before January 1, 1994, became statute (Civil Code) in 2009. This legislation, in part, provided definitions for “Water-conserving plumbing fixtures,” “noncompliant plumbing fixture” as noted below and specified deadlines for replacement of noncompliant fixtures.

Water-conserving plumbing fixtures: Any fixture that is in compliance with current building standards applicable to a newly constructed real property of the same type.

Noncompliant plumbing fixture is any of the following:

- Any toilet manufactured to use more than 1.6 gallons of water per flush.
- Any urinal manufactured to use more than 1 gallon of water per flush.
- Any showerhead manufactured to have a flow capacity of more than 2.5 gallons of water per minute.
- Any interior faucet that emits more than 2.2 gallons of water per minute.

Civil Code Section 1101.4.

- (a) On and after January 1, 2014, for all building alterations or improvements to single-family residential real property, as a condition for issuance of a certificate of final completion and occupancy or final permit approval by the local building department, the permit applicant shall replace all noncompliant plumbing fixtures with water-conserving plumbing fixtures.
- (b) On or before January 1, 2017, noncompliant plumbing fixtures in any single-family residential real property shall be replaced by the property owner with water-conserving plumbing fixtures.
- (c) On and after January 1, 2017, a seller or transferor of single-family residential real property shall disclose in writing to the prospective purchaser or transferee the requirements of subdivision (b) and whether the real property includes any noncompliant plumbing fixtures.

Civil Code Section 1101.5.

- (a) On or before January 1, 2019, all noncompliant plumbing fixtures in any multifamily residential real property and in any commercial real property shall be replaced with water-conserving plumbing fixtures.

...

- (d)(1) On and after January 1, 2014, all noncompliant plumbing fixtures in any multifamily residential real property and any commercial residential real property shall be replaced with water-conserving plumbing fixtures in the following circumstances:

- (A) For building additions in which the sum of concurrent building permits by the same permit applicant would increase the floor area of the space in a building by more than 10 percent, the building permit applicant shall replace all noncompliant plumbing fixtures in the building.
 - (B) For building alterations or improvements in which the total construction cost estimated in the building permit is greater than one hundred fifty thousand dollars (\$150,000), the building permit applicant shall replace all noncompliant plumbing fixtures that service the specific area of the improvement.
 - (C) Notwithstanding subparagraph (A) or (B), for any alterations or improvements to a room in a building that require a building permit and that room contains any noncompliant plumbing fixtures, the building permit applicant shall replace all noncompliant plumbing fixtures in that room.
- (2) Replacement of all noncompliant plumbing fixtures with water-conserving plumbing fixtures, as described in paragraph (1), shall be a condition for issuance of a certificate of final completion and occupancy or final permit approval by the local building department.

SB 407 also specifies deadlines for replacing noncompliant plumbing fixtures starting in 2017 (for single-family residential real property) and 2019 (for multifamily residential property) and requires disclosure of noncompliant plumbing fixtures when selling or transferring real property.

See additional details in Civil Code sections enacted by SB 407 and any subsequent amendments to related code sections.

SECTION 4.304 OUTDOOR WATER USE

The regulatory text for this section has been amended for the 2019 code.

4.304.1 Outdoor potable water use in landscape areas. Residential developments shall comply with one a local water efficient landscape ordinance or the current California Department of Water Resources' Model Water Efficient Landscape Ordinance (MWELo), whichever is more stringent.

Note: The Model Water Efficient Landscape Ordinance (MWELo) is located in the California Code of Regulations (CCR), Title 23, Chapter 2.7, Division 2.

MWELo and supporting documents, including a water budget calculator, are available at: <https://www.water.ca.gov/>.

COMMENTARY

PURPOSE

To reduce the use of potable water.

To align the requirements for outdoor water use in *CALGreen* with the Department of Water Resources' (DWR's) Model Water Efficient Landscape Ordinance (MWELo), or with a local water efficient landscape ordinance.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

Comply with a local water efficient landscape ordinance or the current MWELo, whichever is more stringent.

BACKGROUND

The Water Conservation in Landscaping Act of 2006 (Assembly Bill 1881, Laird) requires cities and counties to adopt landscape water conservation ordinances by January 1, 2010. Pursuant to this law, DWR has prepared the MWELo for use by local agencies. The MWELo was approved by the Office of Administrative Law on September 10, 2009, and became effective on the same date. All local agencies are required to adopt either the MWELo or a local ordinance that fits local conditions. Local ordinances must be as effective as MWELo. The MWELo was also updated by DWR, effective December 1, 2015, to implement further reduction of outdoor water use for irrigation.

The 2013 Emergency Rulemaking made critically needed changes to the 2013 *CALGreen*, Section 4.304, as related to reduction of potable water use for outdoor irrigation. This action aligned the requirements for outdoor water use in *CALGreen* with the DWR MWELo by referring to and requiring compliance with MWELo, instead of repeating the language or mandating conflicting measures in *CALGreen*. This action also placed the outdoor water use requirement in a published building standards code (*CALGreen*), which is regularly used by designers, architects, building officials, enforcement officials, and other code users. In turn, this action requires any building plans, including landscaping details, to comply with MWELo or an equally or more stringent local ordinance. This requirement would typically be reviewed at the “plan check” portion of the permit application process, conducted by the local building department (or planning department in some jurisdictions).

As an emergency regulation, the proposed standards became effective on June 1, 2015, immediately after approval by the BSC (meeting held on May 29, 2015) and filing with the Secretary of State. The regulations were adopted on an emergency basis to avoid serious harm to the public peace, health, safety and general welfare in response to ongoing drought conditions and the subsequent State of Emergency proclamations and Executive Order B-29-15, issued by the Governor. Pursuant to the Administrative Procedure Act (Government Code Section 11346.1), the subject emergency building standards remain in effect for only 180 days, unless the rulemaking process is completed. A 90-day readoption, followed by the certification rulemaking activities (certification of the emergency approved building standards) were necessary in order for the emergency building standards to become permanent, and to be published in *CALGreen*.

Section 4.304.1, as originally adopted by the BSC on May 29, 2015, provided a starting compliance date of June 1, 2015, which applied to the DWR MWELo as it existed on that date. DWR updated the MWELo, and a revised version, dated July 9, 2015 (effective December 1, 2015), was approved by the California Water Commission and codified in the California Code of Regulations, Title 23. Due to the update to the MWELo, HCD further modified this section during the certification process, by providing a direct reference to the updated MWELo and the revised effective date of December 1, 2015.

Due to the significant and comprehensive changes in the updated MWELo, HCD proposed a direct reference to the MWELo for compliance purposes rather than duplicating the selected requirements of the MWELo. This reinforces a statewide standard adopted by DWR and still allows more restrictive standards to be adopted by local enforcing agencies, if desired. Addition-

ally, for the 2019 *CALGreen*, HCD revised the notes to provide pointers to resources such as the website for the MWELo and supporting references, and the web address of a water budget calculator on the DWR website.

Necessity for adoption of original emergency regulations:

Governor Brown's Executive Order B-29-15 (April 1, 2015) provided a summary of the ongoing drought conditions in California, covering declarations for a State of Emergency (January 17, 2014) and Continued State of Emergency (April 25, 2014), evidence of a record low snowpack, decreased water levels in reservoirs, reduced river flows and declining supplies in underground water basins. In addition, the Governor acknowledged that a distinct possibility exists for drought conditions to continue. Further, the Executive Order found that conditions of extreme peril to the safety of persons and property continue to exist due to water shortage and drought conditions with which local authority is unable to cope. To address these concerns, the Executive Order specified that strict compliance with identified statutes and regulations would prevent, hinder, delay, or mitigate the effects of the drought.

At the time of development and approval of the emergency regulations, existing Government Code, Water Conservation in Landscaping Act, Section 65591 et seq., required cities, counties and charter cities and counties to adopt landscape water conservation ordinances by January 1, 2010. DWR implemented the Act by preparing the MWELo effective September 10, 2009, for use by local agencies. The MWELo provided a framework for development of water budgets for landscapes ensuring that a landscape is allowed sufficient water for a specific design based on climate and type of plants. The MWELo applied to landscaped areas at least 2,500 square feet (developer-installed) or 5,000 square feet (homeowner-provided), requiring a building or landscape permit, plan check and design review.

History has identified that full implementation of the MWELo has not been achieved, largely because it has been a local planning issue at project conception, and has not been implemented at the local building department permitting and inspection level. DWR has neither the authority to propose building standards, nor mandate local building departments to verify compliance with the MWELo. The requirements in Section 4.304.1 provide additional visibility of the MWELo requirements in building standards and provide additional oversight of compliance.

Given the extensive code adoption process, adherence to the 2015 Triennial Code Adoption Cycle schedule made the proposed building standards effective at the local level on January 1, 2017. At that time, deadlines for proposed changes in the 2013 Intervening Code Adoption Cycle were already passed, and the approved changes, effective July 1, 2015, were already published.

A delay of nearly 18 months in the effective date for measures reducing outdoor use of potable water in building standards did not address the Governor's declared emergency for the effective conservation of California's limited water resources. In view of the urgency to conserve California's water resources, as deemed essential by the Governor's Executive Order and prior proclamations, HCD proposed the adoption of these building standards through the emergency adoption process.

Additional information for compliance with the MWELo is available from the DWR at the following website: <https://water.ca.gov/Programs/Water-Use-And-Efficiency>

SECTION 4.305 WATER REUSE SYSTEMS

This section was added for the 2016 code supplement, effective July 1, 2018; but has been removed from the 2016 and 2019 CALGreen.

4.305.1 Recycled water supply systems. Newly constructed residential developments, where disinfected tertiary recycled water is available from a municipal source to a construction site, may be required to have recycled water supply systems installed, allowing the use of recycled water for residential landscape irrigation systems. See Chapter 15 of the California Plumbing Code.

COMMENTARY

HCD has removed Section 4.305.1 from the 2016 and 2019 *CALGreen* through a Change Without Regulatory Effect rulemaking approved by the California Building Standards Commission on July 17, 2019. This removal was in response to the Peremptory Writ of Mandate for Case No. BS171958 issued by the Superior Court of California, County of Los Angeles, which declared the regulations invalid and ordered HCD to vacate the regulations. See HCD's Information Bulletin 2019-02 for additional details.

Frequently Asked Questions

Q: Can I meet the low-flow showerhead requirement for an existing home by just replacing the showerhead?

A: Yes, but it is important that the low-flow showerhead be used with an appropriate shower or tub/shower mixing (anti-scald) valve which compensates for sudden changes in water pressure or temperature. EPA WaterSense has recognized the issues associated with installation of low-flow showerheads on inappropriate automatic-compensating mixing valves, and issued Technical Clarification SH-0113-1 on January 24, 2013, addressing two options for properly identifying minimum showerhead flow rates at 45 psi. This information would ensure that installers match the water flow from the showerhead with the appropriate automatic-compensating mixing valves.

Note: According to the ASSE white paper Scald Hazards Associated with Low-Flow Showerheads, "low-flow showerheads should never be used with nonautomatic compensating-type shower or tub/shower valves."

Q: How is the reduced water flow for a dual flush toilet calculated?

A: To get the flow rate of a dual flush toilet, an average use is determined by totaling two reduced-rate flushes (R) with one full rate flush (F), then dividing by 3. $(R+R+F)/3 =$ Average flow. This flow must be 1.28 gallons per flush or less to meet the reduced flow requirements.

Division 4.4 – MATERIAL CONSERVATION AND RESOURCE EFFICIENCY

SECTION 4.406 ENHANCED DURABILITY AND REDUCED MAINTENANCE

4.406.1 Rodent proofing. Annular spaces around pipes, electric cables, conduits, or other openings in sole/bottom plates at exterior walls shall be protected against the passage of rodents by closing such openings with cement mortar, concrete masonry or similar method acceptable to the enforcing agency.

COMMENTARY

PURPOSE

This section requires barriers in exterior openings to prevent rodents from entering the dwelling and causing health hazards and/or damage to a building's components and systems. It addresses the sealing of openings in wall framing for controlling rodent intrusion, which differs from California Energy Code provisions intended to prevent air leakage.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

Openings should be sealed or closed with materials that cannot be damaged or penetrated by rodents:

- Cement mortar.
- Concrete masonry.
- Lightweight concrete/cellular concrete.
- Similar methods withstanding rodent penetration and approved by the enforcing agency.

BACKGROUND

The California Energy Code requires joints and other openings in the building envelope, which are potential sources of air leakage, to be sealed to limit infiltration and exfiltration. *CALGreen* specifically addresses protection of structures from rodent entry at the sole (bottom) plates of exterior walls. Keeping pests out of dwellings can help control the spread of disease; and prevent damage to buildings.

Rodents can cause significant damage to a building's structure or operating systems by gnawing on wood, plastic, copper, electrical conduits or other components. They may also damage stored items or personal property. Rats can burrow under building slabs undermining a foundation. A rodent also may nest in insulation and contribute to salmonellosis (food poisoning) and carry other diseases.

Therefore, penetrations, voids, joints and openings in structures need to be sealed to prevent passage of rodents. Openings include, but are not limited to, cuts, holes, and notches in sole/bottom plates, exterior wall openings around plumbing pipes, flues, exhaust vents, and HVAC conduits. Openings as small as $\frac{1}{4}$ inch can be used by a rodent to enter a wall, crawl space or attic. In addition, doors, windows, or screens should fit tightly. Other openings such as chimneys and vents should be rodent proofed without compromising their function. Dense vegetation, especially around roofs, walls and foundations, should be avoided to decrease rodent habitat and access into or onto buildings.

SECTION 4.408 CONSTRUCTION WASTE REDUCTION, DISPOSAL AND RECYCLING

4.408.1 Construction waste management. Recycle and/or salvage for reuse a minimum of 65 percent of the nonhazardous construction and demolition waste in accordance with either Section 4.408.2, 4.408.3 or 4.408.4, or meet a more stringent local construction and demolition waste management ordinance.

Exceptions:

1. Excavated soil and land-clearing debris.
2. Alternate waste reduction methods developed by working with local agencies if diversion or recycle facilities capable of compliance with this item do not exist or are not located reasonably close to the jobsite.
3. The enforcing agency may make exceptions to the requirements of this section when isolated jobsites are located in areas beyond the haul boundaries of the diversion facility.

COMMENTARY

PURPOSE

Construction waste diverted from landfills will help reduce landfill production of methane gas, a direct greenhouse gas. In addition, reusing and recycling materials typically results in less energy use than producing materials from virgin materials, conserves the original resources and reduces the burden on landfills.

BACKGROUND

Where a local jurisdiction has not adopted a waste reduction requirement, the mandatory 65-percent waste reduction established in Section 4.408.1 shall apply. Section 4.408 provides choices for meeting waste reduction requirements, including alternate waste reduction methods developed in consultation with local agencies. An exception was developed that recognizes that waste facilities may not exist, or be reasonably close to the job site, making compliance with the literal requirements and the benefits intended by this section infeasible. Determination of “reasonably close” will vary by jurisdiction according to the location of a job site and the nearest waste/diversion facility or whether the type of waste in question is accepted at the facility. In addition, construction waste reduction, disposal and recycling services may be economically impracticable or unavailable in some areas.

Local agencies can employ the use of a variety of strategies; through public- and private-sector recycling facilities to achieve state-mandated waste reduction and recycling goals. Local agencies should be contacted prior to construction to obtain a list of approved waste haulers. The Department of Resources Recycling and Recovery (CalRecycle) also maintains a C & D (construction and demolition) “Recyclers Database,” listing recycling facilities. Any successful recycling program will involve upfront due diligence, planning and the consideration of “multiple” factors. Many of these factors include, but are not limited to:

- Local authority approved waste hauler.
- Consideration of distance from the site to the recycling facility.
- Method of recycling: on-site sorting (source separation) or bulk mixed (single stream).

- Recyclers with a reliable/verifiable performance record.
- Clearly marked bins.
- Routinely checked bins for material accuracy.
- All involved parties are on board/buy-in.
- “Load Tags” or “Trip Tickets” are collected and recorded.

Definitions for “Hazardous waste,” “Recycle or Recycling,” and “Re-use” are located in *CALGreen* Chapter 2, Section 202. Section 4.408 also supports legal requirements for local jurisdictions to divert 50 percent of solid waste through source reduction, recycling, and composting activities as required in Public Resources Code Section 41780.

HCD amended the regulatory text in Section 4.408.1 during the 2015 Triennial Code Adoption Cycle. The modified language increases the percentage of diverted nonhazardous construction and demolition waste from 50 percent to 65 percent, moving the existing Tier 1 voluntary measure (65 percent) to mandatory. This change represents an increase of 15 percent. Similarly, the weight of construction waste in Section 4.408.4 was also reduced by 15 percent per square foot for consistency. HCD further increased the verification requirements for Tier 1 and Tier 2 in Section A4.408.1.

These modifications (including Tier 1 and Tier 2) aid in CalRecycle’s statewide recycling goal of 75 percent for 2020 as stated in AB 341 (Chapter 476, Statutes of 2011).

4.408.2 Construction waste management plan. Submit a construction waste management plan in conformance with Items 1 through 5. The construction waste management plan shall be updated as necessary and shall be available during construction for examination by the enforcing agency.

1. Identify the construction and demolition waste materials to be diverted from disposal by recycling, reuse on the project or salvage for future use or sale.
2. Specify if construction and demolition waste materials will be sorted on-site (source-separated) or bulk mixed (single stream).
3. Identify diversion facilities where the construction and demolition waste material will be taken.
4. Identify construction methods employed to reduce the amount of construction and demolition waste generated.
5. Specify that the amount of construction and demolition waste materials diverted shall be calculated by weight or volume, but not by both.

4.408.3 Waste management company. Utilize a waste management company, approved by the enforcing agency, which can provide verifiable documentation that the percentage of construction and demolition waste material diverted from the landfill complies with Section 4.408.1.

Note: The owner or contractor may make the determination if the construction and demolition waste materials will be diverted by a waste management company.

4.408.4 Waste stream reduction alternative [LR]. Projects that generate a total combined weight of construction and demolition waste disposed of in landfills, which do not exceed 3.4 pounds per square foot of the building area shall meet the minimum 65 percent construction waste reduction requirement in Section 4.408.1.

4.408.4.1 Waste stream reduction alternative. Projects that generate a total combined weight of construction and demolition waste disposed of in landfills, which do not exceed 2 pounds per square foot of the building area, shall meet the minimum 65 percent construction waste reduction requirement in Section 4.408.1.

4.408.5 Documentation. Documentation shall be provided to the enforcing agency which demonstrates compliance with Section 4.408.2, Items 1 through 5, Section 4.408.3 or Section 4.408.4.

Notes:

1. Sample forms found in “A Guide to the California Green Building Standards Code (Residential)” located at <http://www.hcd.ca.gov/building-standards/CALGreen/cal-green-forms.shtml> may be used to assist in documenting compliance with this section.
2. Mixed construction and demolition debris (C&D) processors can be located at the California Department of Resources Recycling and Recovery (CalRecycle).

COMMENTARY

PURPOSE

Sections 4.408.2, 4.408.3 and 4.408.4 address approved methods for ensuring compliance with the 65-percent construction and demolition waste requirement of Section 4.408.1. These methods are intended to save raw materials and preserve landfill space, especially where local regulations do not apply or do not meet the required *CALGreen* 65 percent or greater construction waste diversion rate.

BACKGROUND

The following discussions also provide information on three methods for calculating and documenting construction waste diversion.

COMPLIANCE METHODS AND SUPPORTING DOCUMENTATION

CALGreen, Section 4.408, recognizes several methods of compliance to meet the 65-percent reduction of construction and demolition waste. In addition, HCD developed several options to assist with calculation of construction waste diversion. Whichever method is chosen, it should be supported by waste tracking documentation and shall be made available to the local enforcement agency. [See sample Construction Waste Management Forms and instructions on HCD’s website (<http://www.hcd.ca.gov/building-standards/CALGreen/cal-green-forms.shtml>), which may be used for providing documentation of construction waste diversion and compliance with *CALGreen*.]

Construction Waste Management Plan (CWMP). The CWMP option provides a direct and clearly understood route to the successful diversion target of minimizing or reducing the amount of waste being sent to landfills. With proper planning, on-site posting and awareness, employees and subcontractors will be able to understand and participate in the process. The CWMP should identify materials to be recycled or reused and the method of their disposal as specified in *CALGreen* Section 4.408.2. The CWMP must also be supported by verifiable documentation that the requirements of the established diversion goals have been satisfied.

A CWMP should be submitted to the local enforcing agency for approval prior to the commencement of construction. Before choosing a tracking method, review of Appendix A4 “Residential

Voluntary Measures” in the 2019 *CALGreen* for additional conservation methods to reduce construction waste generation is strongly encouraged.

Recycling Facility or Waste Management Company Method. Use of this option requires all construction waste generated by a project to be transported to a recycling facility or waste management company that has a waste diversion rate of 65 percent or more. A recycling facility sorts the construction waste it receives and reclaims and recycles 65 percent or more of all the materials. Some larger municipalities have programs to certify their recycling facilities, via audits, as having a diversion rate of 65 percent or greater. Where such a program exists, this method may be the easiest path to achieving compliance. Similar to the volume or weight method or 3.4 pounds per square foot method, load tickets, receipts, and facility certification documents indicating the diversion rate for the project should be retained and provided to the local enforcing agency to demonstrate compliance with the 65-percent construction waste reduction requirements of *CALGreen*. Check with the local enforcing agency for specific requirements.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Comply with a local waste management ordinance.
- Develop and submit a CWMP for approval by the local enforcing agency.
- Transport all construction waste to a recycling facility having a 65-percent or greater diversion rate.
- Generate a total combined weight of construction and demolition waste disposed in landfills not to exceed 3.4 pounds per square foot of the building area. (This provision applies only to low-rise residential projects.)
- Generate a total combined weight of construction and demolition waste disposed in landfills not to exceed 2 pounds per square foot of the building area. (This provision applies to all residential projects.)
- Demonstrate evidence of compliance, through worksheets or haul tags, scales/weight certification from a waste management facility and/or any other records as required by the enforcing agency.
- If the project is located outside the haul boundaries of a diversion facility, contact the local authority as soon as possible for resolution. It is recommended that the owner or authorized agent research and discuss all logistical requirements with the enforcing agency early in the plan submittal process.

3.4 Pounds per Square Foot Method or Waste Stream Reduction Alternative (for Low-rise only). According to statistics provided by the National Association of Homebuilders (NAHB), the total waste generated on an average home in California has historically been approximately 8.5 pounds per square foot. The 3.4 pounds per square foot (net) waste limit can be achieved through efficient design, careful and accurate material ordering, handling and storage, panelized/prefabricated construction, and recycling and reuse. This method considers the construction waste generated at the construction site and not at the manufacturing site where some larger building components may have been pre-cut, manufactured, or pre-assembled.

Similar to the Volume or Weight Documentation Methods discussed, the facility where construction waste is transported will furnish load tickets or receipts, which together with the completed Construction Waste Management Worksheets (3.4 pounds per square foot) should be retained and provided to the local enforcing agency to demonstrate compliance with the construction waste reduction provisions of *CALGreen*.

2 Pounds per Square Foot Method or Waste Stream Reduction Alternative. This is an alternative method for construction waste reduction which considers the concept that there is inherently less construction waste in multifamily and high-rise residential projects. A similar compliance alternative exists for nonresidential buildings in *CALGreen* Section 5.408.1.3. Documentation for this method is similar to the 3.4 Pounds per Square Foot Method discussed previously.

Volume or Weight Documentation Method. The waste can be site-sorted (source separated), bulk mixed (single stream), or both. When using this method, documentation and tracking of the volume or weight (not both) of all waste generated by the project and transported to a facility is required. Most facilities will supply tickets or other detailed receipts showing the weight or volume of all materials being recycled, reused, or disposed, which should be retained and provided to the local enforcing agency to demonstrate compliance with *CALGreen*. Additionally, the weight or volume totals from these tickets or receipts should be entered on the Construction Waste Management Worksheets (Volume or Weight) to verify compliance with *CALGreen* 65-percent waste reduction requirement.

Other Documentation Methods.

Additional documentation methods for verifying compliance with *CALGreen* construction waste reduction requirements may be used. For example, web-based construction waste management systems may be available which track the history and volume of construction waste generated on a project-by-project basis. All documentation methods used must be acceptable to the local enforcing agency.

INFORMATIVE NOTE

AB 341: State Policy Goal for 75-percent solid waste reduction, recycling or composting by 2020, Recycling of commercial solid waste effective 7/1/12

Assembly Bill 341 (Chapter 476/Statutes of 2011) codified the Legislature’s policy goal for the state that not less than 75 percent of solid waste generated be source reduced, recycled, or composted by the year 2020 and annually thereafter.

AB 341 defined “Business” (for purposes of the bill) as including multifamily residential buildings. AB 341 also required businesses generating more than 4 cubic yards of commercial solid waste per week or that are multifamily residential dwellings of five units or more to arrange for recycling services.

See complete text of AB 341, amended statutory sections, and California’s 75 Percent Initiative on the Department of Resources Recycling and Recovery (CalRecycle) website (www.calrecycle.ca.gov).

AB 1343: Architectural Paint Recovery Program

Assembly Bill 1343 (Chapter 420/Statutes of 2010) established the Paint Stewardship Program to reduce the generation of postconsumer architectural paint, promote the reuse of post-consumer architectural paint, and manage the end-of-life of post-consumer architectural paint, in an environmentally sound fashion, including collection, transportation, processing, and disposal.

AB 1343 required manufacturers to submit architectural paint stewardship plans to CalRecycle by April 2012, implement plans approved by CalRecycle, and submit an annual report to CalRecycle starting September 2013. The program is funded through assessments on sales of architectural paint and enforced by CalRecycle.

See complete text of AB 1343, amended statutory sections and the Product Stewardship and Extended Producer Responsibility (EPR) on CalRecycle’s website (www.calrecycle.ca.gov).

AB 2398: Product Stewardship for Carpets

Assembly Bill 2398 (Chapter 681/Statutes of 2010) established the Carpet Stewardship Program to increase the amount of postconsumer carpet diverted from landfills and recycled into secondary products or otherwise managed in a manner that is consistent with the state's hierarchy for waste management (source reduction, recycling and composting, environmentally safe transformation and environmentally safe land disposal).

Basically, manufacturers design stewardship programs, prepare and implement plans to reach goals, and report on progress. CalRecycle approves the plans, checks progress, and provides oversight and enforcement. Other service providers participate in the management system as negotiated.

Implementation of early action measures was funded through assessments of 5 cents (\$0.05) per square yard of carpet (through January 1, 2013) with continued funding through assessments as approved by CalRecycle on the purchase price of carpet.

See complete text of AB 2398, amended statutory sections and the Extended Producer Responsibility (EPR) and Carpet Stewardship Law on CalRecycle's website (www.calrecycle.ca.gov).

SECTION 4.410 BUILDING MAINTENANCE AND OPERATION

4.410.1 Operation and maintenance manual. At the time of final inspection, a manual, compact disc, web-based reference or other media acceptable to the enforcing agency which includes all of the following shall be placed in the building:

1. Directions to the owner or occupant that the manual shall remain with the building throughout the life cycle of the structure.
2. Operation and maintenance instructions for the following:
 - a. Equipment and appliances, including water-saving devices and systems, HVAC systems, photovoltaic systems, electric vehicle chargers, water-heating systems and other major appliances and equipment.
 - b. Roof and yard drainage, including gutters and downspouts.
 - c. Space conditioning systems, including condenser and air filters.
 - d. Landscape irrigation systems.
 - e. Water reuse systems.
3. Information from local utility, water and waste recovery providers on methods to further reduce resource consumption, including recycle programs and locations.
4. Public transportation and/or carpool options available in the area.
5. Educational material on the positive impacts of an interior relative humidity between 30-60 percent and what methods an occupant may use to maintain the relative humidity level in that range.
6. Information about water-conserving landscape and irrigation design and controllers which conserve water.
7. Instructions for maintaining gutters and downspouts and the importance of diverting water at least 5 feet away from the foundation.

8. Information on required routine maintenance measures, including, but not limited to, caulking, painting, grading around the building, etc.
9. Information about state solar energy and incentive programs available.
10. A copy of all special inspection verifications required by the enforcing agency or this code.

COMMENTARY

PURPOSE

To ensure owners and occupants are provided information regarding proper operation and maintenance of a building, its equipment and components. To provide additional building- and residence-related information for increased sustainable use and longevity of the building, enhanced performance, and to provide an optimal living environment.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- If a builder/developer does not currently provide a building or homeowner's manual, then a single manual should be created, placed in the dwelling at the time of final inspection, and provided to the purchaser or occupant. It should be noted on the manual cover: "Manual shall remain with the building for the life cycle of the structure."
- A building or homeowner's manual that includes use of web-based programs or templates that may be available for purchase or may be free-share.
- HCD's Operation and Maintenance Manual template form customized and completed by builder/developers. (<http://www.hcd.ca.gov/building-standards/CALGreen/cal-green-forms.shtml>).
- Manual must be in a media format (hardcopy, compact disc, on-line, etc.) approved by the enforcing agency.

BACKGROUND

The Operation and Maintenance Manual is intended to provide a one-stop location for maintenance and operation information for a building's equipment and features, and to promote the continued health of the complete building system. The manual may also be used as a record for compliance if additional required information is included. Due to its importance to the structure itself, *CALGreen* requires that the manual remain with the building for the "life cycle" of the structure. It is also recommended that the manual be continuously updated or supplemented to reflect changes occurring to the site, structure or appliances.

As construction practices become more sophisticated, a certain level of knowledge is required to maintain building systems and information must be easily available to the building owner, manager or occupants. Even the most efficient designs or equipment can operate poorly when users are not knowledgeable in the continued maintenance and operation of buildings and systems. Owners who are not the builder or the first occupant, tenants and guests repeatedly neglect the most minor maintenance tasks, such as changing an air filter or understanding that a properly operating exhaust fan can prevent excess moisture in a dwelling unit.

The manual will provide technical, operational, and educational resources enabling owners and

occupants to make well-informed decisions. Supplying owners' information on green features, equipment operation, warranties, special inspection reports, subcontractor names and phone numbers, utility information, landscape and irrigation plans, along with water and energy conservation ideas provides necessary information for building operation and maintenance and also important documentation for the building. Additionally, the manual will provide residence-related information such as transportation options, recycling opportunities, and energy incentive programs assisting the new owners and occupants to further the goals of green building.

Notes:

1. The requirements for the Operation and Maintenance Manual are directed at owners of dwelling units. In cases where resident users are transient or renters, operation and maintenance of the building and some building features may be the responsibility of the building manager or building owner (see following Frequently Asked Questions section).
2. Additional statutes and regulations outside the scope of *CALGreen* may require specific building information to be provided to the homeowners or residents or require performance of specific maintenance activities by designated parties. Some of these rules and regulations are included in the Health and Safety Code, California Energy Code, California Mechanical Code, Civil Code (landlord-tenant responsibilities), etc.

4.410.2 Recycling by occupants. Where 5 or more multifamily dwelling units are constructed on a building site, provide readily accessible area(s) that serves all buildings on the site and are identified for the depositing, storage and collection of nonhazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics, organic waste, and metals, or meet a lawfully enacted local recycling ordinance, if more restrictive.

Exception: Rural jurisdictions that meet and apply for the exemption in Public Resources Code Section 42649.82 (a)(2)(A) et seq. are not required to comply with the organic waste portion of this section.

COMMENTARY

PURPOSE

To ensure multifamily dwellings are provided with a readily accessible area for depositing, storage and collection of nonhazardous materials for recycling, or meet a lawfully enacted local recycling ordinance, if more restrictive.

BACKGROUND

HCD adopted Section 4.410.2 during the 2015 Triennial Code Adoption Cycle. This measure, which was initially proposed by the Department of Resources Recycling and Recovery (CalRecycle), requires developers and/or owners of multifamily buildings with five or more dwelling units on a building site to provide a readily accessible area, adequate in size to accommodate containers for depositing, storage and collection of nonhazardous materials (including organic waste) for recycling. This requirement is intended to assist businesses that will be required to meet AB 1826 (Chapter 727, Statutes of 2014). Multifamily buildings with five or more dwelling units are also defined as "Businesses" in AB 1826. In addition, HCD added a definition for "Organic waste" in Chapter 2.

AB 341 (Chapter 476, Statutes of 2011) set California's statewide recycling goal at 75 percent, and directs CalRecycle to propose statewide strategies to assist in meeting that goal. Organic materials constitute about 40 percent of the landfilled waste and are the primary source of methane emissions from landfills. Providing adequate space for the storage and collection of organic waste would increase overall recycling and reduce emissions of methane, a potent greenhouse gas.

AB 1826 (Chapter 727, Statutes of 2014) requires, as of April 1, 2016, any business (including some multifamily residential buildings) generating eight (8) cubic yards or more of organic waste to arrange for recycling services specific to that waste. The threshold for required service is reduced to four (4) cubic yards of organic waste on January 1, 2017, and to four (4) cubic yards of commercial solid waste effective January 1, 2019.

Frequently Asked Questions

Q: Section 4.406.1 applies to openings at exterior walls. Does this apply to a combination of all openings through exterior walls or just the openings in the top and bottom plates?

A: This section requires the sealing of openings, e.g., cuts, holes and notches in sole or bottom plates, to prevent entry of rodents and the resulting damage.

Q: CALGreen requires recycling and/or salvaging for reuse a minimum of 65 percent of the nonhazardous construction and demolition waste. Does the 65-percent reduction requirement also apply to demolition-only projects?

A: No. *CALGreen* Section 408.1 requires 65-percent reduction of construction waste and demolition waste, however, this requirement applies when a project includes both demolition and construction. Local waste management ordinances may require that demolition-only projects be subject to a specified waste reduction requirement based on project size, cost, or other factors.

Q: CALGreen requires that 100 percent of excavated soil and land-clearing debris must be reused or recycled for commercial projects. Does this requirement also apply to residential projects?

A: No. *CALGreen* Section 408.1 requires 65-percent reduction of construction waste with a specific exception for excavated soil and land-clearing debris from this requirement. Unlike the provisions for nonresidential construction, there are no mandatory requirements for reuse or recycling of excavated soil and land-clearing debris. However, *CALGreen* voluntary Tier 1 level of enhanced green building does include a prerequisite for topsoil protection and reuse (Section A4.106.2.3). As noted, this is not a mandatory requirement of *CALGreen* unless the voluntary Tier 1 level is adopted or the measure is specifically required at the local level.

Q: The building department in my jurisdiction does not allow the reuse of previously used materials. Is reuse of materials a violation of CALGreen?

A: No. There are provisions for used materials in the *California Building Standards Code*. The code specifies that used materials, equipment and devices shall not be reused unless approved by the building official. This means that some materials cannot be reused if they do not comply with the requirements of the *California Building Standards Code* and/or the local ordinances for new construction. *CALGreen* Sections A4.105.1

and A4.105.2 state that reused materials or products must comply with current building standards requirements or be an accepted alternate method or material.

Q: Is a building operation and maintenance manual required for each condominium, duplex or dwelling unit?

A: Yes. Each individually-owned unit in a multifamily building shall have an approved operation and maintenance manual at the time of final inspection. Information must be for the appropriate dwelling unit or building. Paper or electronic copies of these documents are acceptable. The required documentation must stay with the building or dwelling unit throughout its life-cycle and be accessible to the owner, tenant or the individual(s) responsible for operating the feature, equipment or device.

Q: Is a building operation and maintenance manual required for each apartment dwelling unit?

A: No. In multifamily dwellings not individually owned, such as an apartment complex, it is not the intent of HCD to require a complete operation and maintenance manual in each individual dwelling unit. An individual operation and maintenance manual may be necessary for each building where dwelling unit features differ within an apartment community or where different special inspections have been required for each building. However, a single comprehensive manual may be permitted when approved by the local enforcing agency.

Tenant rights and responsibilities typically vary with each rental contract. The building owner/manager shall retain the original manual(s), which must remain on-site and made available for review by all tenants. All maintenance and operation information for all applicable features of a dwelling unit and common areas shall be provided to whoever is responsible for operating the feature, equipment or device. When the tenant is the responsible party, applicable maintenance or operating information shall be provided to them. Photocopied information from the approved manual is acceptable. Public transportation options or other information required by the manual, applicable to all individual tenants, may be provided individually or at a central location where all tenants have access.

Q: Is a building operation and maintenance manual required for each guestroom in hotels/motels?

A: No. All operation and maintenance information for all applicable features of guestrooms and common areas shall be provided to whomever is responsible for operating the feature, equipment or device. In hotels/motels, where the occupants are primarily transient in nature, guests are not responsible for the maintenance of the property, buildings or rooms; the only responsible party is the building owner and/or the manager. For more details regarding hotels/motels in which occupants are primarily permanent in nature, see the previous question and answer.

Division 4.5 – ENVIRONMENTAL QUALITY

SECTION 4.503 FIREPLACES

4.503.1 General. Any installed gas fireplace shall be a direct-vent sealed-combustion type. Any installed woodstove or pellet stove shall comply with U.S. EPA New Source Performance Standards (NSPS) emission limits as applicable, and shall have a permanent label indicating they are certified to meet the emission limits. Woodstoves, pellet stoves and fireplaces shall also comply with applicable local ordinances.

COMMENTARY

PURPOSE

This requirement prevents use of indoor air for either combustion or exhaust of combustion products.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Install a direct-vent gas fireplace.
- Install an “EPA-Certified” pellet stove or wood stove compliant with U.S. Environmental Protection Agency (EPA) New Source Performance Standards (NSPS) emission limits. More information on “EPA-Certified” appliances and emission standards can be found at: <http://www.epa.gov/residential-wood-heaters/final-new-source-performance-standards-residential-wood-heaters>.
- Comply with local ordinance(s) including rules and regulations of a local air district.

Note: To protect our environment and promote public health and safety in California, the state is divided into Air Pollution Control Districts (APCD) and Air Quality Management Districts (AQMDs), which are also called “Air Districts”. There are currently 35 AQMDs or APCDs. These agencies are county or regional governing authorities that have primary responsibility for controlling air pollution from stationary sources. Their rules and regulations may be enforced through the local building department through plan review and permit application. The California Air Resources Board provides further information on the role of local air districts and links to individual districts, searchable district rules, district maps, a directory of key personnel at each district, and the District Rules Log Database showing district rulemaking activity. See sections addressing local air districts at: <https://www.arb.ca.gov/capcoa/roster.htm>.

BACKGROUND

When HCD proposed to adopt fireplace regulations during the 2009 Triennial Code Adoption Cycle, the Green Building Code Advisory Committee suggested that HCD be consistent with requirements found in Title 24, Part 6, the *California Energy Code* (CEC) regarding the use of gas and wood burning devices. CEC requirements for Fireplaces, Decorative Gas Appliances, and Gas Logs specify energy efficiency mandates, but do not address indoor air quality.

HCD requirements do not conflict with or restate CEC requirements. HCD fireplace requirements go beyond Title 24, Part 6, requiring gas fireplaces to be “direct-vent” sealed-combus-

tion type. Direct-vent sealed-combustion gas fireplaces do not have the same potential as traditional gas fireplaces to affect indoor air quality. Traditional gas fireplaces may “backdraft,” allowing products of combustion, including carbon monoxide and other harmful gases and particulate matter into the living environment. Direct-vent sealed-combustion gas fireplaces have a combustion chamber which is completely sealed from the indoor environment and is not susceptible to “backdrafting.” These direct-vent units draw all combustion air from the outside, and exhaust all products of combustion to the outside of a building through either one integral, or two separate pipes, known as either “coaxial” (one pipe within another) or “co-linear” (side-by-side) vent pipes. Direct-vent sealed-combustion gas fireplaces also reduce heat loss by preventing warm air from exiting the home through the vent pipe. Another benefit of the sealed combustion chamber of direct-vent gas fireplaces is that they greatly reduce the chance of embers or sparks entering the home and starting a fire.

Section 4.503.1 does not currently place additional restrictions upon other types of fuel burning fireplaces. Section 4.503.1 references US EPA New Source Performance Standards (NSPS) as guidance. NSPS emission limits are already mandated by the US EPA for woodstoves and pellet stoves. HCD language specifying that woodstoves, pellet stoves and fireplaces shall also comply with applicable local ordinances is helpful guidance to alert the code user that there may be more restrictive local regulations. Local Air Districts are the proper authority to impose additional restrictions and/or prohibitions upon other fuel burning appliances. HCD proposed this additional language because it was deemed beneficial guidance to code officials and code users.

SECTION 4.504 POLLUTANT CONTROL

4.504.1 Covering of duct openings and protection of mechanical equipment during construction. At the time of rough installation, during storage on the construction site and until final startup of the heating, cooling and ventilating equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheetmetal or other methods acceptable to the enforcing agency to reduce the amount of water, dust and debris, which may enter the system.

COMMENTARY

PURPOSE

This section provides protection for duct openings, permanent mechanical equipment and other components which are often used for conditioning and ventilating during construction. Protection would result in reduced recirculation of construction dust, debris and other airborne contaminants upon occupancy, reduce moisture and water intrusion, and increase operating efficiency.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Several methods of protection are acceptable ranging from supply boots to cardboard and duct tape to specially designed rolled sheeting. Protection should have sufficient strength and be securely fastened to provide protection during the timeframe needed.
- Equipment, ducting, and plenums should be protected using a method that is successful during the entire construction process.
- Equipment stored on the construction site for future installation should be wrapped or protected.

- It is recommended that the system not be operated when airborne contaminants are present. However, if the system is operated during construction, then it is recommended that a high efficiency filter such as a MERV 8, suitable for system capacity, be used throughout the construction process and the system be protected after each use. If the system is used prior to final start-up, it is recommended that the entire system, including ductwork, furnace and coil, be thoroughly cleaned and inspected to remove any construction-related particles.
- Consider use of alternate space conditioning systems during construction.

BACKGROUND

Pollutants caused from construction activities are of major concern as they migrate to the duct systems and air-handling units. Both visible and invisible pollutants can greatly affect indoor air quality when distributed throughout the dwelling by a forced air system. Dust, dirt, and airborne particles can substantially reduce the efficiency and operation of coils and compressors. This practice encourages and provides a method of protection to ensure that the long-term mechanical efficiency and occupant health are not adversely affected by construction pollution.

**TABLE 4.504.1
ADHESIVE VOC LIMIT^{1,2}**

Less Water and Less Exempt Compounds in Grams per Liter

ARCHITECTURAL APPLICATIONS	VOC LIMIT
Indoor carpet adhesives	50
Carpet pad adhesives	50
Outdoor carpet adhesives	150
Wood flooring adhesive	100
Rubber floor adhesives	60
Subfloor adhesives	50
Ceramic tile adhesives	65
VCT and asphalt tile adhesives	50
Drywall and panel adhesives	50
Cove base adhesives	50
Multipurpose construction adhesives	70
Structural glazing adhesives	100
Single-ply roof membrane adhesives	250
Other adhesives not specifically listed	50
SPECIALTY APPLICATIONS	
PVC welding	510
CPVC welding	490
ABS welding	325
Plastic cement welding	250
Adhesive primer for plastic	550
Contact adhesive	80
Special purpose contact adhesive	250
Structural wood member adhesive	140
Top and trim adhesive	250
SUBSTRATE SPECIFIC APPLICATIONS	
Metal to metal	30
Plastic foams	50
Porous material (except wood)	50
Wood	30
Fiberglass	80

1. If an adhesive is used to bond dissimilar substrates together, the adhesive with the highest VOC content shall be allowed.
2. For additional information regarding methods to measure the VOC content specified in this table, see South Coast Air Quality Management District Rule 1168.

4.504.2 Finish material pollutant control. Finish materials shall comply with this section.

4.504.2.1 Adhesives, sealants and caulks. Adhesives, sealants and caulks used on the project shall meet the requirements of the following standards unless more stringent local or regional air pollution or air quality management district rules apply:

1. Adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, and caulks shall comply with local or regional air pollution control or air quality management district rules where applicable or SCAQMD Rule 1168 VOC limits, as shown in Table 4.504.1 or 4.504.2, as applicable. Such products also shall comply with the Rule 1168 prohibition on the use of certain toxic compounds (chloroform, ethylene dichloride, methylene chloride, perchloroethylene and trichloroethylene), except for aerosol products, as specified in Subsection 2 below.
2. Aerosol adhesives, and smaller unit sizes of adhesives, and sealant or caulking compounds (in units of product, less packaging, which do not weigh more than 1 pound and do not consist of more than 16 fluid ounces) shall comply with statewide VOC standards and other requirements, including prohibitions on use of certain toxic compounds, of *California Code of Regulations*, Title 17, commencing with Section 94507.

**TABLE 4.504.2
SEALANT VOC LIMIT
Less Water and Less Exempt Compounds in Grams per Liter**

SEALANTS	VOC LIMIT
Architectural	250
Marine deck	760
Nonmembrane roof	300
Roadway	250
Single-ply roof membrane	450
Other	420
SEALANT PRIMERS	
Architectural Nonporous	250
Porous	775
Modified bituminous	500
Marine deck	760
Other	750

COMMENTARY

PURPOSE

This section incorporates the South Coast Air Quality Management District's (SCAQMD's) limits for volatile organic compounds (VOCs) contained in adhesives, sealants and caulks. Compliance with SCAQMD VOC limits or more restrictive local VOC limits will help improve indoor and outdoor air quality.

BACKGROUND

Volatile organic compounds are recognized as one of several factors that can affect indoor air quality and occupant health and comfort. Requiring the use of low-emitting construction materials can greatly help improve indoor air quality. One compliance path with this section is to satisfy the requirements of the SCAQMD's Rule 1168, Adhesive and Sealant Applications:

Purpose and Applicability of Rule 1168 as described by South Coast Air Quality Management District: “The purpose of this rule is to reduce emissions of volatile organic compounds (VOCs) and to eliminate emissions of chloroform, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene from the application of adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, or any other primers. This rule applies to all commercial and industrial sales and applications of adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, or any other primers, unless otherwise specifically exempted by this rule.”

An enforcing agency may require proof of compliance. If so, product manufacturers’ information, Material Safety Data Sheets (MSDS), technical data sheets or compliance letters may be acceptable forms of compliance.

4.504.2.2 Paints and coatings. Architectural paints and coatings shall comply with VOC limits in Table 1 of the ARB Architectural Suggested Control Measure, as shown in Table 4.504.3, unless more stringent local limits apply. The VOC content limit for coatings that do not meet the definitions for the specialty coatings categories listed in Table 4.504.3 shall be determined by classifying the coating as a Flat, Nonflat or Nonflat-high Gloss coating, based on its gloss, as defined in subsections 4.21, 4.36, and 4.37 of the 2007 California Air Resources Board, Suggested Control Measure, and the corresponding Flat, Nonflat or Nonflat-high Gloss VOC limit in Table 4.504.3 shall apply.

4.504.2.3 Aerosol paints and coatings. Aerosol paints and coatings shall meet the Product-Weighted MIR Limits for ROC in Section 94522(a)(2) and other requirements, including prohibitions on use of certain toxic compounds and ozone depleting substances, in Sections 94522(e)(1) and (f)(1) of *California Code of Regulations*, Title 17, commencing with Section 94520; and in areas under the jurisdiction of the Bay Area Air Quality Management District additionally comply with the percent VOC by weight of product limits of Regulation 8, Rule 49.

COMMENTARY

PURPOSE

Section 4.504.2.2 incorporates the California Air Resources Board’s (ARB’s) VOC limits for architectural paints and coatings. Compliance with ARB VOC limits or more restrictive local VOC limits will help improve indoor and outdoor air quality.

BACKGROUND

The requirements of Section 4.504.2.2 apply to the use of paints and coatings as indoor applications and as applied on-site. Coating classification by flat, nonflat or nonflat-high gloss is required to determine the allowable levels of VOC content as established in Table 4.504.3. Verification of product compliance may be required and product manufacturers’ information should be available for enforcement agency review.

4.504.2.4 Verification. Verification of compliance with this section shall be provided at the request of the enforcing agency. Documentation may include, but is not limited to, the following:

1. Manufacturer's product specification.
2. Field verification of on-site product containers.

COMMENTARY

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Provide product specifications and/or data sheets and save product containers, labels, and installation instructions for inspector verification.
- Product specifications should be easily obtainable from product and material suppliers. Make these available at time of inspection.
- Be aware that inspectors can request to field verify that applied products meet the requirements of Section 4.504.2.3. It is suggested that contractors keep available any containers and/or product labels for inspector's verification until such time the inspector deems they are not required.
- A hyperlink to sample forms and worksheets is provided in Chapter 8 of this guide. These forms may be used for documenting VOCs and formaldehyde content in adhesives, paints and coatings, flooring and composite wood products. The forms should be supplemented by product labels, specifications, Material Safety Data Sheets, evidence of certifications, or other means acceptable to the local enforcing agency. The forms are not mandatory and may be modified as needed.

It is suggested to have a method of compliance ready and prepared so inspections are not failed or postponed because compliance materials are not available.

4.504.3 Carpet systems. All carpet installed in the building interior shall meet the testing and product requirements of one of the following:

1. Carpet and Rug Institute's Green Label Plus Program.
2. California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.1, February 2010 (also known as Specification 01350.)
3. NSF/ANSI 140 at the Gold level.
4. Scientific Certifications Systems Indoor Advantage™ Gold.

4.504.3.1 Carpet cushion. All carpet cushion installed in the building interior shall meet the requirements of the Carpet and Rug Institute's Green Label program.

4.504.3.2 Carpet adhesive. All carpet adhesive shall meet the requirements of Table 4.504.1.

TABLE 4.504.3
VOC CONTENT LIMITS FOR ARCHITECTURAL COATINGS ^{2,3}
 Grams of VOC per Liter of Coating,
 Less Water and Less Exempt Compounds

COATING CATEGORY	VOC LIMIT
Flat coatings	50
Nonflat coatings	100
Nonflat-high gloss coatings	150
SPECIALTY COATINGS	
Aluminum roof coatings	400
Basement specialty coatings	400
Bituminous roof coatings	50
Bituminous roof primers	350
Bond breakers	350
Concrete curing compounds	350
Concrete/masonry sealers	100
Driveway sealers	50
Dry fog coatings	150
Faux finishing coatings	350
Fire resistive coatings	350
Floor coatings	100
Form-release compounds	250
Graphic arts coatings (sign paints)	500
High temperature coatings	420
Industrial maintenance coatings	250
Low solids coatings ¹	120
Magnesite cement coatings	450
Mastic texture coatings	100
Metallic pigmented coatings	500
Multicolor coatings	250
Pretreatment wash primers	420
Primers, sealers, and undercoaters	100
Reactive penetrating sealers	350
Recycled coatings	250
Roof coatings	50
Rust preventative coatings	250
Shellacs	
Clear	730
Opaque	550
Specialty primers, sealers, and undercoaters	100
Stains	250
Stone consolidants	450
Swimming pool coatings	340
Traffic marking coatings	100
Tub and tile refinish coatings	420
Waterproofing membranes	250
Wood coatings	275
Wood preservatives	350
Zinc-rich primers	340

1. Grams of VOC per liter of coating, including water and including exempt compounds.
2. The specified limits remain in effect unless revised limits are listed in subsequent columns in the table.
3. Values in this table are derived from those specified by the California Air Resources Board, Architectural Coatings Suggested Control Measure, February 1, 2008. More information is available from the Air Resources Board.

COMMENTARY

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

Builders should be ready to provide verification of compliance with any portion of this section to the enforcing agency. Compliance information is readily available online and should be accessible if required by an enforcing agency.

It is recommended that a method of compliance be ready and prepared so inspections are not failed or postponed because compliance materials are not available.

- Product specifications should be easily obtainable from the manufacturer or product and material suppliers. Make these available at time of inspection.
- Contractors should be aware that field inspectors can request to field verify that applied products meet the requirements of Section 4.504.3. It is suggested that contractors keep available any containers and/or product labels for inspectors' verification until such time the inspector deems they are not required.
- A hyperlink to sample forms and worksheets is provided in Chapter 8 of this guide. These forms may be used for documenting VOCs and formaldehyde content in adhesives, paints and coatings, flooring and composite wood products. The forms should be supplemented by product labels, specifications, Material Safety Data Sheets, evidence of certifications, or other means acceptable to the local enforcing agency. The forms are not mandatory and may be modified as needed.

BACKGROUND

All carpet systems, padding, cushions, and adhesives are required to comply with the VOC requirements set forth by Sections 4.504.3, 4.504.3.1 and 4.504.3.2, and will help reduce indoor emission levels thereby improving the overall indoor air quality. Installed products used are third-party certified and installed in a manner acceptable to the manufacturer's requirements.

4.504.4 Resilient flooring systems. Where resilient flooring is installed, at least 80 percent of floor area receiving resilient flooring shall comply with one or more of the following:

1. Products compliant with the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.1, February 2010 (also known as Specification 01350), certified as a CHPS Low-Emitting Material in the Collaborative for High Performance Schools (CHPS) High Performance Products Database.
2. Products certified under UL GREENGUARD Gold (formerly the Greenguard Children & Schools program).
3. Certification under the Resilient Floor Covering Institute (RFCI) FloorScore program.
4. Meet the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.1, February 2010 (also known as Specification 01350).

COMMENTARY

PURPOSE

This section adopts VOC limits for interior resilient flooring. Compliance with these VOC limits will help improve indoor and outdoor air quality and reduce building occupants' exposure to chemicals that can have adverse effects on human health at higher levels.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- 80 percent or more of the total area of resilient flooring is VOC-emissions compliant.
- Products compliant with the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.1, February 2010 (also known as Specification 01350), certified as a CHPS Low-Emitting Material in the Collaborative for High Performance Schools (CHPS) High Performance Products Database. **Note:** CDPH has released a new version "Version 1.2 January, 2017" which supersedes Version 1.1
- Products certified under UL GREENGUARD Gold (formerly the Greenguard Children & Schools program).
- Flooring certified under RFCI's FloorScore program.
- Products meeting specifications of the California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Version 1.1, February 2010 (also known as Specification 01350). Note: CDPH has released a new version "Version 1.2 January, 2017" which supersedes Version 1.1
- Provide documentation of product certification and compliance.
- A hyperlink to sample forms and worksheets is provided in Chapter 8 of this guide. These forms may be used for documenting VOCs and formaldehyde content in adhesives, paints and coatings, flooring and composite wood products. The forms should be supplemented by product labels, specifications, Material Safety Data Sheets, evidence of certifications, or other means acceptable to the local enforcing agency. The forms are not mandatory and may be modified as needed.

BACKGROUND

Resilient flooring is commonly used in kitchens, bathrooms, entryways, family rooms and in other areas. These systems are commonly made from materials such as cork, vinyl, linoleum and rubber. Resilient flooring provides users a standing surface with "give" or "bounce back." In some instances, the ability for the material to be resistant to stains and microbial contamination makes it a logical choice for use in homes.

Executive Order B-18-12 directed state agencies to implement relevant and feasible voluntary measures in *CALGreen* Divisions A4.5 (residential) and A5.5 (nonresidential) to ensure healthy indoor environments for building occupants. The 2010 *CALGreen* required 50 percent of installed resilient flooring meet the specified emission limits for volatile organic compounds (VOCs). The 2013 *CALGreen* increased the mandatory and voluntary percentage of resilient flooring. The 80-percent 2010 Tier 1 level requirement became mandatory in the 2013 *CALGreen* and the 2013

Tier 1 requirement became 90 percent, which previously was the 2010 Tier 2 requirement. The 2013 Tier 2 requirement was increased to 100 percent with an exception for 5 percent specialty flooring.

The 2013 *CALGreen* supplement effective July 1, 2015, included the following changes:

- Clarification of the criteria used by the Collaborative for High Performance Schools (CHPS) as the California Department of Public Health’s “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers,” Version 1.1, February 2010 (also known as Specification 01350). **Note:** CDPH has released a new version “Version 1.2 January, 2017” which supersedes Version 1.1
- A name change from GREENGUARD Children & Schools program to UL GREENGUARD Gold. This is a name change only that occurred in early 2013; however, the standards on which certification is based remain the same. (The GREENGUARD Gold Certified products also must comply with the California Department of Public Health’s “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers,” Version 1.1, February 2010 (also known as Specification 01350). According to UL, manufacturers have 3 years to comply with the change. **Note:** CDPH has released a new version “Version 1.2 January, 2017” which supersedes Version 1.1

4.504.5 Composite wood products. Hardwood plywood, particleboard and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB’s Air Toxics Control Measure for Composite Wood (17 CCR 93120 et seq.), by or before the dates specified in those sections, as shown in Table 4.504.5.

**TABLE 4.504.5
FORMALDEHYDE LIMITS¹
Maximum Formaldehyde Emissions in Parts per Million**

PRODUCT	CURRENT LIMIT
Hardwood plywood veneer core	0.05
Hardwood plywood composite core	0.05
Particleboard	0.09
Medium density fiberboard	0.11
Thin medium density fiberboard ²	0.13

1. Values in this table are derived from those specified by the California Air Resources Board, Air Toxics Control Measure for Composite Wood as tested in accordance with ASTM E1333. For additional information, see California Code of Regulations, Title 17, Sections 93120 through 93120.12.
2. Thin medium density fiberboard has a maximum thickness of 5/16” (8 millimeters).

COMMENTARY

PURPOSE

Compliance with these VOC limits will help improve air quality and reduce health risks. This section adopts formaldehyde emission limits for certain composite wood products as specified in ARB’s Air Toxics Control Measure for Composite Wood.

BACKGROUND

The following information is from CARB's website on Composite Wood Products Airborne Toxics Control Measure (ATCM) regarding formaldehyde.

One major use includes the production of wood binding adhesives and resins. The California Air Resources Board (CARB) evaluated formaldehyde exposure in California and found that one of the major sources of exposure is from inhalation of formaldehyde emitted from composite wood products containing urea-formaldehyde resins. The International Agency for Research on Cancer (IARC) reclassified formaldehyde from "probably carcinogenic to humans" to "carcinogenic to humans" in 2004, based on the increased risk of nasopharyngeal cancer. Formaldehyde was also designated as a toxic air contaminant (TAC) in California in 1992 with no safe level of exposure. State law requires CARB to take action to reduce human exposure to all TACs.

Many products are available to meet the limits specified in Table 4.504.5. Table 4.504.5 was updated for the 2013 *CALGreen* since the 2012 "early" compliance dates had already occurred during the effective period of the 2010 *CALGreen*.

For more information on ARB's Composite Wood Products ATCM, please see ARB's website at <http://www.arb.ca.gov/toxics/compwood/compwood.htm>.

4.504.5.1 Documentation. Verification of compliance with this section shall be provided as requested by the enforcing agency. Documentation shall include at least one of the following:

1. Product certifications and specifications.
2. Chain of custody certifications.
3. Product labeled and invoiced as meeting the Composite Wood Products regulation (see CCR, Title 17, Section 93120, *et seq.*).
4. Exterior grade products marked as meeting the PS-1 or PS-2 standards of the Engineered Wood Association, the Australian AS/NZS 2269, European 636 3S and Canadian CSA O121, CSA O151, CSA O153 and CSA O325 standards.
5. Other methods acceptable to the enforcing agency.

COMMENTARY

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

Provide verification of compliance with any portion of this section to the enforcing agency. It is recommended to have methods of compliance ready and prepared so inspections are not failed because compliance materials are not available.

- Product specifications should be easily obtainable from the product and material suppliers. Make these available at time of inspection. Products that are compliant with ARB's regulation are required to be labeled and invoiced as such per Title 17, CCR, Section 93120.2.
- Be aware that field inspectors can request to field verify that products meet the requirements of Section 4.504.5. It is recommended to keep available any packaging and/or product labels for inspector verification until such time the inspector deems they are not required.
- A hyperlink to sample forms and worksheets is provided in Chapter 8 of this guide. These

forms may be used for documenting VOCs and formaldehyde content in adhesives, paints and coatings, flooring and composite wood products used in the structure. These forms should be supplemented by product labels, specifications, Material Safety Data Sheets, evidence of certifications, or other means acceptable to the local enforcing agency. These forms are samples and may be modified by the user as needed.

- Chain of custody certifications.
- Other methods acceptable to the enforcing agency.

BACKGROUND

Chain of Custody: Refers to the chronological documentation or paper trail, showing the receipt, custody, control, transfer, analysis, and disposition of the product or materials from manufacture to sale.

SECTION 4.505 INTERIOR MOISTURE CONTROL

4.505.2 Concrete slab foundations. Concrete slab foundations required to have a vapor retarder by the *California Building Code*, Chapter 19 or concrete slab-on-ground floors required to have a vapor retarder by the *California Residential Code*, Chapter 5, shall also comply with this section.

4.505.2.1 Capillary break. A capillary break shall be installed in compliance with at least one of the following:

1. A 4-inch-thick (101.6 mm) base of $\frac{1}{2}$ inch (12.7 mm) or larger clean aggregate shall be provided with a vapor retarder in direct contact with concrete and a concrete mix design, which will address bleeding, shrinkage, and curling, shall be used. For additional information, see American Concrete Institute, ACI 302.2R-06.
2. Other equivalent methods approved by the enforcing agency.
3. A slab design specified by a licensed design professional.

COMMENTARY

PURPOSE

These provisions reduce movement of moisture into the slab as well as into the building.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Follow prescriptive requirements in this section.
- Use appropriate concrete mix design and cure periods for the area.
- Obtain approval from the enforcing agency for an alternate design.
- Use the design specified by a licensed California architect or engineer.

BACKGROUND

Concrete is frequently subject to cracks due to shifting or settling of substrate, uneven stresses, or exposure to temperature extremes or chemical or biological processes. Therefore, vapor retarders

are commonly being used in both residential and commercial applications to retard moisture migration from beneath the slab. When selecting a vapor retarder several important physical properties should be considered, such as a low moisture vapor transmission rate, high tensile strength, high puncture resistance, and resistance to chemical or environmental attacks. Vapor retarders can be located and purchased in several thicknesses; consult an engineer to determine which product is best for your application. Both the *California Building Code* and *California Residential Code* reference a minimum 6-mil thickness vapor retarder for vapor retardant purposes.

Moisture penetrating the building envelope is a major concern which can affect indoor air quality. Installing an underslab vapor retarder, or foundation wall damp proofing or water barrier, provides a method to address the growing concern of water intrusion through the slab and foundation walls. A capillary break will provide a discontinuity which prevents water wicking from the ground and being absorbed and transmitted through the concrete slab and foundation. This section mandates the installation of a vapor retarder in all concrete slabs as part of a capillary break. The retarder must be placed in direct contact with the slab thereby separating the aggregate layer from the concrete. The vapor retarder must be overlapped by a recommended 6 inches to ensure continuity and taped with a water resistive tape product.

CALGreen Section 4.505.2 specifically references concrete slab foundations required to have vapor retarders pursuant to the *California Building Code* or *California Residential Code*.

Although not required, additional information on installation and selection of vapor retarders is available in the American Concrete Institute's publication "Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials," ACI 302.2R-06 and ASTM International "Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs," ASTM Standard E1643 11.

4.505.3 Moisture content of building materials. Building materials with visible signs of water damage shall not be installed. Wall and floor framing shall not be enclosed when the framing members exceed 19-percent moisture content. Moisture content shall be verified in compliance with the following:

1. Moisture content shall be determined with either a probe-type or a contact-type moisture meter. Equivalent moisture verification methods may be approved by the enforcing agency and shall satisfy requirements found in Section 101.8 of this code.
2. Moisture readings shall be taken at a point 2 feet (610 mm) to 4 feet (1219 mm) from the grade stamped end of each piece to be verified.
3. At least three random moisture readings shall be performed on wall and floor framing with documentation acceptable to the enforcing agency provided at the time of approval to enclose the wall and floor framing.

Insulation products which are visibly wet or have a high moisture content shall be replaced or allowed to dry prior to enclosure in wall or floor cavities. Wet-applied insulation products shall follow the manufacturers' drying recommendations prior to enclosure.

COMMENTARY

PURPOSE

The purpose of this section is to provide additional safeguards against growth of mold or other biological growth in moist enclosed areas. This section requires field verification of moisture content and prevents enclosure of wood framing members exceeding 19-percent moisture content. This section also prevents the enclosure and use of wet or moist insulation products.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Cover building materials to protect from rain and moisture.
- Ensure building is weather tight before insulating.
- Use other precautions necessary to ensure building materials are kept dry.
- Test for moisture levels of building materials.
- Moisture sensors are available for purchase and range from \$80 to \$200.
- To comply with the requirements of this section, moisture readings must be properly taken and recorded and made available for review by the enforcing agency. The code also allows equivalent methods of moisture verification as allowed by the local enforcing agency.

BACKGROUND

Wood frame construction is the most commonly used type of building construction for single-family and multifamily homes today. Freshly milled wood framing members often display moisture content levels of 30 percent or higher. Lumber installed with moisture content of this percentage, especially when enclosed by siding and drywall and prevented from adequately drying, could lead to mold growth and have a negative effect on building and occupant health.

Commonly used by building inspectors as criterion for serviceability and performance of wood products; the maximum allowable moisture content of 19 percent is the performance threshold for air-dried lumber for many building codes. Section 4.505.3 details the requirements and methods to ensure that the supplied building materials are safe for installation. According to the USDA, the objective of drying lumber to 20 percent or less serves to: reduce the opportunity for wood-destroying fungi to grow, prevents blue stain, and protects against damage from wood boring insects. For more information, see the USDA Forest Service Technical Report FPL-GTR-117, "Air Drying of Lumber," located at: <https://www.fs.usda.gov/treearch/pubs/5730>

SECTION 4.506 INDOOR AIR QUALITY AND EXHAUST

4.506.1 Bathroom exhaust fans. Each bathroom shall be mechanically ventilated and shall comply with the following:

1. Fans shall be ENERGY STAR compliant and be ducted to terminate outside the building.
2. Unless functioning as a component of a whole house ventilation system, fans must be controlled by a humidity control.
 - a. Humidity controls shall be capable of adjustment between a relative humidity range of ≤ 50 percent to a maximum of 80 percent. A humidity control may utilize manual or automatic means of adjustment.
 - b. A humidity control may be a separate component to the exhaust fan and is not required to be integral (i.e., built-in).

Notes:

1. For the purposes of this section, a bathroom is a room which contains a bathtub, shower, or tub/shower combination.

2. Lighting integral to bathroom exhaust fans shall comply with the *California Energy Code*.

COMMENTARY

PURPOSE

The functions of a bathroom exhaust fan are to exhaust odors and excess humidity. This mandatory measure is intended to reduce moisture inside the residence through use of bathroom exhaust fans controlled by humidity sensing devices.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Install ENERGY STAR fans with humidity controls in each bathroom. Humidity controls for exhaust fans may be integrated in (built-in) or external to the exhaust fan units. Manual or automatic controls capable of adjusting for relative humidity of less than 50 percent are acceptable. The maximum relative humidity setting allowed is 80 percent.
- Install a fan in compliance with ASHRAE 62.2 “Ventilation and Acceptable Indoor Air Quality in Residential Buildings” and Title 24, Part 6, in the bathroom that is a part of a whole house ventilation system.

BACKGROUND

Excess moisture in the interior areas of buildings can lead to condensation, which promotes the growth of mold and may cause structural problems such as dry rot, warping of wood, etc.

Humidistats are sensors detecting the amount of moisture in the air. Humidistats can also be used as controllers to switch fans on or off when moisture levels exceed a designated range. Humidity control devices allow the humidity settings to be adjustable from 20- to 80-percent relative humidity and may be an integral component of the fan or may be external to the fan. Humidity controls ensure that bathroom exhaust fans continue to run until moisture levels in the bathroom fall to desired levels depending on local conditions and personal comfort levels. Often this may be more than 20 minutes after the bathroom is vacated.

ENERGY STAR states that “Qualified ventilation fans use 70 percent less energy than standard models. These fans provide better efficiency and comfort with less noise, and use high performance motors that work better and last longer than motors used in conventional models. They feature high-performance motors and improved blade design, providing better performance and longer life.”

SECTION 4.507 ENVIRONMENTAL COMFORT

4.507.2 Heating and air-conditioning system design. Heating and air-conditioning systems shall be sized, designed and have their equipment selected using the following methods:

1. The heat loss and heat gain is established according to ANSI/ACCA 2 Manual J—2016 (*Residential Load Calculation*), ASHRAE handbooks or other equivalent design software or methods.

2. Duct systems are sized according to ANSI/ACCA 1 Manual D—2016 (*Residential Duct Systems*), ASHRAE handbooks or other equivalent design software or methods.
3. Select heating and cooling equipment according to ANSI/ACCA 3 Manual S—2014 (*Residential Equipment Selection*) or other equivalent design software or methods.

Exception: Use of alternate design temperatures necessary to ensure the systems function are acceptable.

COMMENTARY

PURPOSE

Section 405.7.2 requires HVAC systems to be appropriately sized to the heating and cooling loads (heat gain/heat loss) of the structure. This section also provides an exception to allow use of appropriate design temperatures reflecting design needs of buildings instead of broad-based climate information.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Heat loss and heat gain calculations using software (available on the Internet) or hand calculations or an equivalent.
- Duct system design to ensure adequate airflow is provided to address the heat loss and gain in each area of the home.
- Select equipment which will provide the necessary airflow and level of conditioning to satisfy the loads, and function within both the duct design criteria and the equipment limitations.
- The referenced Air Conditioning Contractors of America (ACCA) manuals are available from:
 - Air Conditioning Contractors of America
 - 2800 Shirlington Road, Suite 300
 - Arlington, VA 22206
 - www.acca.org
- Use of design temperatures consistent with the California Energy Commission's 2019 Reference Appendices for the 2019 Building Energy Efficiency Standards or a successor document.

BACKGROUND

The ACCA technical manuals include procedures and calculations used by designers, installers and technicians with the objective of creating heating, ventilation, air conditioning and refrigeration systems that meet code requirements and ensure customer comfort.

ANSI/ACCA 2 Manual J, Residential Load Calculation: Produces equipment sizing loads for single-family-detached homes, small multiunit structures, condominiums, townhouses and manufactured homes.

ANSI/ACCA 1 Manual D, Residential Duct Systems: This is a comprehensive guide outlining the methods and procedures used to design residential duct systems.

ANSI/ACCA 3 Manual S, Residential Equipment Selection: Shows how to select and size heating and cooling equipment to meet Manual J loads based on local climate and ambient conditions at the building site.

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) handbooks consist of a series of four volumes titled HVAC Applications, Refrigeration, Fundamentals, and HVAC Systems and Equipment. The handbooks are available from the ASHRAE Bookstore at www.techstreet.com.

Frequently Asked Questions

Q: Does *CALGreen* restrict wood burning masonry fireplaces? What about other types of wood burning fireplaces such as factory-built fireplaces?

A: No. Wood burning fireplaces whether site-built masonry or factory-built are not restricted or prohibited by HCD. Any restriction in their use would emanate through a local air district. Structural requirements, clearances, etc., for fireplaces installed in residential buildings are found in Title 24, Part 2, the *California Building Code*, and Title 24, Part 2.5, the *California Residential Code*. Title 24, Part 6, the *California Energy Code*, also maintains minimum requirements that relate to energy efficiency.

Q: If *CALGreen* allows a certain type of fireplace or wood burning appliance to be used, can it be installed even though the local regulations may prohibit or restrict use of the fireplaces?

A: No. If a legally adopted local regulation prohibits the installation and use of wood burning fireplaces, woodstoves, or other appliances due to air quality or other sufficiently related concern, then *CALGreen* cannot reduce or waive those local rules.

Q: *CALGreen* Section 4.504.1 requires covering and protection of duct opening and mechanical equipment until “final startup.” What does “final startup” mean and can the equipment be used for drying during drywall installation or painting?

A: The purpose of Section 4.504.1 is to ensure that heating, ventilating and air-conditioning systems and related equipment be protected from contamination and damage until they are ready for use on a regular basis for its designed purposes. Temporary uses (early start-up) of a building’s permanent heating, ventilation and air-conditioning (HVAC) systems for purposes of heat out (bake out), cooling during construction, or for drying wet surfaces is not an appropriate use. These types of uses may exceed design specifications for the equipment and introduce construction dust, mold and other related airborne contaminants into the HVAC system which may not be easily removed. This may lead to inefficiency of the system, subsequent air quality problems, and possible voiding of equipment warranties. Temporary heating and moisture removal equipment that can be directed to the exact locations where needed is also more energy efficient than using a building-wide system on a continuous basis at full capacity.

Q: Do the volatile organic compounds (VOCs) in *CALGreen* apply to the exterior of a low-rise residential building?

A: Not in all cases. Specific *CALGreen* sections addressing exterior VOC requirements are noted below.

Section 4.504.2. Finish material pollutant control. *CALGreen* VOC limits apply to interior and exterior conditions. As noted in Tables 4.504.1, 4.504.2 and 4.504.3, some

applications are specifically identified as “indoor” or “outdoor”; other applications (e.g., Structural Glazing Adhesives) are defined within the referenced Rule 1168 as used for adherence to exterior building frames; other specified applications can be used for both interior and exterior purposes.

Section 4.504.5. Composite wood products. This section addresses formaldehyde (a type of VOC) in hardwood plywood, particleboard and medium density fiberboard composite wood products used for either interior or exterior purposes. Limits for formaldehyde are specified in Table 4.504.5.

Q: What is the difference between a vapor retarder and a vapor barrier? What is the importance of a capillary break?

A: Concrete under-slab vapor retarders are designed to intercept and block moisture vapor before it can reach the slab. They are always installed below the slab on top of the capillary break. This positioning is critical, as no concrete top coat can protect slabs from moisture migrating from beneath the concrete. The terms “vapor retarder,” “vapor barrier,” and “moisture barrier” are often used interchangeably; however, there are differences.

The *California Building Code* provides the definition for “Vapor retarder class” as follows (a similar definition is included in the *California Residential Code*):

A measure of a material or assembly’s ability to limit the amount of moisture that passes through that material or assembly. Vapor retarder class shall be defined using the desiccant method with Procedure A of ASTM E96 as follows:

Class I:	0.1 perm or less.
Class II:	0.1 < perm ≤ 1.0 perm.
Class III:	1.0 < perm ≤ 10 perm.

CALGreen defines “vapor barrier” as follows:

Material that has a permeance of one perm or less and that provides resistance to the transmission of water vapor.

A “capillary break” as used in this section provides a separation by which capillary action in the soil or rock is disrupted. “Capillary action” is generally defined by the U. S. Geological Survey as the movement of water within the spaces of a porous material due to the forces of adhesion, cohesion, and surface tension.

Q: *CALGreen* includes requirements for mechanical ventilation for bathrooms. Does *CALGreen* require exhaust fans for each bathroom?

A: Yes. Section 4.506 requires each bathroom to be mechanically ventilated. However, exhaust fans are not required to be within each bathroom; a bathroom can be ventilated by a whole house ventilation system, or by remote fans provided the ventilation fan can be controlled by humidity controls or sensors.

Q: The code states “Building materials with visible signs of water damage shall not be installed.” What is the definition of “Visible signs”?

A: “Visible signs” of water damage means an obvious presence of water damage or decay, which would affect the structural integrity of the dwelling. Discoloration, by itself, does not constitute “water damage.” However, warping, splitting or softness due to decay can be considered “visible signs of water damage” if it is present to the extent that it would affect the structural integrity of the framing members.

Q: What does “enclosed” mean?

A: “Enclosed” is not defined in *CALGreen*. As used in Section 4.505.3, “enclosed” refers to enclosure or covering of the framing lumber with drywall, flooring, etc. Enclosure occurs when both sides of a framing member are covered. Enclosing wall or floor framing members exceeding 19-percent moisture content would reduce air circulation and impede or prolong the drying of green lumber. Moisture content in excess of 19 percent can provide conditions conducive to mold growth and create reduced performance variations in framing lumber. Enclosed typically means the covering of the framing with drywall and occurs when both sides of a framing member are covered. Lathing, flooring sheathing, roof sheathing, shear panel or siding that is installed on one side during framing is not considered “enclosed” framing under this section.

Q: Does Section 4.505.3 require the use of “kiln dried” lumber?

A: No. This section does not specify the lumber grade and allows the use of “green” lumber. The only requirement is that the moisture content of the lumber is verified to be at or below 19 percent prior to enclosure.

Q: Is the use of “green lumber” allowed under HCD’s green building standards?

A: Yes. The moisture reading is not taken at time of initial framing construction. Section 4.505.3 only requires the reading to be taken prior to the wall or floor cavity being enclosed.

Q: Who is required to complete and document the moisture testing?

A: The code does not specify who does the testing. It can be done by the builder, trade contractor, building inspector or a third party prior to enclosing the wall and floor cavity. The testing can be documented by using an inspection checklist or other means acceptable to the local jurisdiction to indicate that the testing was successfully completed. Methods of verification could vary from jurisdiction to jurisdiction as approved by the enforcing agency pursuant to Section 101.8 of *CALGreen*.

Q: Does every piece of installed lumber need to be verified for moisture content?

A: No. Each piece of lumber does not need to be verified for moisture content. Section 4.505.3 specifically states, “**At least three random moisture readings shall be performed on wall and floor framing ...**” This means that if the three random readings are at or below 19 percent, the walls and floors can be enclosed.

Q: At what phase of the construction schedule should the moisture readings be taken?

A: It is the intent of Section 4.505.3 that the moisture readings are to be taken just prior to the enclosure of the interior wall and floor cavities. This will typically occur during the frame inspection prior to approval to insulate. At this stage, the exterior side of the dwelling envelope is covered, floor sheathing, roof sheathing, and shear walls may have been installed and the building is ready for sheetrock. The measurement must be taken prior to enclosure of the interior side of the dwelling envelope.

Q: During the winter months, a project may be subjected to a substantial amount of rainfall. Are subsequent moisture readings allowed under the requirements of Section 4.505.3?

A: Yes. At the time of frame inspection, the building envelope should be weather tight. In the case of severe rainstorms, entire job sites will experience delays affecting grading operations, concrete installation, framing, stucco, painting, roof, and framing. Projects, which have not taken appropriate measures to ensure the framing lumber is protected from the weather during storage or for a sufficient time prior to testing, may need additional time to allow the framing members to reach 19 percent. Enclosure of the interior of the dwelling wall and floor may not commence until a passing test showing moisture readings at or below 19 percent has been verified.

Q: If lumber gets wet and stained, can it be installed and then allowed to dry?

A: Yes. Section 4.505.3 requires that the moisture level prior to enclosure be 19 percent or less.

Q: If rainy weather sets in and the structure is ready for its framing inspection, and a moisture reading is received that exceeds 19 percent, how long must the subcontractor wait before getting another inspection?

A: The time will vary based on location, air circulation and the administrative procedures of the particular jurisdiction. There is no requirement in Section 4.505.3 to wait a certain period of time to retest for moisture content.

Q: Is it a requirement to cover stored material while it is on-site prior to installation?

A: No. Covering of stored lumber is not required unless the local jurisdiction has adopted the “Tier 2” requirements.

Q: Does the requirement for 19-percent maximum moisture content of building materials (Section 4.505.3) apply to preservative-treated wood and fire-retardant treated wood?

A: Yes. In general, as per the manufacturers’ specifications, the moisture content for treated lumber is high—over 35 percent (sometimes as high as 75 percent), and the wood is still wet when it arrives at the job site. However, both *CALGreen* and the *California Building Code* (CBC) do not make distinctions between regular lumber and preservative-treated lumber. Pursuant to 2019 CBC (Section 2303.1.9.2), where preservative-treated wood is used in enclosed locations where drying in service cannot readily occur, such wood shall be at a moisture content of 19 percent or less before being covered with insulation, interior wall finish, floor covering or other

materials. One way to comply with this requirement is by using kiln-dried after treatment (KDAT) material with moisture content of 19 percent or less. Another option is to air-dry the treated lumber on the job site (or in the lumberyard). This process will take time depending on the type of weather and the extent to which the lumber is exposed. The requirement for fire-retardant treated wood is the same; for interior application, it shall be dried to a moisture content of 19 percent or less for lumber, and 15 percent or less for wood structural panels before use.

Q: Do local jurisdictions have the authority to require moisture control building standards more stringent than those adopted by the HCD?

A: Yes. *Health and Safety Code* Section 17958.7 indicates that local jurisdictions have the authority to adopt building standards, including green building standards, which are more stringent than those contained in the state building code. However, this statute also requires the local jurisdiction to make a finding that such a change is needed based upon local climatic, geological or topographical conditions. The local modification (and finding) must be adopted via open public proceedings. The local amendment cannot take effect until both the ordinance and finding of local conditions have been duly filed with the BSC.

Q: Can an enforcing agency eliminate the need for a moisture meter testing of the lumber?

A: An enforcing agency may modify the requirements if it is reasonably necessary due to climatic, geological or topographical conditions. Any amendments made by the enforcing agency must include findings, be approved through a public process, and be filed with the BSC.

Q: Why did the HCD choose 19 percent for the maximum allowed moisture content of building materials?

A: After much stakeholder input and research, HCD has cited many references supporting the adoption of 19-percent maximum allowable moisture content:

Source #1: National Association of Homebuilders Model GREEN Home Building Guidelines, Section 5 (Page 147):

Section 5.3.8 Check moisture content of wood before enclosing on both sides. Because wood's ability to dry is compromised when it is not subject to free airflow, moisture content should be acceptable before the wood is enclosed in a wall or floor joist cavity. Reduce the risk of shrinkage and mold on lumber by ensuring the moisture content of dimensional lumber is below 19 percent before enclosing.

Source #2: 2008 National Green Building Standard Commentary, Indoor Environmental Quality (Page 159):

*Section 903.4 Moisture Control Measures.
The moisture content of lumber is sampled to ensure it does not exceed 19 percent prior to the surface/wall cavity being enclosed.*

Source #3: American Softwood Lumber Standards, Doc PS 20, June 2010 (Page 2): Section 2.7 Dry Lumber.

Lumber of less than nominal 5-inch thickness which has been seasoned or dried to a maximum moisture content of 19 percent.

Source #4: A California Builder's Guide to Reducing Mold Risk, Construction (Page 40):

Section 4 Measure moisture in wood framing before "rocking walls." To avoid mold growth in gypsum board caused by wet framing lumber, it would be prudent to make sure the maximum moisture content of the framing is below 19 percent before the wall board is placed in the home.

Source #5: Indoor airPLUS, Construction Specifications (Page 3):

Section 1.13 Do not install building materials that have visible signs of water damage or mold. In addition, interior walls shall not be enclosed (e.g., with drywall) if either the framing members or insulation has a high moisture content. For wet applied insulation, follow the manufacturer's drying recommendations.

Advisory: Lumber should not exceed 19-percent moisture content.

Q: Why was the requirement for insulated louvers or covers for whole house fan openings removed?

A: The requirements in the 2013 *CALGreen*, Section 4.507.1 were removed (repealed) in light of the California Energy Commission's (CEC's) requirement for installation of whole house fans as a prescriptive requirement for energy efficiency. However, the CEC's analysis of cost versus benefit in requiring insulated covers, louvers, etc., and corresponding energy savings did not justify the associated costs. Therefore, the CEC recommended deletion of this measure from *CALGreen*. Insulated louvers or covers may still be used for purposes of energy efficiency or a local enforcing agency may include these provisions as a local requirement.



CHAPTER 5 NONRESIDENTIAL MANDATORY MEASURES



Note: The 2019 *CALGreen* Chapter 5 “Nonresidential Mandatory Measures,” effective January 1, 2020, is divided into six separate divisions and contains measures adopted by the California Building Standards Commission *CALGreen* (BSC-CG) and the Division of the State Architect–Structural Safety (DSA-SS). *CALGreen* Chapter 5 primarily addresses green building standards for nonresidential structures and is not discussed in this guide. An exception is the reference to energy requirements for high-rise residential, hotels and motels which are considered “nonresidential” buildings in the *California Energy Code*. This residential section is briefly discussed in this chapter of the guide.

For additional information on *CALGreen* Chapter 5, see “Guide to the (Nonresidential) California Green Building Standards Code,” prepared by the BSC. (www.dgs.ca.gov/bsc)

Division 5.2 – ENERGY EFFICIENCY

SECTION 5.201 GENERAL

5.201.1 Scope. California Energy Code. For the purposes of mandatory energy efficiency standards in this code, the California Energy Commission will continue to adopt mandatory building standards.

COMMENTARY

PURPOSE

This section clarifies the California Energy Commission (CEC) as the ongoing authority for adopting statewide energy mandates for nonresidential buildings which, for energy purposes, are grouped with high-rise residential and hotel/motel buildings.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Prescriptive method
- Performance method

BACKGROUND

The CEC is the state's primary energy policy and planning agency. As such, the CEC adopts regulations to establish the minimum level of energy efficiency a heated or cooled structure must meet or exceed.

For this section, designers should refer to CEC's latest minimum energy standards applicable to all structures, and specifically for new construction and additions/alterations for low-rise residential, high-rise residential and hotel/motel buildings. The proper integration of the mandatory requirements as well as the voluntary requirements is important to long-term building performance, reduced energy costs, and assurance of good occupant indoor air quality, comfort, safety and durability.

In addition, energy efficient design contributes to reduced greenhouse gas emissions. The California Air Resources Board anticipates a related reduction of greenhouse gas emissions as new residential structures meet and exceed minimum California Energy Code requirements.

California's Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24, Part 6, of the California Code of Regulations) is available online at <http://www.energy.ca.gov/title24/2019standards/>. The CEC's website also provides links to information such as detailed California Climate Zone Maps, appliance efficiency standards, and other information related to implementation and enforcement of the California Energy Code.

Contact the CEC regarding questions about Title 24 at:

E-mail: title24@energy.ca.gov

Phone: (916) 654-5106; or 1-800-772-3300 (toll free in California)



CHAPTER 6 REFERENCED ORGANIZATIONS AND STANDARDS



CALGreen includes references to standards that are used to regulate materials and methods of construction. This chapter of *CALGreen* provides a reference to various organizations and standards that are noted in *CALGreen* provisions and cross references *CALGreen* section(s) where the standard is noted or referenced.

As noted in the 2019 *CALGreen* Section 101.5, referenced codes and standards are “considered part of the requirements of this code to the prescribed extent of each such reference.” Similar to other building standards codes, if only a reference to a standard is included, but not the complete text of the standard, it may be necessary to access the original standard to clarify code requirements, test methodology, or further details.

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CHAPTER 7 INSTALLER AND SPECIAL INSPECTOR QUALIFICATIONS FOR RESIDENTIAL PROJECTS



SECTION 702 QUALIFICATIONS

702.1 Installer training. HVAC system installers shall be trained and certified in the proper installation of HVAC systems, including ducts and equipment by a nationally or regionally recognized training or certification program. Uncertified persons may perform HVAC installations when under the direct supervision and responsibility of a person trained and certified to install HVAC systems or contractor licensed to install HVAC systems. Examples of acceptable HVAC training and certification programs include but are not limited to the following:

1. State certified apprenticeship programs.
2. Public utility training programs.
3. Training programs sponsored by trade, labor or state-wide energy consulting or verification organizations.
4. Programs sponsored by manufacturing organizations.
5. Other programs acceptable to the enforcing agency.

COMMENTARY

PURPOSE

This section establishes minimum requirements for HVAC installers by requiring appropriate training or supervision. This training/certification list is not a complete list so additional training or certification programs may be appropriate if acceptable to the enforcing agency.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Certification or training as an HVAC systems installer through a program acceptable to the enforcing agency.
- Work is performed under the direct supervision of a person with acceptable training.
- See other appropriate installer qualifications in Section 702.1.

BACKGROUND

The proper installation of HVAC (heating, ventilating and air-conditioning) systems is important to maximize performance and reduce costs related to improper function and needed repairs. HCD received comments during development of *CALGreen* that installation of HVAC systems is, in some instances, problematic and not at an acceptable level. In addition, a need was expressed for the types of training that would ensure qualified installers.

702.2 Special inspection [HCD]. When required by the enforcing agency, the owner or the responsible entity acting as the owner's agent shall employ one or more special inspectors to provide inspection or other duties necessary to substantiate compliance with this code. Special inspectors shall demonstrate competence to the satisfaction of the enforcing agency for the particular type of inspection or task to be performed. In addition to other certifications or qualifications acceptable to the enforcing agency, the following certifications or education may be considered by the enforcing agency when evaluating the qualifications of a special inspector:

1. Certification by a national or regional green building program or standard publisher.
2. Certification by a statewide energy consulting or verification organization, such as HERS raters, building performance contractors, and home energy auditors.
3. Successful completion of a third party apprentice training program in the appropriate trade.
4. Other programs acceptable to the enforcing agency.

Notes:

1. Special inspectors shall be independent entities with no financial interest in the materials or the project they are inspecting for compliance with this code.
2. HERS raters are special inspectors certified by the California Energy Commission (CEC) to rate homes in California according to the Home Energy Rating System (HERS).

COMMENTARY

PURPOSE

Inspection and verification of installations are necessary to implement the intent of *CALGreen*. This section was developed to establish minimum requirements for third-party special inspectors acting on behalf of the enforcing agency. This section requires appropriate training, education or completion of other programs acceptable to the enforcing agency.

The Building Energy Efficiency Standards requires acceptance testing for a wide range of installations including insulation, lighting controls and mechanical systems. As of July 1, 2014, acceptance testing for lighting controls must be performed by a certified lighting controls acceptance test technician. Mechanical acceptance tests may be completed by the field technician until the mechanical threshold requirement has been satisfied. There needs to be at least 300 certified mechanical acceptance test technicians to conduct acceptance testing. (For more information on acceptance testing see <https://www.energy.ca.gov/title24/attcp/>).

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Demonstrate competence to the enforcing agency in the discipline being inspected.
- Special inspectors cannot have any financial interest in the project.

BACKGROUND

HCD received comments during development of *CALGreen* that inspection quality is, in some instances, problematic and not at an acceptable level. Stakeholders also expressed a need for guidance on types of training acceptable for special inspectors.

SECTION 703 VERIFICATIONS

703.1 Documentation. Documentation used to show compliance with this code shall include but is not limited to, construction documents, plans, specifications, builder or installer certification, inspection reports, or other methods acceptable to the enforcing agency which demonstrate substantial conformance. When specific documentation or special inspection is necessary to verify compliance, that method of compliance will be specified in the appropriate section or identified in the application checklist.

COMMENTARY

PURPOSE

This section provides a list of documents or methods suitable for showing compliance.

The 2019 edition of the *California Building Code* (portions of Section 107 Submittal Documents) and *California Residential Code* (portions of Section R106 Construction Documents) include model code provisions addressing documents submitted for construction projects. These adoptions provide consistency between *CALGreen* and other building standards codes.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Documentation as identified in this section and other methods acceptable to the enforcing agency.
- Use of the sample form, “Installation Certificate (*CALGreen*-RMM-1)” prepared by HCD may be used by enforcing agencies for documenting verification or certification of mandatory *CALGreen* requirements. A hyperlink to this form is in Chapter 8, “Compliance Forms and Worksheets.”
- Use of the sample pollutant control forms prepared by HCD may be used by enforcing agencies for verifying VOC in finish materials. A hyperlink to these forms is in Chapter 8, “Compliance Forms, Worksheets and Reference Material.”

BACKGROUND

Stakeholders expressed needs for enforcing agency guidance on methods that may demonstrate compliance with this code.

Frequently Asked Questions

Q: *CALGreen* Section 702.2, entitled “Special Inspection,” includes language reading “When required by the enforcing agency ...” Does this mean that special inspection is optional by the enforcing agency?

A: Verification and use of third-party special inspectors is at the discretion of the enforcing agency, except when those measures are otherwise required to have third-party verification.



CHAPTER 8 COMPLIANCE FORMS, WORKSHEETS AND REFERENCE MATERIAL



Chapter 8 provides sample worksheets, compliance forms and other supporting documents for implementing HCD *CALGreen* measures. Copies of forms found in *CALGreen* as well as additional simplified optional forms developed by HCD are now available on the following HCD website: <http://www.hcd.ca.gov/building-standards/calgreen/cal-green-forms.shtml>

Chapter 8 is not adopted by HCD; however, this chapter contains forms that might be useful for complying with *CALGreen*. Use of these forms is not mandated for compliance with *CALGreen*. These forms serve as templates or guides and may be modified for user convenience. It is now HCD's intent to maintain these nonregulatory forms on our website. This provides easier updating and corrections than through a formal rulemaking process and facilitates user downloading and customization of forms and input of data into interactive forms. Since the forms are not regulatory, but are used for assisting the user in implementing the regulations, maintenance of the forms on HCD's website has no change in regulatory effect.

The 2019 *CALGreen* requires a completed Residential Occupancies Application Checklist or an alternate method of documentation submitted to the local enforcing agency for all residential projects under HCD's authority. This form can be found on HCD's website: <http://www.hcd.ca.gov/building-standards/CALGreen/cal-green-forms.shtml>



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APPENDIX A4 RESIDENTIAL VOLUNTARY MEASURES



Appendix A4 discusses select “voluntary measures” found in the 2019 *CALGreen*. The measures provide enhanced levels of green building construction and sustainability that are not mandatory statewide, but were developed as a consistent set of standards available for adoption by local government. When lawfully adopted, Appendix A4 establishes prerequisites that are mandatory to achieve compliance with the enhanced measures in Tier 1 and/or Tier 2. Additionally, a predetermined number of electives have also been established for each tier (see Division A4.6 for a discussion of *CALGreen* Tier 1 and Tier 2 levels). Local enforcing agencies may adopt *CALGreen* Appendix A4 “Residential Voluntary Measures” in whole, in part, or not at all. Therefore, a local ordinance may require some or all of *CALGreen* enhanced tier measures. On the other hand, agencies may adopt other green building standards or other green programs altogether. Enhanced green building requirements may vary from jurisdiction to jurisdiction based upon the goals of the local governing body.

HCD recognizes that there may be practical difficulties in complying with the threshold levels of a tier, and it is not HCD’s intent to discourage local adoption of enhanced green building measures. This provision has been codified in Section 304.1.1, which is similarly adopted by the BSC.

Section numbers referenced in this guide correspond with chapters, sections and headings in the 2019 *CALGreen*. Preselected (prerequisite) items for implementing the voluntary Tier 1 and Tier 2 levels are shown in bold above each section. Code text and tables are followed by nonregulatory commentary in italics. This chapter does not address every voluntary measure included in *CALGreen*. Commonly understood concepts, terms and regulatory language that provide general information (e.g., scope, definitions, notes) are not included for discussion in this guide.



Division A4.1 – PLANNING AND DESIGN

SECTION A4.103 SITE SELECTION

An elective measure for Planning and Design:

A4.103.1 Selection. A site which complies with at least one of the following characteristics is selected:

1. An infill site is selected.
2. A greyfield site is selected.
3. An EPA-recognized and remediated Brownfield site is selected.

COMMENTARY

PURPOSE

To promote and encourage the use of underused, outdated, or failing lands (greyfields), or abandoned or underused industrial and commercial facilities (brownfields). Implementation of this measure will reduce development pressures on the urban fringe resulting in conservation of natural resources, including agricultural land, open space and undeveloped lands (greenfields); contribute to revitalizing urban and community areas; and decrease transportation impacts.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Select infill, greyfield, or brownfield sites.
- Participate in governmental or nongovernmental programs that support or provide incentives for residential development on these sites.

BACKGROUND

Utilization of infill and greyfield sites for residential development reduces costs and use of natural resources by utilizing existing infrastructure, utilities, and public transportation opportunities. In addition, it focuses development into contiguous areas reducing expansion of urbanized areas and urban sprawl. Greyfield and brownfield sites, for example, may have significant redevelopment potential due to their large size, existing infrastructure, and established community presence. Development of these sites can bring new life to blighted areas, place development in close proximity to existing transit networks, and maximize a community's existing investments in water, sewer, and road infrastructure. Development of greyfield and brownfield areas may also reduce large impermeable areas by breaking up the site into parks, open space or buffer areas.

Utilization of brownfield sites with real (or perceived) environmental contaminations once properly cleaned up, supports mitigation of the original environmental threats. This may further contribute to improving the local environment and community through implementation of additional local requirements for development, and also avoids increasing the development footprint.

Definitions for "Brownfield site," "Development footprint," "Greenfields," and "Greyfield site" are in *CALGreen* Chapter 2. The referenced definition for "Infill site" is as follows:

Infill Site (California Environmental Quality Act, Public Resources Code Section 21061.3)

“Infill site” means a site in an urbanized area that meets either of the following criteria:

- (a) The site has not been previously developed for urban uses and both of the following apply:
 - (1) The site is immediately adjacent to parcels that are developed with qualified urban uses, or at least 75 percent of the perimeter of the site adjoins parcels that are developed with qualified urban uses, and the remaining 25 percent of the site adjoins parcels that have previously been developed for qualified urban uses.
 - (2) No parcel within the site has been created within the past 10 years unless the parcel was created as a result of the plan of a redevelopment agency.
- (b) The site has been previously developed for qualified urban uses.

An elective measure for Planning and Design:

A4.103.2 Community connectivity. Facilitate community connectivity by one of the following methods:

1. Locate project within a 1/4-mile true walking distance of at least four basic services, readily accessible by pedestrians.
2. Locate project within a 1/2-mile true walking distance of at least seven basic services, readily accessible by pedestrians.
3. Other methods increasing access to additional resources.

Note: Examples of services include, but are not limited to, bank, place of worship, convenience grocery, day care, cleaners, fire station, barber shop, beauty shop, hardware store, laundry, library, medical clinic, dental clinic, senior care facility, park, pharmacy, post office, restaurant, school, supermarket, theater, community center, fitness center, museum or farmers market. Other services may be considered on a case-by-case basis.

COMMENTARY

PURPOSE

- Decrease emissions related to transportation.
- Reduce the development of open lands and the amount of paved areas.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Locate and develop project in an area that is already within an urban environment providing basic services.
- Design mixed-use projects which include commercial and nonresidential areas within multi-family developments.
- Design streets within projects to provide a well-connected network that provides more opportunities for pedestrians to reach services within a 1/4-mile walking distance.
- Verify availability of type and number of basic services within the required distance of the project.
- Documentation showing number and type of services within the required walking distance from the project boundary. This can be through use of map and computerized mapping technology or through the use of “walkability” calculators showing similar information as acceptable to the local enforcing agency.

BACKGROUND

Residential buildings located within walking distance of existing basic services reduces the number of vehicle trips to be made by residents, increases public transit ridership, and decreases the levels of pollutants associated with vehicle trips. Easy access to basic services also increases potential for residents to live near places of employment, and contributes to a more active lifestyle.

Walking distances should be measured as true walking distance on walking surfaces from the project to the service resource. The distance is not measured “as the crow flies.” For larger projects, the distance may be measured from the center of the project to the resource. If this method is used, distances for residential buildings that are further from the required center of the project than the required distance from the service may need to be recalculated.

Other factors that may affect walkability of routes include convenience (at both the beginning and end of the route), distance, safety, and interests along the way. Therefore, residents may choose walking routes longer than $\frac{1}{4}$ -mile due to the convenience of having more choices of transit, shopping, chance to relax, etc.

SECTION A4.104 SITE PRESERVATION

An elective measure for Planning and Design:

A4.104.1 Supervision and education. Individuals with oversight authority on the project who have been trained in areas related to environmentally friendly development can teach green concepts to other members of the development staff and ensure that training is provided to all parties associated with the development of the project.

Prior to beginning the construction activities, all parties involved with the development process shall receive a written guideline and instruction specifying the green goals of the project.

Note: Lack of adequate supervision and dissemination of the project goals can result in negative effects on green building projects. If the theme of green building is not carried throughout the project, the overall benefit can be substantially reduced by the lack of knowledge and information provided to the various entities involved with the construction of the project.

COMMENTARY

PURPOSE

To ensure that all parties involved with the project have general knowledge of sustainable or green building goals and practices. This measure requires all associated parties to receive written information on the green goals for the project. Identification of project goals will aid in coordination and pre-planning, avoiding conflicts and helping to ensure the goals will be met.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Require written guidelines and instructions on project green goals to be provided to all parties involved in the development process.

- Training sessions or meetings providing education on green building concepts and implementation measures especially as related to the project.
- Meetings to implement timing and coordination of project activities, review project activity deadlines and to verify completion of green goals.

SECTION A4.106 SITE DEVELOPMENT

Section A4.106.1 in the 2019 *CALGreen* has been reserved for future use and includes no regulatory language.

Two elective measures (A4.106.2.1 and A4.106.2.2) for Planning and Design:

A4.106.2 Soil analysis and protection. The soils at the building site are analyzed and protected as specified in this section.

A4.106.2.1 Soil analysis. Soil analysis is performed by a licensed design professional and the findings utilized in the structural design of the building.

A4.106.2.2 Soil protection. The effect of development on building sites is evaluated and the soil is protected by one or more of the following:

1. Natural drainage patterns are evaluated and erosion controls are implemented to minimize erosion during construction and after occupancy.
2. Site access is accomplished by minimizing the amount of cut and fill needed to install access roads and driveways.
3. As allowed by other parts of the *California Building Standards Code* underground construction activities are coordinated to utilize the same trench, minimize the amount of time the disturbed soil is exposed and the soil is replaced using accepted compaction methods.

COMMENTARY

PURPOSE

The first measure requires site-specific soil analysis which would provide information on physical and chemical properties of the soil type and identify any associated strengths or weaknesses. This information could then be used for appropriate design of the building.

The second measure requires soil protection to reduce erosion and resulting sedimentation. Implementation of this measure would minimize soil disturbance, undesirable changes in natural slopes and utilize the most natural landscape.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

Protect soil by utilizing at least one of three methods. These methods should include implementation of erosion controls based on evaluation of natural drainage patterns, minimizing cut and fill for access roads, and coordinating underground construction to utilize the same trench.

BACKGROUND

The requirements are intended to address soil characteristics on portions of an individual lot. Soil analysis at each specific site will provide information on the capabilities of the soil for building and hardscape support, interaction with building materials, requirements for landscaping, and other related issues. These issues are not always identified at the subdivision level of project analysis.

State Housing Law requires geotechnical investigations or soil reports to be conducted at the subdivision level. This requirement may be expanded to individual lots if preliminary reports indicate critically expansive soils or other soil problems. The report is required to include corrective actions. The State Housing Law (Health and Safety Code Section 17953) permits a waiver of the soil report requirement based on the enforcing agency's knowledge of local soil conditions.

The *California Building Code* also provides a table to determine load-bearing capacity based on the class of material (e.g., crystalline bedrock, clay, etc.) in lieu of a soil report unless subject to specified site conditions.

Prerequisite Planning and Design Measure(s) for Tier 1 and Tier 2 (Tier 2 requires both measures):

A4.106.2.3 Topsoil protection. Topsoil shall be protected or saved for reuse as specified in this section.

Tier 1. Displaced topsoil shall be stockpiled for reuse in a designated area and covered or protected from erosion.

Note: Protection from erosion includes covering with tarps, straw, mulch, chipped wood, vegetative cover, or other means acceptable to the enforcing agency to protect the topsoil for later use.

Tier 2. The construction area shall be identified and delineated by fencing or flagging to limit construction activity to the construction area. Heavy equipment or vehicle traffic and material storage outside the construction area shall be limited to areas that are planned to be paved.

COMMENTARY

PURPOSE

Provides for conservation of topsoil as a natural resource, and methods to preserve soil quality and function. Tier 1 requires compliance with topsoil stockpiling and protection. Tier 2, which provides further topsoil protection, requires compliance with both the Tier 1 requirement and limits construction activities to designated areas.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Removed topsoil should be stockpiled in designated areas and protected from erosion.
- Install fencing or clearly flag topsoil stockpile areas to protect from construction activities. (Tier 2)
- Heavy equipment or vehicle traffic is restricted to areas which will be paved. (Tier 2)

BACKGROUND

Soil includes a combination of air, water, minerals and organic matter which are essential for proper soil function. These functions include nutrient cycling, minimizing runoff and erosion and maximizing water-holding capacity; adsorbing and filtering excess nutrients, sediments and pollution from groundwater or surface water; providing a healthy rooting environment and habitat; and providing a stable foundation for structures. If possible, it is functionally more effective to preserve existing soil and vegetation since much of the physical and biological structure of native soil is lost when moved. Soil and vegetation left in place can also repopulate adjoining areas over time.

In addition to protecting the soil resource, this prevents erosion of the soil, runoff and sedimentation downstream. Check with local enforcing agencies for any ordinances related to soil removal and erosion and sedimentation control.

Although not required by *CALGreen*, consider further treatment of stockpiled topsoil based on its final use. For gardening, the soil may require further amendments such as compost, treatment for compaction, and blending into the subsoil to ensure adequate root growth and permeability. Soils may also be analyzed for vegetative growth potential and be treated to remedy problems such as salinity or extreme pH. [See soil preparation requirements in the California Department of Water Resources' Model Water Efficient Landscape Ordinance (MWELO)].

An elective measure for Planning and Design:

A4.106.3 Landscape design. Postconstruction landscape designs shall accomplish one or more of the following:

1. Areas disrupted during construction are restored to be consistent with native vegetation species and patterns.
2. Utilize at least 75 percent native California or drought tolerant plant and tree species appropriate for the climate zone region.

COMMENTARY

PURPOSE

To minimize disturbance of native vegetation and encourage restoration of areas impacted by construction, to encourage use of native California or drought-tolerant plants appropriate for the site, and to reduce high-water use turf areas.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Restore disturbed areas to native vegetative conditions.
- Use at least 75-percent native California or drought-tolerant plants suitable for the climate zone.

BACKGROUND

Turf provides benefits such as preventing soil erosion and runoff; reducing radiant heat, noise and glare; and provides recreational spaces. However, it can also contribute to green waste by increased water use and associated costs.

Reducing turf areas by using native vegetation species and patterns to restore areas disrupted during construction is one method to save water and other related costs.

Use of native or drought-tolerant plants on new landscape areas will help save on water and irrigation costs as well as provide landscaping that is adapted to the local conditions.

Additional conditions to be considered for successful plant performance should include consideration of soil, light, and temperature needs for the selected plants.

Sources of information for appropriate plant species for the area:

- Gardening books.
- Local nurseries.
- Water districts or conservation districts.
- University of California Cooperative Extension Offices.
- California Department of Water Resources (DWR).
- Water Use Classification of Landscape Species (WUCOLS IV).

This section was modified during the 2015 Triennial Code Adoption Cycle in order to avoid conflicts with Section 4.304.1, adopted during the 2015 Emergency Rulemaking and effective June 1, 2015. Section 4.304.1 refers to the Department of Water Resources' Model Water Efficient Landscape Ordinance (MWELO), and helps mitigate and alleviate current and future impacts of California's multiyear drought.

Prerequisite Planning and Design measure for Tier 1 and Tier 2 as specified:

A4.106.5 Cool roof for reduction of heat island effect. Roofing materials for Tier 1 and Tier 2 buildings shall comply with this section:

Exceptions:

1. Roof constructions that have a thermal mass over the roof membrane, including areas of vegetated (green) roofs, weighing at least 25 pounds per square foot.
2. Roof areas covered by building integrated solar photovoltaic panels and building integrated solar thermal panels.

A4.106.5.1 Solar reflectance. Roofing materials shall have a minimum 3-year aged solar reflectance equal to or greater than the values specified in Tables A4.106.5.1(1) and A4.106.5.1(3) for Tier 1 and Tables A4.106.5.1(2) and A4.106.5.1(4) for Tier 2.

If CRRC testing for aged solar reflectance is not available for any roofing products, the aged value shall be determined using the Cool Roof Rating Council (CRRC) certified initial value using the equation $\rho_{\text{aged}} = [0.2 + \beta[\rho_{\text{initial}} - 0.2]]$, where ρ_{initial} = the initial Solar Reflectance and soiling resistance β , is listed by product type in Table A4.106.5.1.

Solar reflectance may also be certified by other supervisory entities approved by the Energy Commission pursuant to Title 24, Part 1, Section 10-113.

**TABLE A4.106.5.1
VALUES OF SOILING RESISTANCE (β) BY PRODUCT TYPE**

PRODUCT TYPE	CCRC PRODUCT CATEGORY	B
Field-applied coating	Field-applied coating	0.65
Other	Not a field-applied coating	0.70

**TABLE A4.106.5.1(1)
TIER 1 - LOW-RISE RESIDENTIAL**

ROOF SLOPE	CLIMATE ZONE	MINIMUM 3-YEAR AGED SOLAR REFLECTANCE	THERMAL EMITTANCE	SRI
≤ 2 : 12	13 & 15	0.63	0.75	75
> 2 : 12	10-15	0.20	0.75	16

**TABLE A4.106.5.1(2)
TIER 2 - LOW-RISE RESIDENTIAL**

ROOF SLOPE	CLIMATE ZONE	MINIMUM 3-YEAR AGED SOLAR REFLECTANCE	THERMAL EMITTANCE	SRI
≤ 2 : 12	2,4,6-15	0.65	0.85	78
> 2 : 12	2,4,6-15	0.23	0.85	20

**TABLE A4.106.5.1(3)
TIER 1 - HIGH-RISE RESIDENTIAL BUILDINGS, HOTELS AND MOTELS**

ROOF SLOPE	CLIMATE ZONE	MINIMUM 3-YEAR AGED SOLAR REFLECTANCE	THERMAL EMITTANCE	SRI
≤ 2 : 12	9, 10, 11, 13, 14, 15	0.55	0.75	64
> 2 : 12	2-15	0.20	0.75	16

**TABLE A4.106.5.1(4)
TIER 2 - HIGH-RISE RESIDENTIAL BUILDINGS, HOTELS AND MOTELS**

ROOF SLOPE	CLIMATE ZONE	MINIMUM 3-YEAR AGED SOLAR REFLECTANCE	THERMAL EMITTANCE	SRI
≤ 2 : 12	2-15	0.65	0.75	78
> 2 : 12	2-15	0.23	0.75	20

A4.106.5.2 Thermal emittance. Roofing materials shall have a CRRC initial or aged thermal emittance equal to or greater than those specified in Tables A4.106.5.1(1) and A4.106.5.1(3) for Tier 1 and Tables A4.106.5.1(2) and A4.106.5.1(4) for Tier 2.

Thermal emittance may also be certified by other supervisory entities approved by the Energy Commission pursuant to Title 24, Part 1, *California Administrative Code*.

COMMENTARY

PURPOSE

- Reduction of urban heat island effect is the primary purpose of cool roofs in this division.
- Cool roofs also increase building energy efficiency, reduce energy costs, reduce cooling equipment costs, and improve human comfort by reducing roof temperatures and the amount of heat that is transferred into buildings.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Low-rise residential:
 - Install roofing materials with Solar Reflectance and Thermal Emittance values per Table A4.106.5.1(1) for Tier 1 and Table A4.106.5.1(2) for Tier 2.
 - Install roofing materials with Solar Reflectance Index (SRI) equal to or greater than those specified in Table A4.106.5.1(1) for Tier 1 and Table A4.106.5.1(2) for Tier 2.
- High-rise residential, hotels and motels:
 - Install roofing materials with Solar Reflectance and Thermal Emittance values per Table A4.106.5.1(3) for Tier 1 and Table A4.106.5.1(4) for Tier 2.
 - Install roofing materials with Solar Reflectance Index (SRI) equal to or greater than those specified in Table A4.106.5.1(3) for Tier 1 and Table A4.106.5.1(4) for Tier 2.
- Inspection by enforcing agency to verify compliance with either aged solar reflectance and thermal emittance, or Solar Reflectance Index (SRI) values.
- Use of California Energy Commission's Solar Reflectance Index (SRI) Calculation Worksheet.

BACKGROUND

A reduction in heat transfer from hot roof surfaces to interior elements and surfaces of buildings keeps buildings cooler, which reduces the heat island effect created by buildings, and reduces the demand for energy needed to cool buildings. This, in turn, reduces the amount of greenhouse gases and air pollution emitted by buildings and the electrical generating facilities that power them.

Cool roofs have been used for decades in a variety of applications on low-slope commercial roofs, as well as steep-slope residential roofs. Cool roofs share two properties that can determine how “green” a roof is – solar reflectance and thermal emittance—which are both measured on a scale from 0-1. The higher the number is, the higher the reflectance or emittance. Solar reflectance is the ability of the roof covering material to reflect heat back away from the building and into the atmosphere. Thermal emittance refers to the ability of a roof to both absorb the heat from the sun and to readily re-emit (or dissipate) absorbed heat back into the atmosphere. Three-year aged solar reflectance refers to the calculated solar reflectance of the roofing material after three years of exposure to environmental conditions, primarily UV exposure from the sun.

Solar reflectance index (SRI) is an alternative method that can be used to determine how cool a roof is. This method combines solar reflectance and thermal emittance into a single number value. The value represents how hot a roofing surface will become compared to standard black roofing (0) and standard white roofing (100). The higher the SRI, the cooler the roof.

Changes in the 2016 *CALGreen* reflected changes adopted, in part, to align with the 2016 California Energy Code related to cool roofs and an updated equation to calculate aged solar reflectance values.

The regulatory text for this section has been amended for the 2019 code.

A4.106.5.3 Solar reflectance index alternative. Solar Reflectance Index (SRI) equal to or greater than the values specified in Tables A4.106.5.1(1) and A4.106.5.1(3) for Tier 1 and Tables A4.106.5.1(2) and A4.106.5.1(4) for Tier 2 may be used as an alternative to compliance with the 3-year aged solar reflectance values and thermal emittance.

SRI values used to comply with this section shall be calculated using the Solar Reflectance Index (SRI) Calculation Worksheet (SRI-WS) developed by the California Energy Commission or in compliance with ASTM E1980-01 as specified in the 2019 *California Energy Code*. Solar reflectance values used in the SRI-WS shall be based on the aged reflectance value of the roofing product or the equation in Section A4.106.5.1 if the CRRC certified aged solar reflectance values are not available. Certified thermal emittance used in the SRI-WS may be either the initial value or the aged value listed by the CRRC.

Solar reflectance and thermal emittance may also be certified by other supervisory entities approved by the Commission pursuant to Title 24, Part 1, *California Administrative Code*.

Note: The Solar Reflectance Index Calculation Worksheet (SRI-WS) is available by contacting the Energy Standards Hotline at 1-800-772-3300, website at https://ww2.energy.ca.gov/title24/2013standards/documents/solar_reflectance/ or by e-mail at Title24@energy.ca.gov.

A4.106.5.4 Verification. Inspection shall be conducted to ensure roofing materials meet cool roof aged solar reflectance and thermal emittance or SRI values.

CALGreen includes references to the California Energy Commission's California Climate Zones. The code user should consult the most current California Climate Zone Map information on the California Energy Commission's website (www.energy.ca.gov). This website provides options for detailed site searches by cities and zip codes and instruction for sites in more than one climate zone.

An elective measure for Planning and Design:

A4.106.6 Vegetated roof. Install a vegetated roof for at least 50 percent of the roof area. Vegetated roofs shall comply with requirements for roof gardens and landscaped roofs in the *California Building Code*, Chapter 15 and Chapter 16.

COMMENTARY

PURPOSE

- Reduction of heat island effect.
- Controlling storm water runoff and improving water quality.
- Prolonging service life of roofing materials.
- Energy conservation.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Extensive vegetative roofs (6 inches or shallower) appropriate for the structure, climate, vegetation and intended use(s).
- Intensive vegetative roofs appropriate for the structure, climate, vegetation and intended use(s).
- Vegetative roofs must be compliant with the California Building Code and local requirements.
- ANSI or ASTM standards and other resources are also available addressing criteria for vegetative roofs.

BACKGROUND

Vegetative roofs consist of thin layers of vegetation which are installed on top of flat or sloped roofs. Vegetative roofs may consist of relatively shallow systems (6-8 inches deep or shallower) or deeper systems which integrate larger landscaping plants. Plants used for vegetative roofs provide a cooling effect on otherwise hot roofs through a daily dew and evaporation cycle. The plants also physically provide a cover for hot roof surfaces.

Efficient vegetated roofs must consider horticultural, waterproofing and engineering needs. In addition, vegetated roofs need to comply with the requirements in the California Building Code, and by reference the California Fire Code. There are many variables to be considered in the design and installation of vegetative roofs to ensure that the roof meets aesthetic and open space needs, is lightweight and structurally sound, and affordable. Some of these factors are listed below.

- Climate (temperature and rainfall).
- Specific purpose, e.g., storm water runoff mitigation, reduction of urban heat island effects, increasing service life of roofs, energy conservation, reduction sound reflection and transmission, visual or aesthetic needs, human traffic, etc.
- Selection of appropriate plants for the site.
- Appropriate media for plant nourishment and support.
- Wind and fire resistance.
- Strength of the supporting structure and other structural loads.
- Roof attributes and conditions (size, slope, height, orientation).
- Underlying waterproofing systems and protection of the system.
- Drainage elements and locations.
- Pest control.
- Need for initial or ongoing irrigation.
- Accessibility for maintenance.
- Insulation.
- Costs.

An elective measure for Planning and Design:

A4.106.7 Reduction of heat island effect for nonroof areas. Reduce nonroof heat islands

for 50 percent of sidewalks, patios, driveways or other paved areas by using one or more of the methods listed.

1. Trees or other plantings to provide shade and that mature within 15 years of planting. Trees should be native or adaptive to the region and climate zones and noninvasive; hardy and resistant to drought, insects and disease; easy to maintain (no frequent shedding of twigs, branches, unwanted fruit or seed pods); and suitable in mature size and environmental requirements for the site. Tree selection and placement should consider location and size of areas to be shaded, location of utilities, views from the structure, distance to sidewalks and foundations, overhangs onto adjacent properties and streets; other infrastructure and adjacent to landscaping. In addition, shading shall not cast a shadow, as specified, on any neighboring solar collectors pursuant to *Public Resources Code* Section 25981, *et seq.* (Solar Shade Control Act).
2. Use high albedo materials with an initial solar reflectance value of at least 0.30 as determined in accordance with American Society for Testing and Materials (ASTM) Standards E1918 or C1549.
3. Use open grid pavement system or pervious or permeable pavement system.
4. Locate 50 percent of parking underground or use multilevel parking.
5. Other methods of reducing heat island effects acceptable to the enforcing agency.

Note: Local agencies may have ordinances requiring mitigation of heat island effects through building or parking lot shading, tree plantings, landscaping, use of pervious pavements and other approved methods.

COMMENTARY

PURPOSE

Reduction of heat island effect using nonroof areas.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- *CALGreen* text identifies several acceptable methods of compliance.
- Provide documentation demonstrating compliance with measurable standards. Include the total area of nonroof potential heat island areas and the percentage of area utilizing materials or methods to reduce heat island effects.

BACKGROUND

Increased temperatures in urban areas resulting from heat island effect can impact human comfort, resulting in increased energy consumption, increases in levels of air pollutants and greenhouse gases, changes in health and comfort, and impaired water quality. The effects of urban heat islands can be mitigated through increasing trees and other vegetative cover, use of vegetative roofs, use of cool roofs, and cool pavements.

Trees and vegetation can lower temperatures by providing shade and through evapotranspiration. Shaded surfaces may be 20-45 degrees Fahrenheit cooler than nonshaded areas and evapotranspiration can reduce temperatures 2-9 degrees Fahrenheit. Selection of trees and vegetation should be based on the climate, site conditions, orientation and desired effects and other criteria listed in Section A4.106.7(1).

Permeable pavements allow air, water and water vapor to permeate the material. As the surface temperature increases, the moisture evaporates and cools the surface through evaporative cooling. Some examples of permeable surfaces include porous asphalt, pervious concrete, permeable pavers, grid pavements, and inclusion of areas of grass or low-lying vegetation. Permeable pavements in a dry state have limited heat transfer to lower layers and less heat storage, thereby releasing less heat during night hours. Permeable pavements must be designed and installed appropriately to provide the desired permeability and traffic structural needs.

Prerequisite Planning and Design measure for Tier 1 and Tier 2 as specified:

The regulatory text for this section has been amended for the 2019 code.

A4.106.8 Electric vehicle (EV) charging for new construction. New construction shall comply with Sections A4.106.8.1, A4.106.8.2 or A4.106.8.3, to facilitate future installation and use of electric vehicle chargers. Electric vehicle supply equipment (EVSE) shall be installed in accordance with the *California Electrical Code*, Article 625.

A4.106.8.1 New one- and two-family dwellings and townhouses with attached private garages.

Tier 1 and Tier 2. For each dwelling unit, a dedicated 208/240-volt branch circuit shall be installed in the raceway required by Section 4.106.4.1. The branch circuit and associated overcurrent protective device shall be rated at 40 amperes minimum. Other electrical components, including a receptacle or blank cover, related to this section shall be installed in accordance with the *California Electrical Code*.

A4.106.8.1.1 Identification. The service panel or subpanel circuit directory shall identify the overcurrent protective device designated for future EV charging purposes as “EV READY” in accordance with the *California Electrical Code*. The receptacle or blank cover shall be identified as “EV READY.”

The regulatory text for this section has been amended for the 2019 code.

A4.106.8.2 New multifamily dwellings.

Tier 1. Fifteen (15) percent of the total number of parking spaces on a building site, provided for all types of parking facilities, but in no case less than one, shall be electric vehicle charging spaces (EV spaces) capable of supporting future EVSE. Calculations for the required number of EV spaces shall be rounded up to the nearest whole number.

Tier 2. Twenty (20) percent of the total number of parking spaces on a building site, provided for all types of parking facilities, but in no case less than one, shall be electric vehicle charging spaces (EV spaces) capable of supporting future EVSE. Calculations for the required number of EV spaces shall be rounded up to the nearest whole number.

A4.106.8.2.1 Technical requirements. The EV spaces required by Section A4.106.8.2 shall be designed and constructed in accordance with Sections 4.106.4.2.1, 4.106.4.2.2, 4.106.4.2.3, 4.106.4.2.4, and 4.106.4.2.5.

The regulatory text for this section is new for the 2019 code.

A4.106.8.3 New hotels and motels.

Tier 1. Number of required EV spaces. The number of required EV spaces shall be based on the total number of parking spaces provided for all types of parking facilities in accordance with Table A4.106.8.3.1. Calculations for the required number of EV spaces shall be rounded up to the nearest whole number.

TABLE A4.106.8.3.1

TOTAL NUMBER OF PARKING SPACES	TIER 1 NUMBER OF REQUIRED EV SPACES
0-9	0
10-25	2
26-50	3
51-75	5
76-100	7
101-150	10
151-200	14
201 and over	8 percent of total

Tier 2. Number of required EV spaces. The number of required EV spaces shall be based on the total number of parking spaces provided for all types of parking facilities in accordance with Table A4.106.8.3.2. Calculations for the required number of EV spaces shall be rounded up to the nearest whole number.

TABLE A4.106.8.3.2

TOTAL NUMBER OF PARKING SPACES	TIER 1 NUMBER OF REQUIRED EV SPACES
0-9	1
10-25	2
26-50	4
51-75	6
76-100	9
101-150	12
151-200	17
201 and over	10 percent of total

COMMENTARY

PURPOSE

- To encourage and support use of electric vehicles as an alternate means of transportation.
- To help reduce the amount of greenhouse gas emissions released into the environment.
- Provide common sense preinstallation methods with listed raceways or other approved methods dedicated to future expansion and installation of electric vehicle supply equipment (EVSE).

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

New one- and two-family dwellings and townhouses with attached private garages.

- Installation of not less than a listed trade size 1 (1-inch inside diameter) raceway secured at the panel and a dedicated 40A/240V branch circuit installed in the raceway.
- Other approved wiring methods with sufficient conductor sizing, ampacity and service capacity to install Level 2 EVSE. [For example, a dedicated 240V/80A (240 Volts/80 amperes) branch circuit.]
- A label or marking stating “EV READY” posted in a conspicuous place at the service panel (or subpanel) and at the receptacle or on the blank cover.
- Electrical load calculations, diagrams, schematics, and a site plan indicating the location(s) and type of each EVSE.
- Prior to construction, during the planning phase, consult with the electric utility and the local enforcing agency to determine any special conditions, additional requirements, rate structure, infrastructure capability, requirements or options for a second meter.

New multifamily dwellings:

- **Tier 1:** Identification of 15 percent of the total number of parking spaces for multifamily buildings, but not less than one parking space, to have the capability to support EV charging. Spaces identified to meet the requirement for EV charging may be in common use areas available for use by all residents, or assigned to specific residents, including in private parking locations.
- **Tier 2:** Identification of 20 percent of the total number of parking spaces for multifamily buildings, but not less than one parking space, to have the capability to support EV charging. Spaces identified to meet the requirement for EV charging may be in common use areas available for use by all residents, or assigned to specific residents, including in private parking locations.

New hotels and motels:

- **Tier 1:** Identification of the required number of EV spaces per Table A4.106.8.3.1.
- **Tier 2:** Identification of the required number of EV spaces per Table A4.106.8.3.2.

BACKGROUND

See background for Section 4.106.4, Electric vehicle (EV) charging for new construction.

DISCUSSION

Section A4.106.8 is a voluntary measure (prerequisite) available for adoption by local government. It was developed not to restrict or discourage homeowners or developers, but to provide them with economical alternatives in design and market choice of electric vehicles.

An elective measure for Planning and Design:

A4.106.9 Bicycle parking. Comply with Sections A4.106.9.1 through A4.106.9.3 or meet a local ordinance, whichever is more stringent.

Exception: Number of bicycle parking spaces shall be permitted to be reduced, as approved by the enforcing agency, due to building site characteristics, including but not limited to, isolation from other development.

A4.106.9.1 Short-term bicycle parking. Provide permanently anchored bicycle racks within 100 feet of the visitor’s entrance, readily visible to passers-by, for 5 percent of visitor motorized vehicle parking capacity with a minimum of one two-bike capacity rack.

A4.106.9.2 Long-term bicycle parking for multifamily buildings. Provide on-site bicycle parking for at least one bicycle per every two dwelling units. Acceptable parking facilities shall be conveniently reached from the street and may include, but not be limited to:

1. Covered, lockable enclosures with permanently anchored racks for bicycles.
2. Lockable bicycle rooms with permanently anchored racks.
3. Lockable, permanently anchored bicycle lockers.

A4.106.9.3 Long-term bicycle parking for hotel and motel buildings. Provide one on-site bicycle parking space for every 25,000 square feet, but not less than two. Acceptable parking facilities shall be conveniently reached from the street and may include, but not be limited to:

1. Covered, lockable enclosures with permanently anchored racks for bicycles.
2. Lockable bicycle rooms with permanently anchored racks.
3. Lockable, permanently anchored bicycle lockers.

COMMENTARY

PURPOSE

To promote and encourage alternate methods of transportation to reduce vehicle emissions.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Increase incentives for alternative means of transportation by providing sufficient and safe locations or facilities for bicycle parking.
- Implement local regional bicycle transportation plans which may provide different requirements based on zoning or site conditions.

BACKGROUND

Many local jurisdictions at the regional, county or city level have bicycle transportation plans specifically to meet eligibility purposes of receiving state funds for bicycle commuter safety and convenience projects. Goals for bicycle transportation and infrastructure are also addressed through regional transportation plans.

High-rise residential and hotels/motels; and low-rise residential buildings, as specified, shall comply with the applicable mandatory lighting requirements in the *California Energy Code* Section 130.2.

An elective measure for Planning and Design:

A4.106.10 Light pollution reduction [HR]. Outdoor lighting systems shall be designed and installed to comply with the following:

1. The minimum requirements in the *California Energy Code* for Lighting Zones 1-4 as defined in Chapter 10 of the *California Administrative Code*; and
2. Backlight, Uplight and Glare (BUG) ratings as defined in IES TM-15-11; and
3. Allowable BUG ratings not exceeding those shown in Table A4.106.10; or

Comply with a local ordinance lawfully enacted pursuant to Section 101.7 of this code, whichever is more stringent.

Exceptions:

1. Luminaires that qualify as exceptions in the *California Energy Code*.
2. Emergency lighting.
3. One- and two-family dwellings.

Note: The International Dark-Sky Association (IDA) and the Illuminating Engineering Society of North America (IESNA) have developed a Model Lighting Ordinance (MLO). The MLO was designed to help municipalities develop outdoor lighting standards that reduce glare, light trespass, and skyglow. The model ordinance and user guides for the ordinance may be accessed at the International Dark-Sky Association website.

**TABLE A4.106.10
MAXIMUM ALLOWABLE BACKLIGHT, UPLIGHT AND GLARE (BUG) RATINGS^{1, 2}**

ALLOWABLE RATING	LIGHT-ING ZONE 1	LIGHT-ING ZONE 2	LIGHT-ING ZONE 3	LIGHT-ING ZONE 4
Maximum Allowable Backlight Rating³				
Luminaire greater than 2 mounting heights (MH) from property line	No Limit	No Limit	No Limit	No Limit
Luminaire back hemisphere is 1 – 2 MH from property line	B2	B3	B4	B4
Luminaire back hemisphere is 0.5 – 1 MH from property line	B1	B2	B3	B3
Luminaire back hemisphere is less than 0.5 MH from property line	B0	B0	B1	B2
Maximum Allowable Uplight Rating				
For area lighting ⁴	U0	U0	U0	U0
For all other outdoor light, including decorative luminaires	U1	U2	U3	U4
Maximum Allowable Glare Rating⁵				
Luminaire greater than 2 MH from property line	G1	G2	G3	G4
Luminaire front hemisphere is 1 – 2 MH from property line	G0	G1	G1	G2
Luminaire front hemisphere is 0.5 – 1 MH from property line	G0	G0	G1	G1
Luminaire back hemisphere is less than 0.5 MH from property line	G0	G0	G0	G1

1. IESNA Lighting Zones 0 and 5 are not applicable; refer to Lighting Zones as defined in the *California Energy Code* and Chapter 10 of the *California Administrative Code*.
2. For property lines that abut public walkways, bikeways, plazas, and parking lots, the property line may be considered to be 5 feet beyond the actual property line for purpose of determining compliance with this section. For property lines that abut public roadways and public transit corridors, the property line may be considered to be the centerline of the public roadway or public transit corridor for the purpose of determining compliance with this section.
3. If the nearest property line is less than or equal to two mounting heights from the back hemisphere of the luminaire distribution, the applicable reduced Backlight rating shall be met.
4. General lighting luminaires in areas such as outdoor parking, sales or storage lots shall meet these reduced ratings. Decorative luminaires located in these areas shall meet U value limits for “all other outdoor lighting.”
5. If the nearest property line is less than or equal to two mounting heights from the front hemisphere of the luminaire distribution, the applicable reduced Glare rating shall be met.

COMMENTARY

PURPOSE

- Reduces amount of light pollution on adjacent properties and reduces energy wasted by inefficient lighting.
- Enhances night skies, improves nighttime visibility in lighted areas, and reduces urban impacts on wildlife environment.

BACKGROUND

CALGreen includes mandatory provisions for light pollution in Section 5.106.8 which applies to nonresidential structures. This was formerly a voluntary provision and then adopted as a mandatory provision effective July 1, 2012. Section A4.106.10 includes voluntary measures applicable to high-rise residential structures which are similar to the provisions for non-residential buildings; however, changes in the 2019 California Energy Code include mandatory requirements related to backlight, uplight and glare for high-rise residential structures.

According to the Illuminating Engineering Society's Model Light Ordinance:

The problems of light pollution first became an issue in the 1970s when astronomers identified the degradation of the night sky due to the increase in lighting associated with development and growth. As more impacts to the environment by lighting have been identified, an international "dark sky" movement is advocating for the precautionary approach to outdoor lighting design.

Many local agencies have adopted light-pollution ordinances; however, these ordinances may vary from agency to agency.

If a local ordinance is not available, local agencies may adopt the Model Lighting Ordinance (MLO) developed by the International Dark-Sky Association (IDA) and the Illuminating Engineering Society of North America (IES). The model ordinance also includes a user's guide which provides information on how to adopt and implement the ordinance as well as explanation of features and terms. The document also recommends that the adopted ordinance be updated as necessary to accommodate changes in technology. The ordinance is available on IES' website at www.ies.org.

SECTION A4.108 INNOVATIVE CONCEPTS AND LOCAL ENVIRONMENTAL CONDITIONS

An elective measure(s) for Planning and Design:

A4.108.1 Innovative concepts and local environmental conditions. The provisions of this code are not intended to prevent the use of any alternate material, appliance, installation, device, arrangement, method, design or method of construction not specifically prescribed by this code. This code does not limit the authority of city, county, or city and county government to make necessary changes to the provisions contained in this code pursuant to Section 101.7.1.

COMMENTARY

PURPOSE

Allows for the use of alternate materials, appliances or devices, installation and construction methods, and designs not specifically identified as an elective measure for purposes of Tier 1 and Tier 2 requirements. This provision also allows for the identification of specific locally required measures.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Local recognition of materials, methods and designs that are equivalent in performance to those recognized in *CALGreen*.
- Local recognition of materials, methods and designs that promote and support green building, but are not specifically identified in *CALGreen*.
- Recognition and use of local attributes that promote and support green building. Some examples could be wind energy, radon-resistant construction with areas that have radon toxicity potential, etc.

BACKGROUND

The enhanced levels of green building beyond the *CALGreen* mandatory requirements provide for prerequisites and specific elective measures. It is difficult to identify every green building measure that would qualify as a *CALGreen* elective measure. To address this situation and to accommodate advances in uses of materials, technology and methods of construction, *CALGreen* provides for the use of innovative concepts and local environmental conditions. This same provision is also included in the Appendix A4 provisions for energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality.

Division A4.2 – ENERGY EFFICIENCY

SECTION A4.201 GENERAL

The regulatory text for this Division has been amended for the 2019 code.

A4.201.1 Scope. For the purposes of mandatory energy efficiency standards in this code, the California Energy Commission will continue to adopt mandatory standards. It is the intent of these voluntary provisions to encourage local jurisdictions through codification to achieve exemplary performance in the area of building energy efficiency. Local jurisdictions adopting these voluntary provisions as mandatory local energy efficiency standards shall submit the required application and receive the required approval of the California Energy Commission in compliance with Title 24, Part 1, Section 10-106 prior to enforcement. Once approval is granted by the Energy Commission, local jurisdictions shall file an ordinance expressly marking the local modification along with findings and receive the required acceptance from the California Building Standards Commission in compliance with Section 101.7 of this code, prior to enforcement. (Title 24, Part 1, Section 10-106 is available at <http://www.energy.ca.gov/title24/2019standards/>)

(See *CALGreen* Section A4.203, *Performance Approach for Newly Constructed Buildings for complete text.*)

PURPOSE

- These voluntary provisions provide building energy efficiency standards that will lead to additional energy and water savings beyond the requirements in the 2019 California Energy Code.
- These voluntary measures are available for interested persons to follow or for local jurisdictions to adopt as mandatory measures to realize the potential energy and cost savings and other benefits.
- Adoption of voluntary standards will also contribute to the state's zero net energy building goals.
- This section also describes the requirements a local jurisdiction must meet when adopting these voluntary standards as mandatory.

BACKGROUND

The 2019 voluntary energy provisions of *CALGreen* go beyond the minimum allowable standards in the Energy Code, and were developed and adopted in response to policy directives from the Governor. These energy efficiency provisions are located in *CALGreen*, but are administered by the California Energy Commission.

Changes for the 2019 *CALGreen* for low-rise residential buildings include an expansion of the prerequisite requirements for Tier 1 and Tier 2 to include Quality Insulation Installation plus a selection of one of four specified new prerequisites. In addition, for buildings to comply with Tier 1 and Tier 2 levels of advanced energy efficiency they are required to have additional integrated efficiency and onsite renewable energy generation to achieve a specified Tier 1 or Tier 2 Total Energy Design Rating based on Climate Zone. The 2019 *CALGreen* also requires that local jurisdictions adopting Tier 1 or Tier 2 consult with their local electric provider to ensure that solar system sizing will be acceptable to the electric provider.

For further information, please visit the California Energy Commission website at: <http://www.energy.ca.gov/>

Division A4.3 – WATER EFFICIENCY AND CONSERVATION

COMMENTARY

Californians use an average of 196 gallons of water per day. Here are some easy ways to reduce water use.

- Fixing leaks, as leaks account for about 16 percent of the average California household indoor water use.
- Filling the bathtub halfway or less can save approximately 12 gallons per bath.
- Recycling indoor water for outdoor use can save gallons of water each month.
- Installing high-efficiency toilets can save 19 gallons per person per day.
- Turning off water when brushing teeth or shaving can save 10 gallons per person per day.
- Washing only full loads of clothes and dishes can save 15-45 gallons per load for clothes washers and 5-15 gallons per load for dishwashers.

SECTION A4.303 INDOOR WATER USE

An elective measure for Water Efficiency and Conservation:

A4.303.1 Kitchen faucets. The maximum flow rate of kitchen faucets shall not exceed 1.5 gallons per minute at 60 psi. Kitchen faucets may temporarily increase the flow above the maximum rate, but not to exceed 2.2 gallons per minute at 60 psi, and must default to a maximum flow rate of 1.5 gallons per minute at 60 psi.

Note: Where complying faucets are unavailable, aerators or other means may be used to achieve reduction.

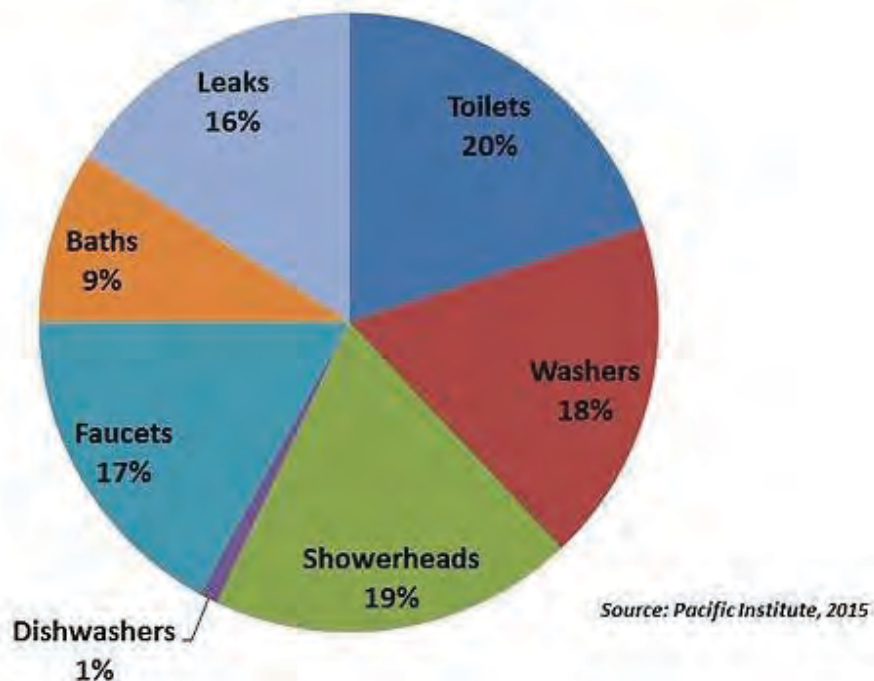
COMMENTARY

PURPOSE

This provision helps reduce indoor potable water use. Reduction of water use also results in decreasing the amount of energy needed to transport, process and treat water, thereby contributing to reduction of greenhouse gas emissions.

The following graphic shows the typical breakdown of indoor water use. As shown, toilets, showers, clothes washers, and faucets are the greatest indoor water users. *CALGreen* focuses on water use related to toilets (water closets and urinals), faucets and showers for purposes of potable water conservation.

Average California Household Water Use
(Indoors), percent



EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

Kitchen faucets cannot exceed a maximum flow rate of 1.5 gpm at 60 psi to meet this elective measure. Faucets must also comply with the low-lead requirements of AB 1953 and federal standards as summarized in the “INFORMATIVE NOTE” in Division 4.3 of this guide.

Note 1: The 2019 California Plumbing Code, Section 420.2.1, requirements reference a higher acceptable flow rate of 1.8 gpm at 60 psi for kitchen faucets.

Note 2: Kitchen faucets with features that temporarily increase flow rates for faster filling or stronger spray, but have default flow rates of 1.5 gpm at 60 psi, may be considered as meeting this elective measure. The maximum flow of kitchen faucets, even at the higher flow rates, shall not exceed 2.2 gpm at 60 psi.

Note 3: Aerators or other means may be used to achieve reduction if complying faucets are unavailable.

An elective measure for Water Efficiency and Conservation:

A4.303.2 Alternate water sources for nonpotable applications. Alternate nonpotable water sources are used for indoor potable water reduction. Alternate nonpotable water sources shall be installed in accordance with the *California Plumbing Code*.

COMMENTARY

PURPOSE

To promote and encourage reduction of potable water use.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

Use of alternate water sources as approved by the local enforcing agency and in compliance with the *California Plumbing Code*. Some examples include:

- Reclaimed (recycled) water.
- Rainwater.
- Nonpotable graywater.
- On-site treated nonpotable water.

BACKGROUND

HCD first developed emergency regulations addressing the use of graywater for purposes of water conservation in the 2007 *California Plumbing Code*. After considerable research, meetings with stakeholders and formal public comment periods, these regulations were approved by the California Building Standards Commission (BSC) and filed with the Secretary of State on January 27, 2010. Several factors led to the development of these regulations:

On June 4, 2008, Governor Arnold Schwarzenegger signed Executive Order S-06-08 proclaiming that a statewide drought condition existed and directed the Department of Water Resources (DWR) to take specific actions to counter the drought.

In 2008, SB 1258 (Chapter 172, Statutes of 2008) was signed by the Governor enacting new statutes in the *Health and Safety Code* (Sections 17922.12 and 18941.7) and amending the existing statute in the *Water Code* (Section 14877.1). These statutes, effective January 1, 2009, included requirements that directed HCD to propose building standards to BSC for the construction, installation, and alteration of graywater systems for residential indoor and outdoor uses.

On February 27, 2009, the Governor issued a proclamation declaring a drought to be in existence and a state of emergency to exist in California. The proclamation directed, to the extent allowed by applicable law, state agencies within his administration to prioritize and streamline permitting and regulatory compliance actions for desalination, water conservation and recycling projects to provide drought relief.

Existing graywater standards contained in the 2007 *California Plumbing Code*, Appendix G, were based upon requirements for private sewage disposal. These standards were found to be overly prescriptive, antiquated, and not readily usable by persons seeking to install graywater systems for the purpose of water conservation. HCD's approved amendment of the model code language is a supplement to the 2007 and 2010 California Plumbing Codes. The 2016 California Plumbing Code, as approved for adoption by the BSC, includes provisions for alternate water sources, including graywater and rainwater.

In September 2014, AB 2282 (Chapter 606, Statutes of 2014) was signed by Governor Brown. This bill added Sections 17921.5 and 18940.6 to the *Health and Safety Code*, related to recycled water systems. The bill, effective January 1, 2015, directed HCD to develop mandatory building standards for the installation of recycled water systems for newly constructed single-family and multifamily residential buildings. These building standards were adopted during the 2016 Intervening Code Adoption Cycle for the 2016 *California Plumbing Code* and *CALGreen* and became effective July 1, 2018. See commentary for Section 4.305.1 for additional information on implementation of AB 2282.

An elective measure for Water Efficiency and Conservation:

A4.303.3 Appliances. Install at least one qualified ENERGY STAR dishwasher or clothes washer.

Note: See Section A5.303.3 for nonresidential dishwashers and clothes washers.

COMMENTARY

PURPOSE

To further reduce the consumption of potable water.

EXAMPLE OF ACCEPTABLE METHOD OF IMPLEMENTATION AND/OR COMPLIANCE

Install at least one qualified ENERGY STAR dishwasher or clothes washer.

BACKGROUND

ENERGY STAR is a U.S. Environmental Protection Agency (EPA) voluntary program that helps businesses and individuals save money and protect the climate through superior energy efficiency. According to the ENERGY STAR program, clothes washers are the second largest water user in a home; therefore, a more efficient clothes washer would contribute to water savings as well as energy savings.

The 2013 *CALGreen* Section A4.303.3 provided an elective measure for appliances, which, if adopted by a jurisdiction or chosen by a builder, would require at least one appliance (dishwasher or clothes washer) to be ENERGY STAR with specified maximum allowed water use. HCD repealed the requirement for water use during the 2015 Triennial Code Adoption Cycle because it was part of the criteria required for these products to earn the ENERGY STAR certificate. Without duplicating the water use requirements in *CALGreen*, if the ENERGY STAR criteria are changed, Section A4.303.3 will automatically refer to the new ENERGY STAR requirement without the need of further modification of *CALGreen*.

The regulatory text for this section has been amended for the 2019 code.

An elective measure for Water Efficiency and Conservation:

A4.303.4 Nonwater urinals and waterless toilets. Nonwater urinals or composting toilets are installed.

Where approved, hybrid urinals, as defined in Chapter 2, shall be considered nonwater urinals.

COMMENTARY

PURPOSE

To promote additional water savings measures that will further reduce the overall water consumption in residential buildings.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Installation of nonwater urinals.

Special Note: The California Plumbing Code requires a water distribution line rough-in to the nonwater urinal location. Additionally, at least one water supplied fixture rated at 1 DFU* is required to be installed upstream of the nonwater urinal on the same drain line. *DFU means “Drainage fixture unit” and is defined in Chapter 2 of the California Plumbing Code.

- Installation of hybrid urinals.
- Installation of approved composting toilets or toilets using dehydration and evaporation technology.

BACKGROUND

Of all plumbing fixtures commonly found in dwellings, toilets have traditionally been known as the single biggest user of water attributing to more than 20 percent of all water used in a single-family home. Although water use has decreased through water saving legislation and improved low-flow toilet designs, toilets continue to consume huge amounts of potable water across the country. Dual flush toilets, successfully introduced in Europe many years ago, are now available in America and can significantly reduce the water required to flush liquid waste. U.S. manufacturers have improved low-flow toilets, generally referred to as high-efficiency toilets or HETs, which have an effective flush volume of 1.28 gallons (4.8 liters) or less. Currently, ultra high-efficiency toilets may have a flush volume as low as 0.8 gallons per flush.

Waterless fixtures may be utilized in areas that may not be able to implement water flush toilets due to local conditions or the absence of a sewage system. Nonwater urinals, composting toilets and other types of technology have been developed to either eliminate or drastically reduce the need for water to flush the liquid and solid waste into the building sewer system or composting chamber (for composting toilets).

Nonwater urinals operate with a special fixture trap and proprietary liquid, which floats on top of liquid waste to provide a seal and prevent sewer gas from entering the building. The proprietary liquid also functions as a deodorant to minimize odors. The deodorizing liquid is added before use and after each cleaning by the owner or maintenance personnel. Nonwater urinals only require periodic water rinsing during normal maintenance and cleaning.

HCD modified this section during the 2015 Triennial Code Adoption Cycle by clarifying that hybrid urinals, where approved for installation, are considered waterless (nonwater) urinals.

The hybrid urinal is a new product currently on the market. These urinals operate as nonwater urinals, but are connected to a water line. The hybrid urinals are able to use a water connection for the purpose of flushing, but do not require water to do so. Like waterless urinals, they rely on gravity to bring fluids down into the filter system; but use the water supply line at regular intervals to rinse the inside of the urinal bowl.

Composting toilets can be completely water free or use very little water. These toilets are self-contained and consist of a seat, a composting chamber, and a drying chamber. They can be supplied with heaters, dehydration fans, rotating tines and blower fans, or can be completely nonelectric. The integral venting system eliminates unpleasant odors. The compost needs to be emptied and toilet parts cleaned, usually twice a year depending on the amount of use. Composting toilets can be a solution to other problems, such as in areas with no public sewer systems, or where septic systems are problematic due to high groundwater, proximity to lakes or streams, or in rocky areas where leach lines are unable to be installed. Where approved, technologies using dehydration and/or evaporation may also be available and utilized under similar conditions.

An elective measure for Water Efficiency and Conservation:

A4.303.5 Hot water recirculation systems. One- and two-family dwellings shall be equipped with a demand hot water recirculation system, as defined in Chapter 2. The demand hot water recirculation system shall be installed in accordance with the *California Plumbing Code*, *California Energy Code*, and the manufacturer's installation instructions.

PURPOSE

To promote additional water saving measures that will further reduce the waiting time for hot water and the overall water consumption in residential buildings.

EXAMPLE OF ACCEPTABLE METHOD OF IMPLEMENTATION AND/OR COMPLIANCE

- Installation of demand hot water recirculation system.

BACKGROUND

The amount of potable water wasted while waiting for hot water to arrive to the point of use in a sink or other plumbing fixtures depends upon numerous factors – the distance between the point of use and the water heater, the water heater temperature setting, the location of the fixtures, internal pipe diameter, effective length, pipe insulation, user behavior, etc. The Department of Energy estimates that 3,600 to 12,000 gallons of water per year can be saved by the typical household of four. When energy used to treat municipal water, pump it to households, and then treat wastewater is factored in, the Department of Energy estimates that energy savings per the same household of four range from 800 to 1,600 kilowatt-hours per year. Demand hot water recirculation systems typically cost \$200 to \$350 up front and cost only \$27 per year in electricity or \$15 a year in natural gas to operate.

SECTION A4.304 OUTDOOR WATER USE

An elective measure for Water Efficiency and Conservation:

A4.304.1 Rainwater catchment systems. An approved rainwater catchment system is designed and installed to use rainwater generated by at least 65 percent of the available roof area. Rainwater catchment systems shall be designed and installed in accordance with the *California Plumbing Code*.

COMMENTARY

PURPOSE

To reduce the amount of potable water used for watering, landscape irrigation, car washing, pet and livestock watering, by implementing rainwater collection (typically a rooftop) and storage systems. Stored rainwater can then be transferred from the storage containers and piping systems for use.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Rainwater capture, storage and use systems utilizing rainwater from at least 65 percent of the roof area.
- Systems must be in compliance with the *California Plumbing Code* and be acceptable to the local enforcing agency, if applicable.

BACKGROUND

Rainwater collection systems have been used worldwide for centuries to take advantage of rainwater for irrigation, bathing, and drinking; however, due to the concern of microbial contamination in collected rainwater, it is not permitted for human consumption without proper filtering and treatment. The collection and reuse of rainwater can greatly reduce, and even eliminate, the use of potable water for irrigation and some indoor uses such as for toilets.

The regulatory text for this section has been amended for the 2019 code.

A4.304.2 Potable water elimination. When landscaping is provided and as allowed by local ordinance, a water efficient landscape irrigation design that eliminates the use of potable water beyond the initial requirements for plant installation and establishment shall be provided. Methods used to accomplish the requirements of this section shall comply with the requirements of the *California Building Standards Code* and shall include, but not be limited to, the following:

1. Use of captured rainwater.
2. Use of recycled water.
3. Water treated for irrigation purposes and conveyed by a water district or public entity.
4. Use of graywater.
5. Use of drought tolerant plants.

COMMENTARY

PURPOSE

To reduce the amount of potable water used for landscape irrigation by implementing rainwater collection, use of graywater, and recycled water.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Use of captured rainwater.
- Use of recycled water.
- Water treated for irrigation purposes and conveyed by a water district or public entity.
- Use of graywater.
- Use of climate appropriate plants that need minimal supplemental water after establishment.

An elective measure for Water Efficiency and Conservation:

A4.304.3 Landscape water meters. For new water service connections, landscaped irrigated areas less than 5,000 square feet shall be provided with separate submeters or metering devices for outdoor potable water use.

COMMENTARY

PURPOSE

To promote water efficient landscape design and installation and to achieve compliance with any adopted local water efficient landscape ordinances.

EXAMPLE OF ACCEPTABLE METHOD OF IMPLEMENTATION AND/OR COMPLIANCE

- Installation of separate water meters (or submeters) for irrigated landscape areas using potable water which are less than 5,000 square feet in area.

BACKGROUND

Recent years of drought and the increasing shortage of drinking water have led to an increase in water rates and an increase in discussions regarding water submetering. Installing water submeters in multifamily residential buildings, such as apartments, condos, and townhouses, and requiring each tenant to pay for their individual water usage has proven to reduce water consumption by tenants when compared to buildings without water submeters. Similarly, separate metering for landscape purposes provides information to the user on the quantity and cost of water used for irrigation and promotes awareness of efficient water use.

During the 2015 Triennial Code Adoption Cycle, HCD replaced the title “Irrigation metering device” to “Landscape water meters,” as used within the revised MWELo’s irrigation design plan requirements. HCD also amended the language to specify that the voluntary requirements for landscape water meters apply to landscape areas less than 5,000 square feet. In 2013 *CALGreen*, the voluntary measure for irrigation metering device applied to irrigated landscapes of more than 2,500 square feet. MWELo and the Water Code require submeters for irrigated residential landscapes of 5,000 square feet or greater. Local agencies may adopt a more restrictive minimum threshold, e.g., 500 square feet, through adoption of local amendments.

SECTION A4.305 WATER REUSE SYSTEMS

An elective measure for Water Efficiency and Conservation:

A4.305.1 Graywater. Alternative plumbing piping is installed to permit the discharge from the clothes washer or other fixtures to be used for an irrigation system in compliance with the *California Plumbing Code*.

COMMENTARY

PURPOSE

To minimize the volume of wastewater from dwellings that flows into the sewer system and to minimize the use of potable water by encouraging graywater to be used for irrigation.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Installation of alternative drainage piping from approved locations and reuse graywater for irrigation.
- Installation of graywater systems in compliance with the *California Plumbing Code* and acceptable to the local enforcing agency.
- Design approved by the local enforcing agency.

BACKGROUND

Graywater is defined in the California Plumbing Code, Chapter 2, as follows:

Graywater (HCD 1). Pursuant to *Health and Safety Code* Section 17922.12, “graywater” means untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. “Graywater” includes, but is not limited to, wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers.

Historically, graywater systems have been used for purposes of disposing of excess water and for landscape irrigation. However, specific building standards related to use of these systems were not adopted on a statewide basis. This changed with enactment of legislation (SB 1258, Chapter 172, Statutes of 2008) directing the Department of Housing and Community Development to develop and adopt building standards for the construction, installation, and alteration of graywater systems for indoor and outdoor uses. These regulations, as adopted in the California Plumbing Code, address the use of graywater and graywater systems for purposes of irrigation and conveyance to disposal fields. These regulations include provisions for unpermitted graywater systems limited to clothes washer systems, as defined, unless local enforcing agencies specifically prohibit their use or require permitting. The regulations include provisions for simple (discharge of less than 250 gallons daily) or complex (more than 250 gallons daily) systems, and also specifically provide for local enforcing agencies to further restrict or even prohibit the installation and use of graywater systems.

Information on availability, construction, operation and maintenance of graywater systems is available on the Internet and from manufacturers, educational institutions, and organizations promoting graywater use.

Note: *CALGreen* does not address the use of graywater for indoor purposes. Provisions for indoor use of recycled water, as defined, are addressed in the *California Plumbing Code*, Chapter 15, and part of building standards promulgated by the California Department of Water Resources.

Division A4.4 – MATERIAL CONSERVATION AND RESOURCE EFFICIENCY

SECTION A4.403 FOUNDATION SYSTEMS

An elective measure for Material Conservation and Resource Efficiency:

A4.403.1 Frost protected foundation systems. As allowed by local conditions, utilize a Frost-Protected Shallow Foundation (FPSF) in compliance with the *California Residential Code* (CRC). When an FPSF foundation system is installed, the manual required by Section 4.410.1 shall include instructions to the owner or occupant regarding the necessity for heating the structure as required in Section R403.3 of the *California Residential Code*.

COMMENTARY

PURPOSE

In colder climates, Frost-Protected Shallow Foundations (FPSFs) can reduce construction costs, minimize the amount of materials used, and promote green and sustainable construction by eliminating the need for constructing deep foundation footings that extend below the frost line.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Installation of FPSF per *California Residential Code* (CRC) requirements.
- Heat provided to all portions of building with FPSF.
- Provide instructions to owner or occupant per CRC Section R403.3 that outlines the necessity of heating the structure.

BACKGROUND

Foundations in cold climate areas can require excavation of 3 to 4 feet of earth or more in order to locate the foundation footings below the frost line. This prevents damage of the foundation caused by freezing and thawing of groundwater (also known as frost heaving). As an alternate to deep footings, insulation can be placed on the exterior side of the foundation wall, and extend away from the footings pursuant to CRC Section R403.3, provided the monthly mean temperature of the building is maintained at a minimum of 64°F (18°C). Further information on FPSFs is available in CRC Section R403.3 or ASCE 32-01 Design and Construction of Frost-Protected Shallow Foundations as adopted for the CRC and *California Building Code*.

Note: The provisions of Section A4.403.1 are only applicable to structures within the scope of the CRC, and do not apply to high-rise residential buildings.

Prerequisite Measure for Material Conservation and Resource Efficiency Tier 1 and Tier 2 as specified:

A4.403.2 Reduction in cement use. As allowed by the enforcing agency, cement used in foundation mix design shall be reduced as follows:

Tier 1. Not less than a 20 percent reduction in cement use.

Tier 2. Not less than a 25 percent reduction in cement use.

Note: Products commonly used to replace cement in concrete mix designs include, but are not limited to:

1. Fly ash.
2. Slag.
3. Silica fume.
4. Rice hull ash.

COMMENTARY

PURPOSE

To reduce the amount of carbon dioxide (CO₂) emissions generated by the manufacturing of cement, and promote the use of available industrial waste materials as a substitute for a portion of portland cement in concrete mix.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Utilize a mix design incorporating the addition of fly ash (pursuant to ASTM C618), blast furnace slag (pursuant to ASTM C989), silica fume, or rice hull ash as a substitute for a portion of the Portland cement used in concrete mix.
- Tier 1—20-percent Portland cement reduction must be achieved.
- Tier 2—25-percent Portland cement reduction must be achieved.

BACKGROUND

The production of concrete used in the construction of buildings requires the manufacture and use of the fundamental ingredient—Portland cement. The production of Portland cement requires approximately 85 percent of the energy required for the concrete construction process, and produces roughly 5 percent of the total carbon dioxide output caused by human activities, which is about 1.5 percent in North America alone. To significantly reduce the levels of CO₂ generated by the manufacturing of cement, manufacturing by-products such as fly ash, blast furnace slag, and silica fume can be added as a substitute for up to one-half of the required Portland cement. This can reduce the amount of embodied energy in concrete by up to one-third.

SECTION A4.405 MATERIAL SOURCES

Prerequisite Material Conservation and Resource Efficiency Measure for Tier 1 and Tier 2 as specified. Section A4.405.3 is discussed in several sections for ease of comprehension:

A4.405.3 Recycled content. Comply with the requirements for recycled content in Section A4.405.3.1.

A4.405.3.1 Recycled content. Use materials, equivalent in performance to virgin materials with a total (combined) recycled content value (RCV) of:

Tier 1. The RCV shall not be less than 10 percent of the total material cost of the project.

Required Total RCV (dollars) = Total Material Cost (dollars) x 10 percent
(Equation A4. 4-1)

Tier 2. The RCV shall not be less than 15 percent of the total material cost of the project.

Required Total RCV (dollars) = Total Material Cost (dollars) x 15 percent
(Equation A4. 4-2)

For the purposes of this section, materials used as components of the structural frame shall not be used to calculate recycled content. The structural frame includes the load bearing structural elements, such as wall studs, plates, sills, columns, beams, girders, joists, rafters, and trusses.

Notes:

1. Sample forms which allow user input and automatic calculation are located at <http://www.hcd.ca.gov/building-standards/calgreen/cal-green-forms.shtml> and may be used to simplify documenting compliance with this section and for calculating recycled content value of materials or assembly products.
2. Sources and recycled content of some recycled materials can be obtained from CalRecycle if not provided by the manufacturer.

COMMENTARY

PURPOSE

Provide incentive for using materials with recycled content and to reduce amount of reusable resources from permanent disposal.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Demonstrating usage of materials with at least 10 percent or 15 percent recycled content value for Tier 1 and Tier 2 projects, respectively.
- Using the following summary worksheets to document recycled content value of materials relative to total cost of materials for the project. Summary worksheets, including interac-

tive versions, are available on HCD's website. ([http:// www.hcd.ca.gov/building-standards/calgreen/cal-green-forms.shtml](http://www.hcd.ca.gov/building-standards/calgreen/cal-green-forms.shtml))

- Table 1 - Recycled Content Value Calculations.
- Table 2 - Assembly Product Recycled Content Calculations.
- Table 3 - Recycled Content Conversion Table (pounds to percent).
- Maintaining complete project records to verify recycled content of materials as well as total materials cost.

BACKGROUND

The general benefits of recycling, as listed below, are commonly known and details are readily available from many resources, including the California Department of Resources Recycling and Recovery (CalRecycle). Therefore, this guide will focus on *CALGreen*-specific provisions related to use of construction materials with recycled content.

BENEFITS OF RECYCLING

1. Saves virgin materials.
2. Uses less energy than extracting and processing virgin materials.
3. Reduces amount of materials destined for landfills.
4. Reduces greenhouse gases associated with extracting, processing and landfilling.
5. Increases carbon sequestration (capture and storage of carbon dioxide) through proper stewardship of forest, agricultural and land resources.

This section of *CALGreen* requires Tier 1 and Tier 2 projects to have minimum recycled content values for construction materials when implementing the enhanced Tier 1 and Tier 2 levels. This helps ensure that construction materials with recycled content are considered in the project design and materials procurement process and support the market for use of recycled materials. Examples of the need for recycling and use of recycled products are addressed in recent laws:

- Assembly Bill 1343 (Chapter 420/Statutes of 2010)—“Solid Waste: Architectural Paint Recovery Program”—which recognizes that architectural paint is the largest volume (35 percent) of waste product collected at publicly operated household hazardous waste facilities. This bill also established the Architectural Paint Recovery Program which requires paint manufacturers to develop and implement a program to collect, transport, process and dispose of postconsumer paint and to develop goals, in part, to promote reuse of postconsumer paint (see Section 4.408 for additional information).
- Assembly Bill 2398 (Chapter 681/Statutes of 2010)—“Product Stewardship: Carpets”—which recognizes that discarded carpet is one of the 10 most prevalent waste materials in California landfills and due to its weight and bulk imposes significant costs related to disposal. This bill requires manufacturers of carpets to develop a product stewardship plan for landfill diversion and recycling of postconsumer carpet, including incentivizing market growth of secondary products made from postconsumer carpet. Some building materials made from recycled carpet include carpet, carpet cushion, plastic-wood composites, or erosion control products (see Section 4.408 for additional information).

DISCUSSION

CALGreen requires Tier 1 and Tier 2 residential projects to include a specified value for recycled content based on the total cost of construction materials. This section of *CALGreen*, amended in July 2011 (effective July 1, 2012), did not change the original requirement for recycled content

value for each tier, but provided further clarification and methods for calculation and documentation of recycled content value and total cost of materials for construction. This section specifically excludes materials used as components of the structural frame from the recycled content calculation. (The structural frame includes the load-bearing structural elements, such as wall studs, plates, sills, columns, beams, girders, joists, rafters, and trusses.)

To provide assistance to enforcing agencies and code users, HCD has developed a series of forms to help calculate and document recycled content, recycled content value and the total cost of construction materials for a residential project. A hyperlink to sample forms and worksheets is provided in Chapter 8 of this guide and is also available on our website as interactive and modifiable forms. These forms incorporate the formulas in this section and are discussed on the following pages.

Compliance Methods and Supporting Documents:

The 2019 *CALGreen* mandates recycled content value (RCV) of at least 10 percent for Tier 1 (15 percent for Tier 2) in newly constructed residential projects. In order to implement this measure, several items need to be clearly identified:

- Required Tier 1 (10 percent) or Tier 2 (15 percent) goals (in dollars) as a percentage of total material cost.
- Total material cost for the project.
- Quantity of recycled content used on the project.
- Value of the recycled content.

Identifying RCV needed to meet Tier 1 or Tier 2 requirements:

The Tier 1 and Tier 2 RCV requirements are 10 percent and 15 percent, respectively, of total cost of materials. These formulas are identified in Section A4.405.3:

Examples for a residential structure with a total materials cost of \$135,000:

Tier 1 10% RCV required
 $\$135,000 \times .10 = \$13,500$ minimum RCV needed **(Equation A4. 4-1)**

Tier 2 15% RCV required
 $\$135,000 \times .15 = \$20,250$ minimum RCV needed **(Equation A4. 4-2)**

Note that the target RCV is identified in dollars as a percentage of the total material cost. The indicated minimum RCV represents the minimum amount of recycled content value for the project. Documentation needs to support that this minimum amount is included in the construction materials for the project. List a sufficient number of materials and/or assembly products to meet the required percentage of RCV. Products with a higher combination of cost and recycled content may show compliance with the RCV requirements more efficiently.

The simplest approach for documenting that a project met the Tier 1 or Tier 2 RCV requirements would be to focus on the materials with highest recycled content and greater costs. Depending on the materials used, the minimum RCV requirements may be met by only a few materials or items.

A4.405.3.1.1 Total material cost. Total material cost is the total estimated or actual cost of materials and assembly products used in the project. The required total recycled content value for the project (in dollars) shall be determined by Equation A4.4-1 or Equation A4.4-2.

Total material cost shall be calculated by using one of the methods specified below:

- 1. Simplified method.** To obtain the total cost of the project, multiply the square footage of the residential structure by the square foot valuation established pursuant to the ICC Building Valuation Data (BVD) or other valuation data approved and/or established by the enforcing agency. The total material cost is 45 percent of the total cost of the project. Use Equations A4.4-3A or A4.4-3B to determine total material costs using the simplified method.

Total material costs =

Project square footage x square foot valuation x 45 percent **(Equation A4.4-3A)**

Total estimated or actual cost of project x 45 percent **(Equation A4.4-3B)**

- 2. Detailed method.** To obtain the total cost of the project, add the estimated and/or actual costs of materials used for the project, including the structure (steel, concrete, wood or masonry); the enclosure (roof, windows, doors and exterior walls); the interior walls, ceilings and finishes (gypsum board, ceiling tiles, etc.). The total estimated and/or actual costs shall not include fees, labor and installation costs, overhead, appliances, equipment, furniture or furnishings.

Determining total material cost for a project:

HCD has identified use of a simplified method, with two options and associated equations, for determining cost of materials:

Simplified method Option 1:

Project square footage x square foot valuation x 45 percent **(Equation A4.4-3A)**

This option provides for calculation of material cost using the square footage of the residential structure, the square foot valuation as determined by the International Code Council (ICC) building valuation data or other valuation data approved by the enforcing agency, and an “average” multiplication factor of 45 percent to derive “average” material cost for a project. Note that the square foot valuation, which does not include the price of the land, is subject to updating every 6 months. The most current information is available on ICC’s website (www.iccsafe.org) and searching for “Building Valuation Data” or “BVD.” Local jurisdictions may also modify this number to accommodate regional cost differences.

An example calculation for a 3,200-square-foot single-family residence using square foot construction cost of \$101.90 follows:

Example: 3,200 square feet x \$101.90/square foot x .45 = \$146,736 = total material cost

Simplified method Option 2:

Total estimated or actual cost of project x 45 percent **(Equation A4.4-3B)**

This option provides for calculation of material cost using the estimated or actual construction costs of the project. The price of the land is not included in this calculation. Similar to the first option, this calculation uses an “average” multiplication factor of 45 percent to derive “average” material cost for a project.

An example calculation for a single-family residence with project construction costs of \$300,000 follows:

Example: $\$300,000 \times .45 = \$135,000 = \text{total material cost}$

HCD has also identified and clarified use of a detailed method for determining total material cost if this method was preferable to the builder or owner. To use this method for determining total material cost, add the estimated and/or actual costs of materials used for the project, including the structure (steel, concrete, wood or masonry); the enclosure (roof, windows, doors and exterior walls); the interior walls, ceilings and finishes (gypsum board, ceiling tiles, etc.). Do not include fees, labor and installation costs, overhead, appliances, equipment, furniture or furnishings. The price of the land is also not included for this calculation.

A4.405.3.1.2 Determination of total recycled content value (RCV). Total RCV may be determined either by dollars or percentage as noted below.

- 1. Total recycled content value for the project (in dollars).** This is the sum of the recycled content value of the materials and/or assemblies considered and shall be determined by Equation A4.4-4. The result of this calculation may be directly compared to Equations A4.4-1 and A4.4-2 to determine compliance with Tier 1 or Tier 2 prerequisites.

$$\text{Total Recycled Content Value (dollars)} = (\text{RCV}_M + \text{RCV}_A) \quad \text{(Equation A4.4-4)}$$

- 2. Total recycled content value for the project (by percentage).** This is expressed as a percentage of the total material cost and shall be determined by Equation A4.4-4 and Equation A4.4-5. The result of this calculation may be directly compared for compliance with Tier 1 (10 percent) or Tier 2 (15 percent) prerequisites.

$$\text{Total Recycled Content Value (percent)} = \frac{[\text{Total Recycled Content Value (dollars)}]}{\text{Total Material Cost (dollars)}} \times 100 \quad \text{(Equation A4.4-5)}$$

A4.405.3.1.3 Determination of recycled content value of materials (RCV_M). The recycled content value of each material (RCV_M) is calculated by multiplying the cost of material, as defined by the recycled content. See Equations A4.4-6 and A4.4-7.

$$\text{RCV}_M \text{ (dollars)} = \text{Material cost (dollars)} \times \text{RC}_M \text{ (percent)} \quad \text{(Equation A4.4-6)}$$

$$\text{RC}_M \text{ (percent)} = \text{Postconsumer content percentage} + \left(\frac{1}{2}\right) \text{Preconsumer content percentage} \quad \text{(Equation A4.4-7)}$$

Notes:

- If the postconsumer and preconsumer recycled content is provided in pounds, Equation A4.4-7 may be used, but the final result (in pounds) must be multiplied by 100 to show RC_M as a percentage.
- If the manufacturer reports total recycled content of a material as one percentage in lieu of separately reporting preconsumer and postconsumer values, the total shall be considered preconsumer recycled material.

Determining Recycled Content (RC) of materials

CALGreen Section A4.405.3.1.3 provides a formula for calculating recycled content of materials:

$$RC_M \text{ (percent)} = \text{Postconsumer content percentage} + \left(\frac{1}{2}\right) \text{ Preconsumer content percentage}$$

(Equation A4.4-7)

Example: Company X gypsum board consists of 6.2-percent postconsumer RC and 93-percent preconsumer RC. In accordance with Equation A4.4-7, RCM for this item is calculated as all of the postconsumer RC and half of the preconsumer (post-industrial) RC. Therefore, the total recycled content of the material (RCM) = 6.2% + (.5)(93%) = 52.7%.

Note: Do not include materials used as components of the structural frame in the recycled content calculation. The structural frame includes the load-bearing structural elements, such as wall studs, plates, sills, columns, beams, girders, joists, rafters, and trusses.

This section also provides clarifying language that when recycled content of a material is not separately reported as preconsumer recycled content and postconsumer recycled content, it is considered 100-percent preconsumer recycled content. This is intended to encourage manufacturers to designate and report the recycled content in materials as preconsumer and postconsumer, and to provide additional benefits for manufacturers using only postconsumer recycled content in their products.

Example: Company Y identifies windows as having a total recycled content of 40 percent, but does not provide breakdowns for preconsumer and postconsumer recycled content. Therefore, recycled content for purposes of CALGreen is calculated as 40-percent preconsumer recycled content for the item.

A4.405.3.1.4. Determination of recycled content value of assemblies – (RCV_A). Recycled content value of assemblies is calculated by multiplying the total cost of the assembly by the total recycled content of the assembly (RC_A), and shall be determined by Equation A4.4-8.

$$RCV_A \text{ (dollars)} = \text{Assembly cost (dollars)} \times \text{Total } RC_A \text{ (percent)}$$

(Equation A4.4-8)

If not provided by the manufacturer, Total RC_A (percent) is the sum (Σ) of the Proportional Recycled Content (PRC_M) of each material in the assembly. RC_A shall be determined by Equation A4.4-9.

$$RC_A = \Sigma PRC_M$$

(Equation A4.4-9)

PRC_M of each material may be calculated by one of two methods using the following formulas:

Method 1: Recycled content (postconsumer and preconsumer) of each material provided in percentages

$$PRC_M \text{ (percent)} = \text{Weight of material (percent)} \times RC_M \text{ (percent)}$$

(Equation A4.4-10)

$$\text{Weight of material (percent)} = [\text{Weight of material (lbs)} \div \text{Weight of assembly (lbs)}] \times 100$$

(Equation A4.4-11)

$$RC_M \text{ (percent)} = \text{Postconsumer content percentage} + \left(\frac{1}{2}\right) \text{ Preconsumer content percentage}$$

(See Equation A4.4-7)

Method 2: Recycled content (postconsumer and preconsumer) provided in pounds

$$PRC_M \text{ (percent)} = [RC_M \text{ (lbs)} \div \text{Weight of material (lbs)}] \times 100$$

(Equation A4.4-12)

$$RC_M \text{ (lbs)} = \text{Postconsumer content (lbs)} + (1/2) \text{ Preconsumer content (lbs)}$$

(Equation A4.4-13)

Note: If the manufacturer reports total recycled content of a material as one percentage in lieu of separately reporting preconsumer and postconsumer values, the total shall be considered preconsumer recycled material.

Determining Recycled Content (RC) of assemblies (more than one material):

CALGreen Section A4.405.3.1.4 provides formulas for calculating recycled content of assemblies (more than one material in a product):

Recycled content of an assembly item:

$$RC_A = \sum PRC_M$$

(Equation A4.4-9)

If not provided by the manufacturer, Total RC_A (percent) is the sum (\sum) of the Proportional Recycled Content (PRC_M) of each material in the assembly. RC_A shall be determined by Equation A4.4-9.

Example: Company Z carpet includes three components with the following RC breakdowns as a percentage of total weight with postconsumer and preconsumer recycled content as shown. Note that the proportional recycled content column shows the percentage of the weight of the component in the assembly multiplied by the percentages of postconsumer RC and preconsumer RC. The total of proportional recycle content values are summed to get total percentages of postconsumer RC and preconsumer RC in the assembly.

COMPONENTS	PERCENTAGE OF TOTAL WEIGHT	POSTCONSUMER RECYCLED CONTENT	PRECONSUMER RECYCLED CONTENT	PROPORTIONAL RECYCLED CONTENT
Face Material	40%	0%	90%	0% Postconsumer 36% Preconsumer
Primary Backing	10%	0%	0%	0% Postconsumer 0% Preconsumer
Secondary Backing	50%	30%	50%	15% Postconsumer 25% Preconsumer
Total Recycled Content *				15% Postconsumer 61% Preconsumer

***Note:** Total recycled content values still need to be adjusted per Equation A4.4-7 to reduce the preconsumer recycled content by 50 percent.

This section provides two methods for determining recycled content of assembly products based on whether recycled content information is provided by the manufacturer in percentages or by weight (pounds).

This section, like Section A4.405.3.1.3, also provides clarifying language that when recycled content of a material is not separately reported as preconsumer recycled content and postconsumer recycled content, it is considered 100-percent preconsumer recycled content.

A4.405.3.1.5. Alternate method for concrete. When Supplementary Cementitious Materials (SCMs), such as fly ash or ground blast furnace slag cement, are used in concrete, an alternate method of calculating and reporting recycled content in concrete products shall be permitted. When determining the recycled content value, the percent recycled content shall be multiplied by the cost of the cementitious materials only, not the total cost of the concrete.

This section provides an alternative method for calculating recycled content value of concrete mixtures using supplementary cementitious materials (SCMs) by using only the cost of the cementitious materials in a concrete mix (or batch) in lieu of using the cost of entire concrete mix or batch. The recycled content value would be based on the recycled content of the cementitious materials only. This is a reasonable approach since SCMs which are recycled materials are very light in weight and especially when SCMs are the only recycled component in a concrete mix.

Use of interactive forms for Recycled Content Value (RCV)
(See www.hcd.ca.gov/building-standards/CALGreen/cal-green-forms.shtml)

SECTION A4.408 CONSTRUCTION WASTE REDUCTION, DISPOSAL AND RECYCLING

Prerequisite measure for Construction Waste Reduction, Disposal and Recycling Material Tier 1 and Tier 2 as specified:

A4.408.1 Enhanced construction waste reduction. Nonhazardous construction and demolition debris generated at the site is diverted to recycle or salvage in compliance with one of the following:

Tier 1. At least a 65 percent reduction. Any mixed recyclables that are sent to mixed-waste recycling facilities shall include a qualified third party verified facility average diversion rate. Verification of diversion rates shall meet minimum certification eligibility guidelines, acceptable to the local enforcing agency.

Tier 2. At least a 75 percent reduction with a third-party verification as required for Tier 1.

Exceptions:

1. Equivalent or alternative waste reduction methods are developed by working with local agencies if diversion or recycle facilities capable of compliance with this item do not exist.
2. The enforcing agency may make exceptions to the requirements of this section when jobsites are located in areas beyond the haul boundaries of the diversion facility.

A4.408.1.1 Documentation. Documentation shall be provided to the enforcing agency which demonstrates compliance with this section. Documentation shall be in compliance with Section 4.408.5.

COMMENTARY

PURPOSE

Construction waste diverted from landfills will help reduce landfill production of methane gas, a direct greenhouse gas. In addition, reusing and recycling materials typically results in less energy use than producing materials from virgin materials; conservation of the original resources and reduces the burden on landfills (see commentary for Section 4.408.1).

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Utilize a recycling facility that processes and recycles mixed construction and demolition waste materials that has received third-party certification of their recycling rates.
- Utilize only qualified third-party organizations meeting minimum certification eligibility criteria acceptable to the local enforcing agency. Examples of certification eligibility criteria include, but is not limited to:
 - The third-party certification organization continuously monitors “certified” facilities to ensure that the facilities are operating legally and meet the minimum requirements for facility certification and recycling rates.
 - At a minimum, the third-party certification organization conducts at least one on-site visit of the “certified” facility for the first year with subsequent site visits occurring at least once every two (2) years unless additional visits are deemed necessary by the certification organization or the local enforcing agency. The site visit includes at a minimum: interviews with key personnel; confirmation of recycling equipment types and capacity; review of incoming waste load classification in the tracking system; verification of the use and accuracy of scales (including calibration frequency); and how materials are measured, deposited, processed or sorted before exiting the facility.
 - Data submitted by the facilities to the certification organization in support of the recycling rate is audited. The audit includes, at a minimum: the evaluation of recyclables sale records, verification of facility sales into commodity markets, monitoring off-site movement of materials, and a review of the facilities’ customers weight tags information.
 - Facilities submit data to the certification organization that supports the recycling rate, such as a mass balance recycling rate (tons in/tons out) for a 12-month period or quarterly sorts completed and verified by an independent third-party entity.
 - Reporting requirements:
 - Measurements must be based on weight (not volume), using scales.
 - Recycling rates must be available on a website and viewable by the general public.
 - Reporting should include a breakdown of material categories (by type and by weight), including analysis of supporting data relating to amounts (in tons) and types of materials received and processed at the facility.

BACKGROUND

HCD amended the regulatory text in Section A4.408.1 during the 2015 Triennial Code Adoption Cycle (2016 *CALGreen*). The modified language increases the verification requirements for Tier 1 and Tier 2, and keeps the same percentages (65 percent and 75 percent) respectively, for construction waste reduction.

Additional verification requirements for Tier 1 and Tier 2, as voluntary measures, will aid in CalRecycle’s statewide recycling goal of 75 percent for 2020 as stated in AB 341 (Chapter 476, Statutes of 2011).

Division A4.5 – ENVIRONMENTAL QUALITY

SECTION A4.504 POLLUTANT CONTROL

An elective measure for Environmental Quality:

A4.504.1 Compliance with formaldehyde limits. Use composite wood products made with either California Air Resources Board approved no-added formaldehyde (NAF) resins or ultra-low emitting formaldehyde (ULEF) resins.

Note: Documentation must be provided that verifies that finish materials are certified to meet the pollutant emission limits.

COMMENTARY

PURPOSE

To reduce air pollutants and improve indoor air quality by decreasing the amount of formaldehyde emitted from composite wood products.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Use of composite wood products using “no added formaldehyde” or “ultra-low emitting formaldehyde” resins.
- Documentation must be available to demonstrate the use of NAF or ULEF resins in the products.

BACKGROUND

This information is from the California Air Resources Board’s (ARB) websites on the Composite Wood Products Airborne Toxic Control Measure (ATCM), as of September 2018, and on Composite Wood Products as of April 2015:

“Composite Wood Products are wood-based panels made from wood pieces, particles, or fibers bonded together with an adhesive which may consist of urea-formaldehyde. Composite, or “pressed” wood made for indoor use includes: hardwood plywood paneling, used for decorative wall covering and used in cabinets and furniture; particleboard, used as sub-flooring and shelving and in cabinetry and furniture; and medium density fiberboard, used for drawer fronts, cabinets, and furniture tops. Medium density fiberboard contains a higher resin-to-wood ratio than any other UF pressed wood product and is generally recognized as being the highest formaldehyde-emitting pressed wood product.

“Formaldehyde is produced on a large scale worldwide. One major use includes the production of wood binding adhesives and resins. The California Air Resources Board (CARB) evaluated formaldehyde exposure in California and found that one of the major sources of exposure is from inhalation of formaldehyde emitted from composite wood products containing urea-formaldehyde resins.

“The Composite Wood Products (CWP) Regulation includes provisions for no-added formaldehyde (NAF) and ultra-low-emitting formaldehyde-based resins (ULEF), to encourage the

use of these lower-emitting resins in composite wood products. However, it is difficult to know if a product is made with these materials unless a manufacturer or fabricator promotes their product as such or specifies it on their product or label. Under the CWP Regulation, a manufacturer or fabricator of NAF/ULEF products may elect to simply label their product as Phase 2 compliant, even though their product emits less formaldehyde than the Phase 2 levels.”

“The Airborne Toxic Control Measure (ATCM) to control formaldehyde emissions from composite wood products was approved on April 26, 2007, by the California Air Resources Board (CARB). The regulation has been filed with the Secretary of State and is codified into Title 17 of the California Code of Regulations, and is now effective.

“In the ATCM, special provisions were provided for manufacturers of hardwood plywood, particleboard, and medium density fiberboard who plan to use no-added formaldehyde (NAF) based resins [Section 93120.3(c)] or ultra-low-emitting formaldehyde (ULEF) resins [Section 93120.3(d)]. NAF-based resins are resins formulated with no added formaldehyde as part of the resin cross linking structure, and include resins made from soy, polyvinyl acetate, or methylene diisocyanate. ULEF resins are formaldehyde containing resins formulated such that the formaldehyde emissions from composite wood products are consistently below applicable Phase 2 emission standards.”

CALGreen Section A4.504.1 recognizes the use of composite wood products including NAF or ULEF resins as an elective measure for decreasing indoor pollutants.

For further information, please visit the California Air Resources Board website at: <http://www.arb.ca.gov/toxics/compwood/compwood.htm>

Prerequisite measure for Environmental Quality Tier 1 and Tier 2 as specified:

A4.504.2 Resilient flooring systems. Resilient flooring systems installed in the building shall meet the percentages specified in this section and comply with the VOC-emission limits defined in at least one of the following:

1. Products compliant with the California Department of Public Health, “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers,” Version 1.1, February 2010 (also known as Specification 01350), certified as a CHPS Low-Emitting Material in the Collaborative for High Performance Schools (CHPS) High Performance Products Database.
2. Products certified UL GREENGUARD GOLD (formerly the Greenguard Children & Schools program.)
3. Certification under the Resilient Floor Covering Institute (RFCI) FloorScore program.
4. Meet the California Department of Public Health, “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers,” Version 1.1, February 2010 (also known as Specification 01350).

Tier 1. At least 90 percent of the total area of resilient flooring installed shall comply.

Tier 2. At least 100 percent of the total area of resilient flooring installed shall comply.

Exception for Tier 2: An allowance for up to 5 percent specialty purpose flooring may be permitted.

Note: Documentation must be provided that verifies that finish materials are certified to meet the pollutant emission limits in this section.

COMMENTARY

PURPOSE

To reduce air pollutants and improve indoor air quality by decreasing the amount of volatile organic compounds (VOCs) used in flooring systems.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Tier 1 – 90 percent of the total area of resilient flooring shall be *CALGreen* compliant.
- Tier 2 – 100 percent of the total area of resilient flooring shall be *CALGreen* compliant. (*CALGreen* provides an allowance of 5 percent of specialty flooring not meeting this requirement.)
- Products compliant with the California Department of Public Health, “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers,” Version 1.1, February 2010 (also known as Specification 01350), certified as a CHPS Low-Emitting Material in the Collaborative for High Performance Schools (CHPS) High Performance Products Database. **Note:** CDPH has released a new version “Version 1.2 January, 2017” which supersedes Version 1.1
- Products certified as UL GREENGUARD GOLD (formerly the Greenguard Children & Schools program).
- Flooring certified under RFCI’s FloorScore program.
- Products meeting specifications of the California Department of Public Health, “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers,” Version 1.1, February 2010 (also known as Specification 01350). Note: CDPH has released a new version “Version 1.2 January, 2017” which supersedes Version 1.1
- Provide documentation of product certification and compliance.
- A hyperlink to sample forms and worksheets is provided in Chapter 8 of this guide. These forms may be used for documenting VOCs and formaldehyde content in adhesives, paints and coatings, flooring and composite wood products used in the structure. These forms should be supplemented by product labels, specifications, Material Safety Data Sheets, evidence of certifications, or other means acceptable to the local enforcing agency. These forms are samples and may be modified by the user as needed.

BACKGROUND

As discussed for Section 4.504.4, the 2016 *CALGreen* implements Executive Order B-18-12 by increasing the mandatory and voluntary percentage of resilient flooring to meet specified VOC limits. The 80-percent 2010 Tier 1 level requirement became the mandatory requirement in the 2013 *CALGreen*. The 2013 Tier 1 requirement became 90 percent, which previously was the 2010 Tier 2 requirement. The 2013 Tier 2 requirement increased to 100 percent with an exception for 5 percent specialty flooring.

The U.S. Environmental Protection Agency (EPA) states that volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of

which may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors.

The U.S. EPA also identifies source control as the best strategy to improve indoor air quality (IAQ) and limit chemical exposure. Resilient flooring and adhesives used for installation have historically emitted high levels of VOCs. For example, resilient flooring, including adhesives used in the installation process and materials used for maintenance, often off-gas VOCs for a period of time after installation. The amount of VOC concentration indoors can be reduced by selection of appropriate flooring materials, adhesives, and cleaning products, and airing out spaces with newly installed resilient flooring for at least 72 hours.

Note: This section provides references to several organizations that provide certification of VOC content for resilient flooring.

Prerequisite measure for Environmental Quality Tier 1 and Tier 2 as specified:

A4.504.3 Thermal insulation. Thermal insulation installed in the building shall meet the following requirements:

Tier 1. Install thermal insulation in compliance with the California Department of Public Health, “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers,” Version 1.1, February 2010 (also known as Specification 01350), certified as a CHPS Low-Emitting Material in the Collaborative for High Performance Schools (CHPS) High Performance Products Database; products certified under the UL GREENGUARD Gold (formerly Greenguard Children & Schools program); or meet California Department of Public Health, “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers,” Version 1.1, February 2010 (also known as Specification 01350).

Tier 2. Install insulation which complies with Tier 1 plus does not contain any added formaldehyde.

Note: Documentation must be provided that verifies the materials are certified to meet the pollutant emission limits in this section.

COMMENTARY

PURPOSE

To reduce air pollutants and improve indoor air quality by decreasing the amount of formaldehyde emitted from wall and ceiling insulation.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- **Tier 1.** Install insulation certified as a low-emitting material in the CHPS High Performance Products Database, certified under the UL GREENGUARD Gold program, or that meets specifications of the California Department of Public Health, “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers,” Version 1.1, February 2010 (also known as Specification 01350).

Note: CDPH has released a new version “Version 1.2 January, 2017” which supersedes Version 1.1

- **Tier 2.** Install insulation meeting requirements for Tier 1 that also has no added formaldehyde.

BACKGROUND

Formaldehyde is widely used by industry to manufacture building materials and numerous household products. Formaldehyde is an organic compound and a natural by-product of combustion; thus, it may be present in sizeable concentrations both indoors and outdoors. In new products, high indoor temperatures or humidity can cause increased release of formaldehyde. Formaldehyde emissions generally decrease as products age. In view of its widespread use, toxicity and volatility, exposure to formaldehyde is a significant consideration for human health, especially as construction trends continue to build tighter and tighter building envelopes. Sources of formaldehyde include materials such as wall and ceiling insulation. Installation of low-VOC, “No-Added Formaldehyde,” or formaldehyde-free insulation will greatly reduce the amounts of formaldehyde off-gased into indoor air.

SECTION A4.506 INDOOR AIR QUALITY AND EXHAUST

The regulatory text for Section A4.506.1 requiring return and incoming air filters with a value of MERV (minimum efficiency reporting value) 6 or greater has been repealed from CALGreen to avoid conflict with the California Energy Code (CEC). The 2019 CEC has been modified to require residential structures to have at least MERV 13 air filters. The MERV 13 requirement also applies to high-rise residential and hotels/motels.

An elective measure for Environmental Quality:

A4.506.2 Construction filter [HR]. Provide filters on return air openings rated at MERV 8 or higher during construction.

COMMENTARY

PURPOSE

To promote and encourage the use of filters with MERV 8 or greater capacity during construction. Use of construction filters will help ensure that the installed HVAC equipment and ductwork remains clean and minimizes the accumulation of construction dust and contaminants within these components.

EXAMPLES OF ACCEPTABLE METHODS OF IMPLEMENTATION AND/OR COMPLIANCE

- Installation of filters with MERV 8 or greater capacity during construction.
- Work with an HVAC contractor to ensure that the filter used will not result in an unacceptable drop in pressure or otherwise compromise function of the equipment.
- Replacement of any used filters after completion of construction.

BACKGROUND

MERV, or minimum efficiency reporting value, is a number typically varying from 1 to 16 that is relative to an air filter's efficiency at trapping dust particles and other airborne contaminants. The higher the MERV, the more efficient the air filter is at removing particles. (Highest ratings are used for non-residential uses such as hospitals, cleanrooms, carcinogenic materials, etc.) A filter with a higher MERV rating has more resistance to airflow (pressure drop) since the filter media becomes denser as filtering efficiency increases. Therefore, it is important that a higher MERV filter not decrease the efficiency of the HVAC system by over-restricting air flow. Design and installation of HVAC systems should consider the impact of the filters on the HVAC system and ducts selected to ensure maximum system efficiency. After installation, all filters should be regularly maintained (cleaned or replaced) to ensure they are functioning as required.

The change in requirement from the MERV 6 to MERV 8 construction filter provides consistency with the requirements for construction filters for nonresidential buildings.

An elective measure for Environmental Quality:

A4.506.3 Direct-vent appliances. Direct-vent heating and cooling equipment shall be utilized if the equipment will be located in the conditioned space or install the space heating and water heating equipment in an isolated mechanical room.

COMMENTARY

PURPOSE

This requirement prevents use of indoor air for combustion air or the exhaust of combustion products into habitable or conditioned spaces.

BACKGROUND

Direct-vent units draw all combustion air from the outside, and exhaust all products of combustion to the outside of a building through either one integral, or two separate pipes, known as either "coaxial" (one pipe within another) or "co-linear" (side-by-side) vent pipes. This technology prevents use of indoor air for combustion or exhausting of contaminants into indoor spaces. Isolating nondirect vent appliances into mechanical rooms would ensure that the equipment is sealed or separated from habitable space and sufficient combustion and exhaust air is provided.



Figure 1 State Housing Law Program staff photo: Drought-resistant landscaping.

Division A4.6 – TIER 1 AND TIER 2

SECTION A4.601 GENERAL

A4.601.1 Scope. The measures contained in this appendix are not mandatory unless adopted by a city, county, or city and county as specified in Section 101.7. The provisions of this section outline means of achieving enhanced construction or reach levels by incorporating additional green building measures. In order to meet one of the tier levels designers, builders or property owners are required to incorporate additional green building measures necessary to meet the threshold of each level.

A4.601.2 Prerequisite measures. Tier 1 and Tier 2 thresholds require compliance with the mandatory provisions of this code and incorporation of the required prerequisite measures listed in Section A4.601.4.2 for Tier 1 and A4.601.5.2 for Tier 2. Prerequisite measures are also identified in the Residential Occupancies Application Checklist in Section A4.602.

As specified in Section 101.7, additional prerequisite measures may be included by the enforcing agency to address specific local environmental conditions and may be listed in the Innovative Concepts and Local Environmental Conditions portions of the checklist.

A4.601.3 Elective measures. In addition to the required measures, Tier 1 and Tier 2 buildings must incorporate at least the number of elective measures specified in Sections A4.601.4.2 and A4.601.5.2.

COMMENTARY

PURPOSE

These sections provide clarity for achieving enhanced green building utilizing *CALGreen* Tier 1 and Tier 2 voluntary options. These sections clarify that although local adoption of Tier 1 and Tier 2 standards is voluntary, the use of these tiers includes some prerequisite measures as well as a specified number of elective measures.

Introduction to Tier 1 and Tier 2:

Tier 1 and Tier 2 are voluntary measures which provide a framework to reach enhanced levels of green building. Tier 1 and Tier 2 were developed in response to numerous requests for a state-wide, consistent method of enhancing green construction practices while also allowing for local flexibility.

To become mandatory, *CALGreen* Tier 1 or Tier 2 must be adopted by the local governing body through ordinance or resolution with filing of express findings with the CBSC. Residential structures are still required to comply with all required mandatory measures in *CALGreen* Chapter 4, but must meet increased prerequisites and elective measures established to achieve Tier 1 or Tier 2. Each tier reduces energy and water consumption and further reduces perceived negative or harmful effects associated with the built environment. Nothing precludes an owner, builder or designer from voluntarily incorporating additional features into a building's design.

Benefits of Adopting *CALGreen* Tier 1 and Tier 2 standards:

- Achieves enhanced levels of green building.
- Demonstrates local commitment to sustainable building.
- Saves time and money needed for local enforcing agencies to independently develop green building measures.
- Provides consistency for enhanced green building on a regional basis.
- Gives jurisdictions the flexibility to adopt measures based on local climatic, environmental, geological or topographical conditions.

Tier 1 and Tier 2 – Mandatory, Prerequisite and Elective Measures:

The voluntary measures in *CALGreen* Appendix A4 align with similarly numbered divisions in *CALGreen* Chapter 4. For example, the mandatory measures for water efficiency and conservation are discussed in *CALGreen* Division 4.3 and voluntary measures are discussed in *CALGreen* Appendix A4, Division A4.3. Again, it is important to emphasize that the measures in Appendix A4 are voluntary unless adopted by a city, county, or city and county by local ordinance with filing of express findings with the CBSC. (See sample Residential Model Ordinance in Appendix A4, Division A4.7.) There are specific prerequisites set forth for each tier. In addition to these prerequisite measures, Tier 1 and Tier 2 buildings must incorporate the designated number of elective measures as outlined in Sections A4.601.4.2 and A4.601.5.2. See Tier 1 and Tier 2 summary spreadsheets at the end of this division.

The 2019 *CALGreen* Tier 1 and Tier 2 energy efficiency measures have been developed by the California Energy Commission (CEC). The energy efficiency measures are also anticipated to be maintained by the CEC. The energy efficiency measures developed by CEC follow the organization of the *California Energy Code* in separating building types into low-rise residential versus

nonresidential, high-rise residential/hotel/motel/nonresidential. Therefore, tier requirements for purposes of energy efficiency are located in both A4.2 (residential) and A5.2 (nonresidential and as specified for high-rise residential and hotel/motel) divisions of *CALGreen*.

As specified in *CALGreen* Section 101.7, additional measures may be included by the enforcing agency to address specific local environmental conditions and may be listed in the Innovative Concepts and Local Environmental Conditions portions of the application checklist. Because of this, the exact requirements for Tier 1 or Tier 2 may vary between local agencies and it is important to verify the specific local requirements of each jurisdiction.

Tier 1 Requirements

Tier 1 Prerequisite and Elective Measures (A4.601.4.2):

In addition to the mandatory measures, compliance with the following prerequisite and elective measures from Appendix A4 is also required to achieve Tier 1 status:

The regulatory text for this section has been amended for the 2019 code.

A4.601.4 Tier 1. To achieve Tier 1 status a project must comply with the following:

A4.601.4.1 Mandatory measures for Tier 1. The project shall meet or exceed all of the mandatory measures in Chapter 4, Divisions 4.1 through 4.5 and Chapter 7 as applicable.

A4.601.4.2 Prerequisite and elective measures for Tier 1. In addition to the mandatory measures, compliance with the following prerequisite and elective measures from Appendix A4 is also required to achieve Tier 1 status:

1. From Division A4.1, Planning and Design.
 - 1.1 Comply with the topsoil protection requirements in Section A4.106.2.3.
 - 1.2 Comply with the 20 percent permeable paving requirements in Section A4.106.4.
 - 1.3 Comply with the cool roof requirements in Section A4.106.5.
 - 1.4 Comply with the Tier 1 electric vehicle (EV) charging requirements in Section A4.106.8.
 - 1.5 Comply with at least two elective measures selected from Division A4.1.
2. From Division A4.2, Energy Efficiency.
 - 2.1 For newly constructed low-rise residential buildings, comply with the energy efficiency requirements in Section A4.203.1.1.1, A4.203.1.1.2, Table A4.203.1.1.1, A4.203.1.2, A4.203.1.3.1 and A4.203.1.4.
3. From Division A4.3, Water Efficiency and Conservation.
 - 3.1 Comply with at least two elective measures selected from Division A4.3.
4. From Division A4.4, Material Conservation and Resource Efficiency.
 - 4.1 Comply with the 20 percent cement reduction requirements in Section A4.403.2.
 - 4.2 Comply with the 10 percent recycled content requirements in Section A4.405.3.1.
 - 4.3 Comply with the 65 percent reduction in construction waste in Section A4.408.1.
 - 4.4 Comply with at least two elective measures selected from Division A4.4.

5. From Division A4.5, Environmental Quality.
 - 5.1 Comply with the 90-percent resilient flooring systems requirements in Section A4.504.2.
 - 5.2 Comply with the thermal insulation requirements for Tier 1 in Section A4.504.3.
 - 5.3 Comply with at least one elective measure selected from Division A4.5.

Note: The Residential Occupancies Application Checklist contained in Section A4.602 may be used to show which elective measures are selected.

Tier 2 Requirements

Tier 2 Prerequisite and Elective Measures (A4.601.5.2):

The measures necessary to achieve Tier 2 status are very stringent. Cities, counties, and cities and counties considering adoption of Tier 2 as mandatory should carefully consider the stringency of each measure and ensure that the measures are achievable in their location.

The regulatory text for this section has been amended for the 2019 code.

A4.601.5 Tier 2. To achieve Tier 2 status a project must comply with the following:

Note: The measures necessary to achieve Tier 2 status are very stringent. Cities, counties, and cities and counties considering adoption of Tier 2 as mandatory should carefully consider the stringency of each measure and ensure that the measures are achievable in their location.

A4.601.5.1 Mandatory measures for Tier 2. The project shall meet or exceed all of the mandatory measures in Chapter 4, Divisions 4.1 through 4.5 and Chapter 7 as applicable.

A4.601.5.2 Prerequisite and elective measures for Tier 2. In addition to the mandatory measures, compliance with the following prerequisite and elective measures from Appendix A4 is also required to achieve Tier 2 status.

1. From Division A4.1, Planning and Design.
 - 1.1 Comply with the topsoil protection requirements for Tier 1 and Tier 2 in Section A4.106.2.3.
 - 1.2 Comply with the 30 percent permeable paving requirements in Section A4.106.4.
 - 1.3 Comply with the cool roof requirements in Section A4.106.5.
 - 1.4 Comply with the Tier 2 electric vehicle (EV) charging requirements in Section A4.106.8.
 - 1.5 Comply with at least four elective measures selected from Division A4.1.
2. From Division A4.2, Energy Efficiency.
 - 2.1 For newly constructed low-rise residential buildings, comply with the energy efficiency requirements in Sections A4.203.1.1.1, A4.203.1.1.2, Table A4.203.1.1.1, A4.203.1.2, A4.203.1.3.2 and A4.303.1.4.
3. From Division A4.3, Water Efficiency and Conservation.

- 3.1 Comply with at least three elective measures selected from Division A4.3.
4. From Division A4.4, Material Conservation and Resource Efficiency.
 - 4.1 Comply with the 25 percent cement reduction requirements in Section A4.403.2.
 - 4.2 Comply with the 15 percent recycled content requirements in Section A4.405.3.1.
 - 4.3 Comply with the 75 percent reduction in construction waste in Section A4.408.1.
 - 4.4 Comply with at least four elective measures selected from Division A4.4.
5. From Division A4.5, Environmental Quality.
 - 5.1 Comply with the 100 percent resilient flooring systems requirements in Section A4.504.2.
 - 5.2 Comply with the thermal insulation requirements for Tier 1 and Tier 2 in Section A4.504.3.
 - 5.3 Comply with at least one elective measure selected from Division A4.5.

Note: The Residential Occupancies Application Checklist contained in Section A4.602 may be used to show which elective measures are selected.

Residential Occupancies Application Checklist

COMMENTARY

PURPOSE

To provide a visual guide and “checklist” for implementing the “reach levels” of Tier 1 and Tier 2, HCD developed a tier-based Residential Occupancies Application Checklist in Appendix A4, Section A4.602. This checklist provides an easy reference to the mandatory measures in *CALGreen*, and the Tier 1 and Tier 2 prerequisites and optional elective measures. To be used as a guide for measures associated with local Tier 1 and/or Tier 2 adoption, the checklist may be customized to show locally approved and adopted mandatory measures and elective measures. Since local agencies have the discretion to include more restrictive or additional measures, it is important to check for local amendments or requirements related to green building standards when planning and constructing a project. A sample simplified checklist at the end of this chapter illustrates various components of the checklist. The full version of the checklist is available on HCD’s website: <http://www.hcd.ca.gov/building-standards/calgreen/cal-green-forms.shtml>

The 2019 *CALGreen* requires a completed Residential Occupancies Application Checklist or alternate method of documentation submitted to the local enforcing agency for all residential projects under HCD’s authority.

Using the Residential Occupancies Application Checklist:

Identify Mandatory Measures. Review all checked (☒) measures in the column labeled “Mandatory.” These measures are **required** green building standards applicable statewide. All local enforcing agencies are required to adopt these standards. If local enforcing agencies have similar or more restrictive green building standards, they may be recognized as local amendments and must be formally adopted locally and filed with the California Building Standards Commission for

enforceability. Detailed information on the local amendment adoption process is in *CALGreen* Section 101.7.

Review Tier 1 and Tier 2 Requirements (Prerequisites) for Consideration of Adopting Enhanced Green Building Standards.

Review all checked (☒) measures in the column labeled “Prerequisites and electives.” Measures that are checked in these columns are **required** measures when adopting Tier 1 and/or Tier 2. Note that Tier 1 requirements may be an enhanced or more restrictive version of a *CALGreen* mandatory measure (e.g., reduced Total Energy Design Ratings than a “standard design building”) or may be new additional requirements (e.g., requirements for permeable paving). Tier 2 requirements operate similarly, but may also incorporate Tier 1 requirements.

Identify Locally Adopted Additional Mandatory or Elective Measures.

The checklist can be modified to include measures not specified in *CALGreen* under sections labeled “Innovative Concepts and Local Environmental Conditions.” These measures may be local mandatory green building measures (☒ in the “Mandatory” column) and/or selected mandatory measures for local Tier 1 or Tier 2 levels [☒² in “Prerequisites and electives” column(s)]. Applicable elective measures for Tier 1 or Tier 2, on project-specific levels, may be indicated on the checklist to ensure that the minimum number of elective measures required for Tier 1 (or Tier 2) are included for the project.

SAMPLE RESIDENTIAL OCCUPANCIES APPLICATION CHECKLIST

[Omitted Sections are shown by ellipses (...)]

FEATURE OR MEASURE	LEVELS APPLICANT TO SELECT ELECTIVE MEASURES			VERIFICATIONS ENFORCING AGENCY TO SPECIFY VERIFICATION METHOD		
	Mandatory	Prerequisites and electives ¹		Enforcing Agency <input type="checkbox"/> All	Installer or Designer <input type="checkbox"/> All	Third party <input type="checkbox"/> All
		Tier 1	Tier 2			
MATERIAL CONSERVATION AND RESOURCE EFFICIENCY						
Foundation Systems						
...		
A4.403.1 A Frost-protected Shallow Foundation (FPSF) is designed and constructed.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A4.403.2 Cement use in foundation mix design is reduced. Tier 1. Not less than a 20-percent reduction in cement use. Tier 2. Not less than a 25-percent reduction in cement use.		<input checked="" type="checkbox"/> ²	<input type="checkbox"/>			
...						
Enhanced Durability and Reduced Maintenance						
4.406.1 Annular spaces around pipes, electric cables, conduits, or other openings in plates at exterior walls shall be protected against the passage of rodents by closing such openings with cement mortar, concrete masonry or similar method acceptable to the enforcing agency.	<input checked="" type="checkbox"/>					
...						
A4.407.4 Protect building materials delivered to the construction site from rain and other sources of moisture.		<input checked="" type="checkbox"/> ²	<input checked="" type="checkbox"/> ²	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...
Innovative Concepts and Local Environmental Conditions						
A4.411.1 Items in this section are necessary to address innovative concepts or local environmental conditions. Item 1.						

Boxes in columns under "Verifications" indicate responsible party or parties for verifying compliance with the measure.

Unchecked boxes in "Tier 1" or "Tier 2" columns indicate ELECTIVES available for adoption by cities and/or counties for Tier 1 or Tier 2. These electives may also be identified and adopted as additional prerequisites.

Boxes with "X" in the "Mandatory" column indicate measures that are MANDATORY for all low-rise residential new construction projects. Cities and/or counties may require additional mandatory requirements.

Boxes with "X" in the "Tier 1" and/or "Tier 2" columns indicate measures that are PREREQUISITES for one or both tiers. See Footnote 2.

CALGreen allows alternate materials, appliances, installation, devices, arrangements, methods, or designs or methods of construction which may not be identified in CALGreen. These items may be identified as mandatory; prerequisites for Tier 1 and/or Tier 2; or as elective measures by adopting cities and/or counties.

1. Green building measures listed in this table may be mandatory if adopted by a city, county, or city and county as specified in Section 101.7.
 2. Required prerequisite for this tier.
 3. These measures are currently required elsewhere in statute or in regulation.

Frequently Asked Questions

Q: What is the benefit of achieving Tier 1 or Tier 2 compliance to a designer/building owner, and for local building departments?

A: The benefit is that a home constructed above the mandatory minimum code in all categories preserves and improves the environment, reduces the demand for energy and water, improves air quality, and minimizes the consumption of materials and resources. Taking part in the effort towards sustainability reduces the amount of greenhouse gas emissions generated by construction, use, and occupancy.

Q: CALGreen has mandatory provisions and optional “voluntary” measures as defined by prescriptive requirements for Tier 1 and Tier 2 compliance levels. Can a local jurisdiction adopt any Tier 1 or Tier 2 voluntary measure and make it mandatory without having to justify it with climatic, geological or topographical conditions?

A: No. The tiers must be adopted in compliance with Section 101.7; however, Section 101.7.1 clarifies that local environmental conditions are considered to be included in the climatic, geological or topographical scope.

Q: Can a local jurisdiction pick and choose elective measures under each tier (understanding that a few of them have been predetermined) and call it, for example, “Green County Tier Measures”?

A: Yes, as long as express findings are filed with the BSC pursuant to *CALGreen* Section 101.7. The Residential Occupancies Application Checklist includes check boxes in each category for enforcing agencies to identify these areas.

Q: Who should I contact if I have questions about the energy efficiency provisions in CALGreen?

A: The California Energy Commission (CEC) developed and is responsible for maintaining the energy efficiency provisions in both the mandatory and voluntary portions of *CALGreen*. The CEC should be contacted regarding any questions related to energy efficiency provisions for low-rise residential, high-rise residential or hotel/motel buildings. The CEC may be contacted at:

Energy Standards Hotline
Toll-Free in California: 800-772-3300
Outside California: 916-654-5106
E-mail: title24@energy.ca.gov

Division A4.7 – RESIDENTIAL MODEL ORDINANCE

A4.701.1 General. The voluntary measures of this code are designed and promulgated to be adopted by reference and made mandatory by local ordinance pursuant to Section 101.7. Jurisdictions wishing to adopt the voluntary provisions of this code as an enforceable regulation governing structures and premises should ensure that certain factual information is included in the adopting ordinance and that the measures are appropriate and achievable and are considered to be suitable as mandatory by the city, county, or city and county. The following sample adoption ordinance addresses several key elements of a code adoption ordinance, including the information required for insertion into the code text.

This code does not limit the authority of city, county, or city and county government to make necessary changes to the provisions contained in this code.

COMMENTARY

PURPOSE

To provide a sample resolution for local agency convenience when adopting the voluntary appendices of *CALGreen*. Local agencies may also develop their own resolutions for adopting the voluntary measures in *CALGreen*. See *CALGreen* for complete sample resolution text.



APPENDIX A5 NONRESIDENTIAL VOLUNTARY MEASURES



NOTE: The 2019 *CALGreen* Appendix A5 “Nonresidential Voluntary Measures” is divided into six separate divisions and contains measures adopted by the BSC, the Division of the State Architect – Structural Safety (DSA-SS), and the Office of Statewide Health Planning and Development (OSHPD). *CALGreen* Appendix A5 addresses voluntary green building standards for nonresidential structures and generally is not discussed in this guide. However, the provisions for energy efficiency for high-rise residential, hotel and motel buildings are considered “nonresidential” for purposes of the *California Energy Code* and, therefore, are included in Appendix Division A5.2 of *CALGreen*.

For information on nonenergy efficiency portions of *CALGreen* Appendix A5, see “*Guide to the California Green Building Standards Code Nonresidential*” prepared by the BSC (www.bsc.ca.gov).

Division A5.2 – ENERGY EFFICIENCY

The regulatory text for this Division has been amended for the 2019 code.

SECTION A5.201 GENERAL

High-Rise Residential, Hotel and Motel Buildings: New Construction and Additions

Note: Voluntary residential provisions for energy efficiency only are located in both Appendix Division A4 and Appendix Division A5.

- **Division A4.2 discusses provisions for new construction and additions for low-rise residential buildings.**
- **Division A5.2 discusses provisions for new construction and additions for high-rise residential and hotel/motel buildings.**

A5.201.1 Scope. For the purposes of mandatory energy efficiency standards in this code, the California Energy Commission will continue to adopt mandatory standards. It is the intent of these voluntary provisions to encourage local jurisdictions through codification to achieve exemplary performance in the area of building energy efficiency. Local jurisdictions adopting these voluntary provisions as mandatory local energy efficiency standards shall submit the required application and receive the required approval of the California Energy Commission in compliance with Title 24, Part 1, Section 10-106, prior to enforcement. Once approval is granted by the Energy Commission, local jurisdictions shall file an ordinance expressly marking the local modifications along with findings and receive the required acceptance from the California Building Standards Commission in compliance with Section 101.7 of this code, prior to enforcement. (Title 24, Part 1, Section 10-10-106 is available at <http://www.energy.ca.gov/title24/2019standards/>)

(See *CALGreen* Section A5.203 Performance Approach for complete code text.)

COMMENTARY

PURPOSE

- These measures create requirements which can result in energy savings beyond the requirements of the 2019 Energy Code if voluntarily implemented or adopted by local jurisdictions.
- Adoption of voluntary standards will also contribute to the State's zero net energy building goals.
- This section also describes the requirements a local jurisdiction must meet when adopting these voluntary standards as mandatory.

BACKGROUND

The 2019 voluntary energy provisions of *CALGreen* go beyond the minimum allowable standards in the Energy Code, and were developed and adopted in response to policy directives from the Governor. These energy efficiency provisions are located in *CALGreen*, but are administered by the California Energy Commission.

The 2019 *CALGreen* includes provisions for nonresidential buildings which include high-rise residential and hotel/motel buildings, with lighting and/or mechanical systems. Changes include additions to and expansion of prerequisite measures. Tier 1 now requires one prerequisite efficiency measure.; Tier 2 now requires two prerequisite efficiency measures.

In order to meet Tier 1 performance standards, high-rise residential buildings and hotel/motel buildings are required to meet no greater than 95 percent of the Title 24, Part 6, Energy Budget for the Standard Design Building as calculated by compliance software certified by the California Energy Commission. In order to meet the Tier 2 performance standard, this threshold is reduced to no greater than 90 percent of the Energy Budget.

Note that the web address in *CALGreen* should reference “2019standards” instead of “2016standards.”

For further information, please visit the California Energy Commission website at: <http://www.energy.ca.gov/>

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