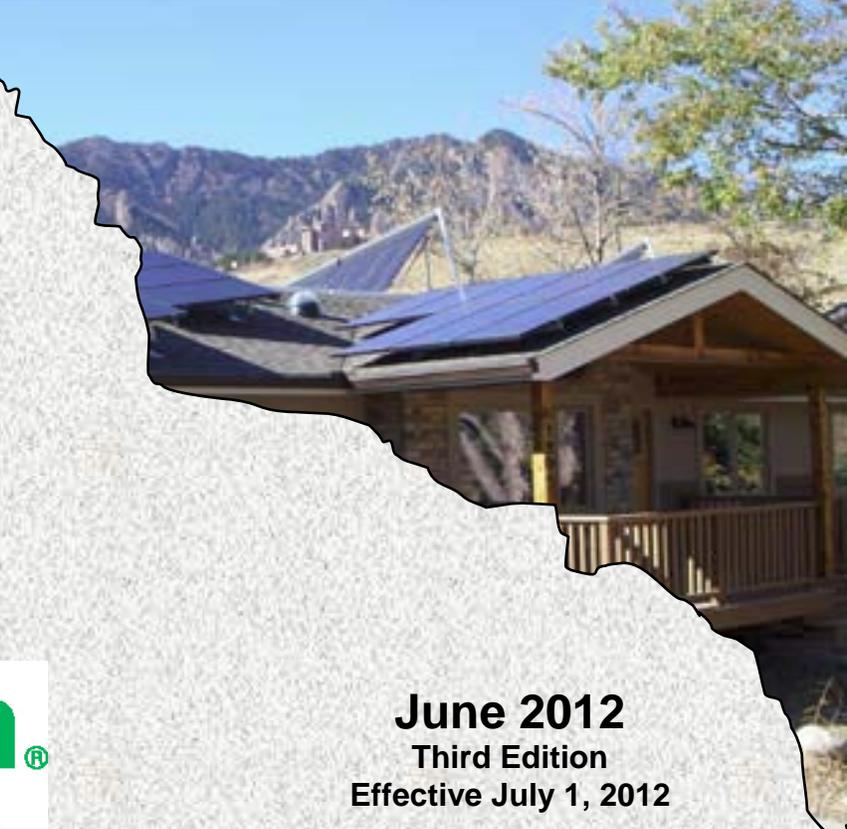




**A
Guide
to the
California
Green
Building
Standards
Code
Low-Rise
Residential**



June 2012
Third Edition
Effective July 1, 2012



A Guide to CALGreen[®] the California Green Building Standards Code

Information on California's Green Building Standards Code governing construction of low-rise residential hotels, motels, lodging houses, apartments and dwellings.

June 2012

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PREFACE

The Division of Codes and Standards in the Department of Housing and Community Development (HCD) is pleased to provide a guide to the California Green Building Standards Code (CALGreen). The June 2012 version of this guide includes amendments to the 2010 CALGreen adopted during the annual code adoption cycle and effective July 1, 2012.

This module is one of several handbooks in development by HCD to supplement our core publication "A Guide to California Housing Construction Codes." It 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 low-rise residential structures. It is intended to provide additional guidance and further enhance user awareness and understanding. Improved awareness of state laws, regulations, and building standards will improve compliance and reduce housing construction costs and delays.

The Department of Housing and Community Development encourages homeowners, design and industry professionals and building department personnel involved in construction, maintenance and use of residential buildings to read this module as a complement to the new mandatory measures and enhanced voluntary tiers in the 2010 California Green Building Standards Code. Further, users of this "Guide to Green Building Standards" handbook should always utilize the most current version of the code and check for any local amendments applicable to structures in that jurisdiction.

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 development 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 who provided additional assistance, time and resources to facilitate timely completion of this module "A Guide to the California Green Building Standards Code."



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 of Testing Materials
BSC / CBSC	California Building Standards Commission
California Climate Zones	Shown on California Energy Commission Climate Zone Map
CALGreen	California Green Building Standards Code
Cal/EPA	California Environmental Protection Agency
CalRecycle	California Department of Resources Recycling and Recovery (<i>formerly California Integrated Waste Management Board and Department of Conservation</i>)
CBC	California Building Code (CCR, Title 24, Part 2)
CCR	California Code of Regulations (<i>includes Title 24, the California Building Standards Code</i>)
C & D	Construction and demolition as used for construction waste
CEC*	California Energy Resources Conservation and Development Commission (<i>aka California Energy Commission</i>); * Also refers to California Energy Code (CCR, Title 24, Part 6)
CRC	California Residential Code (CCR, Title 24, Part 2.5)
CWMP	Construction Waste Management Plan



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 (<i>administered by the California Energy Commission</i>)
HVAC	Heating, ventilating, air-conditioning
NSF	NSF International (<i>formerly National Sanitation Foundation</i>)
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 California Code of Regulations (CCR)
TITLE 20	Public Utilities and Energy regulations in the California Code of Regulations (CCR)
TITLE 24	California Building Standards Code as included in the California Code of Regulations (CCR)
VOC	Volatile Organic Compounds as defined in the CALGreen Code, Chapter 2



CHAPTER 1. INTRODUCTION AND ADMINISTRATION

CALGreen is California's first green building standards 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 module will provide helpful tools and information about CALGreen mandatory measures, tiers that become mandatory only after local adoption and other regulations, laws and construction codes related to green building standards, which are applicable to low-rise residential dwelling construction in California. It is recommended that the reader be familiar with California building standards development, adoption and implementation processes as discussed in the Department of Housing and Community Development's (HCD) general information module "A Guide to California Housing Construction Codes." It is also recommended that the reader have a copy of the latest edition of the CALGreen Code for reference while reading this module. A copy of the CALGreen code may be viewed or downloaded by clicking on the CALGreen logo at HCD's website.

Background

Development of green building standards was originally approached from a legislative or statutory approach. Several legislative 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 Schwarzenegger administration, after much consideration, these bills were ultimately vetoed. The Governor's veto message stated:

- Building standards should not be statutory. The California Building Standards Commission (CBSC) 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 CBSC 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 CBSC 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. Commissioners also requested and encouraged the Department of Housing and Community Development (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 the CBSC, 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 the Commission's adoption of the 2008 California Green Building Standards Code (CGBC). Effective August 1, 2009, the 2008 CGBC regulations were primarily voluntary building standards, although some mandatory provisions were included that were, in part, required in other building standards codes or had future implementation dates.

Introduction of the 2008 CGBC was supplemented by clarifying information (CBSC Building Standards Bulletin 08-02) that local enforcing agencies have the option to adopt local amendments or even adopt the CGBC prior to its effective date. It was acknowledged that the initial 2008 CGBC publication would provide a framework and first step toward establishing mandatory green building standards for low-rise 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, future CALGreen iterations will continue to proactively move California forward to a more sustainable and environmentally responsible future.

2010 California Green Building Standards Code

CALGreen is Part 11 of Title 24, of the California Building Standards Code. CALGreen is not based upon a model building code nor adopted by reference. However, the same rulemaking process that applies to all codes promulgated by HCD applies to CALGreen. The 2008 CGBC was used as a base document, analyzed and evaluated during the 2009 code adoption cycle for necessary updates and transitioned into the 2010 CALGreen Code. There are significant changes in the 2010 CALGreen provisions, including mandatory requirements, introduction of Tier 1 and Tier 2 enhanced performance levels, and the

reorganization of the code provisions to easily distinguish low-rise residential provisions from the nonresidential provisions. The statewide effective date of the 2010 CALGreen Code was January 1, 2011. Amendments to the 2010 CALGreen Code related to low-rise residential structures were approved by the California Building Standards Commission on July 20, 2011. These non-emergency amendments become effective July 1, 2012.

Building standards addressed in the 2010 CALGreen Code are not isolated and must be used in conjunction with other parts of Title 24, to achieve code compliance and ensure minimum standards of life, public health and safety. Knowledge of energy and performance standards in Part 6, the California Energy Code, is also essential. Additionally, changes resulting from recent legislation or statute, 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 codes and any local amendments be used. The code user should also be aware of the other changes mentioned above that may impact a construction project.

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

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

Note: The CALGreen Code 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 module.

Administration

Administration of the CALGreen Code is similar to the other parts of the 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, Part 11 of Title 24 (the California Building Standards Code).

Purpose

The purpose of CALGreen is to improve public health, safety and general welfare through enhancement of design and construction of buildings using building concepts reducing negative impacts or having positive environmental impacts and encouraging sustainable construction practices. As such, CALGreen has been written to address the following areas of building construction.

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

Application

CALGreen applies to planning, design, operation, construction, use and occupancy of every newly constructed building or structure on a statewide basis, unless otherwise indicated.

CALGreen also specifies applications regulated by the California Building Standards Commission, Division of the State Architect, Department of Public Health, Office of Statewide Health Planning and Development, and the Department of Water Resources.

Scope

CALGreen provisions under the jurisdiction of HCD are for newly constructed low-rise residential structures. Therefore, for the purposes of HCD, CALGreen applies to the following types of low-rise* (three stories or less) residential structures:

- Hotels, motels, lodging houses
- Apartment houses, condominiums
- One- and two-family dwellings, townhouses, factory-built housing
- Dormitories, shelters for homeless persons, congregate residences, employee housing
- Other types of dwellings containing sleeping accommodations with or without common toilets or cooking facilities

*CALGreen defines "low-rise residential" as "A building that is of Occupancy Group R and is three stories or less, or that is a one- or two- family dwelling or townhouse."

Use of Appendices

CALGreen tier provisions included in appendix chapters are not mandatory unless specifically adopted by a state agency or adopted by a local 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 building construction:

- 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

Order of Precedence and Use

When there are any differences between CALGreen and standard reference documents, the text of CALGreen building standards shall govern. If local enforcing agencies amend CALGreen, the local amendment, when legally adopted, shall govern.

Local Amendments

CALGreen establishes mandatory minimum green building standards and includes voluntary tiers. Local amendments to CALGreen, including adoption of CALGreen's voluntary tiers, 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 to CALGreen 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. Building standards also cannot be applied retroactively unless mandated by statute. In order to be enforceable, local amendments must be formally adopted by the local agency and filed with the California Building Standards Commission (CBSC).

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 California Energy Commission for approval. Only those local ordinances related to energy efficiency that have been approved by the California Energy Commission are legally enforceable.

See CALGreen Section 101.7 and 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 Section 10-106 of the Building Energy Efficiency Standards (Standards) for energy efficiency amendments; and Water Code Section 14877.3 regarding amendments related to greywater standards. Information is available on the CBSC's website addressing filing of local amendments, including related Building Standards Bulletins; and on the California Energy Commission's website addressing local ordinances exceeding the 2008 energy standards. 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 other parts of Title 24, CALGreen also allows the use of any approved alternate material, appliance, installation, device, arrangement, method, 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 at least equivalent to provisions of the code. See CALGreen Section 101.8 for further details and references.

Effective Use of the Code

CALGreen provides a step-by-step approach to determining whether the code is applicable to a project. For purposes of HCD CALGreen requirements for low-rise residential structures, the following steps are the most important:

- Is the project considered "new construction"?
- Is the project a residential use or occupancy pursuant to the California Building Code or California Residential Code?
- Is the building three stories or less? (HCD's CALGreen provisions apply to low-rise residential uses three stories or less in height.)
- If questions 1 through 3 are answered "yes," then CALGreen Chapter 4 and Appendix A4 (if adopted) will specifically apply to the structure. In addition, Chapters 1-3, 6, 7 and 8 will be used for administration and implementation.

- Note that CALGreen Chapter 5 and Appendix A5 may also apply to the applicable portions of mixed occupancy buildings (e.g., commercial use combined with residential uses.)
- 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. Local amendments may be more restrictive than the statewide provisions in CALGreen. Although this guide will be updated as the CALGreen code evolves, it is possible that it may not include the most recent amendments to CALGreen and does not include any local amendments.

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 determine compliance with CALGreen and other codes. CALGreen provides the enforcing agencies discretion to require additional construction documents or to waive construction documents, as specified. CALGreen also provides for use of alternate methods of documentation demonstrating substantial conformance when satisfactory 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 the *CALGreen* code. 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 not considered low-rise residential buildings by definition, but are still residential occupancies. Only residential buildings three stories or less are covered by the scope of *CALGreen* (Section 101.3.1, #3). Residential buildings taller than three stories are not nonresidential buildings and do not need to comply with the nonresidential portions of the *CALGreen* code.

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

A: CALGreen applies to low-rise residential structures of three stories or less. In the case of podium or pedestal construction, the number of floors or stories of residential use determine whether CALGreen's provisions for low-rise residential apply.

For example, a five story building with a parking garage on the first level has four stories of residential construction above it. CALGreen's provisions for low-rise residential would not apply to the residential construction since there are more than three stories of residential use involved.

Q: Does CALGreen apply to attached or detached garages?

A: The residential provisions of CALGreen apply to low-rise residential structures in Occupancy Group R (Residential Group R). Private garages, unless exceeding size or other specified limits, are U occupancies pursuant to the *California Building Code*. Parking garages are in Storage Group S-2 and, therefore, exempt from the CALGreen code.

However, in the case of attached garages, it may be impractical to separately address building standards for the main low-rise residential structure and an attached garage. For example, it would be impractical to plan for retention of storm water, track construction waste, or save topsoil from only the residential portions of the project.

Local enforcing agencies may choose to specify or clarify if attached and/or detached garages associated with residential uses also would be subject to green building standards. This would constitute a local amendment more restrictive than the statewide CALGreen provisions and require a local ordinance adoption process, findings, and filing with the California Building Standards Commission.

Q: Section 102.3 of CALGreen is titled "Verification", which requires that "Documentation of conformance for applicable green building measures be provided to the enforcing agency". What type of documentation, and by whom, will meet the provisions of this section?

A: The documentation must be sufficient to satisfy Section 703.1 and the enforcing agency.

Q: If a local agency already has a green building ordinance, will it get "grandfathered" in when the 2010 CALGreen Code 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 and cannot replace it with a locally adopted green building ordinance. 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, 2011, and approved statewide amendments to these codes. In addition, an adopted local ordinance and supporting findings are required to be filed with the California Building Standards Commission to be enforceable.

Q: Can a local jurisdiction adopt building standards, including “green building standards”, which 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 a local jurisdiction expand the applicability of Chapters 4 and A4 to all Group R occupancies taller than three stories?

A: Yes; however, compliance with Section 101.7 is required.

Q: Can local jurisdictions apply local amendments retroactively?

A: No. Health and Safety Code Sections 17912 and 18398.5 (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.

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.” The Attorney General has indicated that “lacking specific statutory limitations, the local jurisdiction maintains great latitude in determining what constitutes an appropriate local climatic, geological or topographical condition.”

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: The environmental justification would be used similar to how ordinances are enacted. 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 their local modifications to *CALGreen* until the ordinance and the local finding have been formally filed with the California Building Standards Commission (CBSC). The CBSC serves as a central filing point or statewide database for local amendments. Although the CBSC does not review local amendments for adequacy, they may reject a local amendment if not supported by findings.
- > Local ordinances apply to the version of the code as specified in the local ordinance and applicable findings. Local ordinances need to be re-filed to ensure or maintain applicability to new versions of the building standards code especially since adopted model code references may differ substantially through reorganization and updating.
- > Additional information on local amendments is available in *CALGreen* Section 101.7, Health and Safety Code Section 17958.7, and on the CBSC website addressing local amendments (www.bsc.ca.gov). The CBSC 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 California Energy Commission?

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 California Energy Commission and filed with the California Building Standards Commission. Further information on this process is available on the California Energy Commission website (www.energy.ca.gov) addressing local ordinances exceeding the 2010 California Energy Code.



CHAPTER 2. DEFINITIONS

CALGreen Chapter 2 provides definitions that are commonly used throughout the document. Additional definitions are placed at the beginning of each chapter when the definitions are specific to the provisions in that chapter, division, section or subsection and are not used elsewhere in the CALGreen regulations. This placement of definitions is consistent with the format used in other parts of the California Building Standards Code.

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.



CHAPTER 3. GENERAL

This chapter provides general information regarding the scope of subsequent CALGreen chapters. It also provides a first introduction to voluntary tiers, direction when a mixed occupancy building is designed, or when a phased development project is considered.

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.

Consider the application of a live/work unit. The requirements are described in the California Building Code, but the design is permitted to use the California Residential Code. This type of construction has a dwelling unit or sleeping unit in which a significant portion of space includes a nonresidential use.

Phased Projects

CALGreen provisions 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 low-rise residential or live/work development; it is less common with single-family development.

Voluntary Tiers

Voluntary tiers and the checklist of measures, located in Appendix A4 of CALGreen, can be used by enforcing agencies who wish to go beyond the mandatory minimum requirements of this code. During CALGreen's development, stakeholders expressed concern that there was a lack of consistent and streamlined methods local government could use to further enhance their local environment or further reduce the impact of development. State agencies supported this concern and the tier concept was viewed as a vehicle to increase the use and acceptability of advanced or enhanced technology, which could ultimately translate to an elevated level of construction that may serve to raise mandatory requirements in the future.



CHAPTER 4. MANDATORY REQUIREMENTS FOR LOW-RISE RESIDENTIAL DWELLINGS

This chapter discusses select mandatory building standards in the 2010 CALGreen Code. For clarity, referenced section numbers in this chapter match chapters, sections and headings in the 2010 CALGreen Code. The full text of select CALGreen regulations are shown in a box with a double border. Tables from CALGreen are not enclosed by a box to avoid confusion. Code text and tables will be followed by non-regulatory commentary in italics, when applicable.

Text of sections shown in this chapter include annual amendments effective July 1, 2012. This chapter does not include text that is not part of the mandatory standard discussed. Some items that may be left out of this discussion include regulatory language that provides general information (e.g., scope, definitions, and notes.) The complete text of CALGreen is available for purchase from the International Code Council (www.iccsafe.org). The CALGreen text also may be viewed on HCD's website (www.hcd.ca.gov) or the California Building Standards Commission's website (www.bsc.ca.gov).

It is important that the user reference the most current version of CALGreen, including the July 1, 2012, supplement, applicable to the project and be aware that lawfully enacted local amendments may require additional and/or more restrictive green building standards.

Note: A summary of “Low-Rise Residential Mandatory Measures” is included at the end of this chapter for reference.

**DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
2010 CALIFORNIA GREEN BUILDING STANDARDS CODE (CALGreen)**

CHAPTER 4. RESIDENTIAL MANDATORY MEASURES

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.

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 streams or rivers.

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 BMP's, 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 which are larger than one acre. This section applies only to construction projects less than one acre which are outside the scope of SWRCB.

Storm water runoff and the sediment and pollutants it usually contains are commonly identified as 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 migrates 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; while 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.

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

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012.

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.

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 ground water 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*

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. Ground water can flow above or below the surface. Control methods should be developed and implemented which allow for both types of ground water flow to ensure water can continually flow away from the building.

Frequently Asked Questions

Q: Do local storm water ordinances need findings and filing?

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. 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), Municipal Storm Water Permitting Program, regulates storm water discharges from municipal separate storm sewer systems (MS4s). Although not a formal finding, changes in local ordinances helpful to or enhancing the local storm water program will need to be reported in the local agency's annual report to the SWRCB.

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

A: No. This section provides three methods for complying with this section. The third method involves compliance with a local lawfully enacted storm water management ordinance. In addition, the local enforcing agency has 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 to be 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.

DIVISION 4.2 – ENERGY EFFICIENCY

SECTION 4.201 GENERAL

4.201.1 Scope. The Department of Housing and Community Development does not regulate mandatory energy efficiency standards in residential buildings. For the purposes of mandatory energy efficiency standards in this code, the California Energy Commission will continue to adopt mandatory building standards.

Note: It is the intent of this code to encourage buildings to achieve exemplary performance in the area of energy efficiency. For the purposes of energy efficiency standards, the California Energy Commission believes specifically, a green building should achieve at least a 15 percent reduction in energy usage when compared to the State's mandatory energy efficiency standards. The Department of Housing and Community Development's mandatory green building standards for residential buildings do not require compliance with levels of minimum energy efficiency beyond those required by the California Energy Commission.

COMMENTARY

Purpose:

This section clarifies the California Energy Code as the ongoing authority for adopting statewide energy mandates.

Examples of Acceptable Methods of Implementation and/or Compliance:

- Prescriptive method
- Performance method

Background:

The California Energy Commission (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. The proper integration of the mandatory requirements as well as the voluntary requirements is important to long term building performance 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 minimal 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/>. 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 California Energy Commission regarding questions about Title 24 at:

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

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

DIVISION 4.3 – WATER EFFICIENCY AND CONSERVATION

**SECTION 4.303
INDOOR WATER USE**

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

4.303.1 Twenty percent savings. A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by at least 20 percent shall be provided. The reduction shall be based on the maximum allowable water use per plumbing fixture and fitting as required by the California Building Standards Code. The 20 percent reduction in potable water use shall be demonstrated by one of the following methods:

1. **Prescriptive Method.** Each plumbing fixture and fitting shall not exceed the Maximum Flow Rate at ≥ 20 Percent Reduction column in Table 4.303.2; or
2. **Performance Method.** A calculation demonstrating a 20 percent reduction in the building “water use” baseline as established in Table 4.303.1 shall be provided. For low-rise residential occupancies, the calculation shall be limited to the following plumbing fixture and fitting types: showerheads, lavatory faucets, water closets and urinals.

COMMENTARY

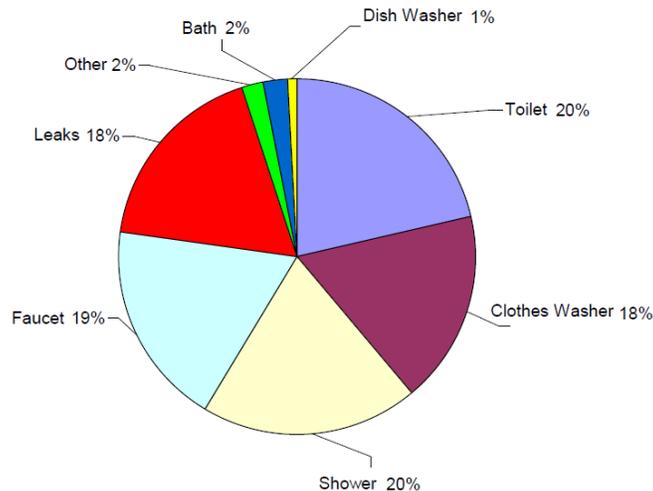
Purpose:

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.

*Section 4.303 provides guidelines on how to achieve a 20 percent reduction in indoor water use. There are two options to use for compliance: the **prescriptive method** and the **performance method**.*

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.

Indoor water use in California



The data provided in this graph is from the California Single Family Home Water Use Efficiency Study. This study was sponsored by the California Department of Water Resources, and conducted by Aquacraft, Inc. The study covers a period between 2005 and 2008; the final report was published in July 2011.

Examples of Acceptable Methods of Implementation and/or Compliance:

The mandatory effective date for 20 percent reduction is July 1, 2011. This date was selected to allow manufacturers additional time to ensure enough product was available to satisfy the construction needs of California and to ensure that the product performance standards would meet consumer expectations.

PRESCRIPTIVE METHOD DISCUSSION: The plumbing fixtures listed below must comply with Table 4.303.2 (see "Maximum Flow Rate at ≥ 20 Percent Reduction" column).

- a) **Toilets (Water Closets):** As shown in Table 4.303.2, the maximum flow rate allowed for use by a single flush toilet is 1.28 gallons/flush. The standard single flush toilet only allows the user to complete a full-flush with each flush regardless of waste type. A "dual flush" toilet provides the user the option based on waste type to utilize the "half flush" or "full-flush" technology. A "dual flush" toilet will have two flushing mechanisms clearly marked for each flushing option minimizing the total water used by the toilet. The "1.28 flush" for a "dual flush" toilet is measured by taking the average of three flushes: (two fluid flushes = 1.0 gal/flush) + (one solid flush = 1.6 gal/flush) \times (1/3). Additional compliance models include gravity-fed single flush low-flow toilets, pressure-assisted low-flow toilets and composting or waterless toilets.

- b) *Urinals: Although typically not found in a low-rise residential application, this fixture type is a viable option to reduce indoor water usage. The maximum flow rate allowed for use by a urinal is 0.5 gallons/flush to be greater than the 20 percent reduction. Many manufacturers are now producing low-flow, ultra low-flow, high efficiency and waterless urinals that are seeing water consumption ranges from 0 gal/flush to 0.125 gal/flush.*
- c) *Showerheads: Studies show that approximately 20 percent of indoor water use can be directly related to showering and even modest flow rate reductions can greatly increase water savings. A showerhead is a perforated nozzle of various designs that applies water to a bather. As shown in Table 4.303.2, the maximum flow rate of a showerhead is 2 gpm @ 80psi. Showerheads with flow rates ranging from 0.5 gpm to 1.6 gpm are readily available.*

Note: *Users should be aware that the 2010 California Plumbing Code allows a higher flow rate of 2.5 gpm @ 80 psi for showerheads. If a showerhead with a higher flow rate than the 2 gpm @ 80 psi flow rate in Table 4.303.2 is used, it will be necessary to use the performance-based calculation method to achieve the overall 20 percent indoor water reduction rate. If showerheads with a flow rate less than 2 gpm @ 80 psi are used, the shower controls shall be capable of providing scald protection that functions at that reduced rate.*

- d) *Lavatory Faucets: Lavatory faucets provide an excellent source of water reduction. Some aerators on reduced flow faucets inject air bubbles into the water stream creating the consumer appeal of large soft water flow with less water while others provide multiple individual streams. Residential lavatory faucets must not exceed a maximum flow rate of 1.5 gpm @ 60 psi and may not be less than 0.8 gpm @ 20 psi. The 2010 CALGreen, as updated for 2012, also provides for use of nonresidential lavatory faucets at a maximum reduced flow rate of .4 gpm. Faucets must also comply with the low-lead requirements of AB 1953 as summarized in the "INFORMATIVE NOTE".*

Note: *Users should be aware that the 2010 California Plumbing Code allows a higher flow rate of 2.2 gpm @ 60 psi for residential lavatory faucets. If a faucet with a higher flow rate is used, it will be necessary to use the performance-based calculation method to achieve the overall 20 percent reduction rate.*

- e) *Kitchen Faucets: Kitchen faucets must not exceed a maximum flow rate of 1.8 gpm @ 60 psi as shown in Table 4.303.2. Faucets must also comply with the low-lead requirements of AB 1953 as summarized in the "INFORMATIVE NOTE".*

Note 1: *The 2010 California Plumbing Code, Section 402.1.2, requirements reference a higher acceptable flow rate of 2.2 gpm @ 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 1.8 gpm at 60 psi, may be considered as meeting the prescriptive requirements of Table 4.303.2. The maximum flow of kitchen faucets, even at the higher flow rates, shall not exceed 2.2 gpm at 60 psi.*

- f) *Verify with local jurisdictions if there are any special conditions which may preclude use of low-water use toilets or urinals.*

INFORMATIVE NOTE
AB 1953: Lead-Free Plumbing Law Effective 1/1/10

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 product. That situation has changed in a big way over the past three 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.

PERFORMANCE METHOD DISCUSSION: A calculation demonstrating a 20 percent reduction in the building “water use” baseline as established in Table 4.303.1 shown below shall be provided. For low-rise residential occupancies, the calculation shall be limited to the following plumbing fixture and fitting types: water closets, urinals, lavatory faucets and showerheads. The following example calculations will assist in determining compliance with this method.

TABLE 4.303.1
WATER USE BASELINE¹

FIXTURE TYPE	BASELINE FLOW RATE	DURATION	DAILY USES	OCCUPANTS²
Showerheads residential	2.5 gpm @ 80 psi	8 min.	1	
Lavatory faucets, residential	2.2 gpm @ 60 psi	.25 min.	3	
Lavatory faucets, nonresidential	0.5 gpm @ 60 psi	.25 min.	3	
Kitchen faucets	2.2 gpm @ 60 psi	4 min.	1	
Replacement aerators	2.2 gpm @ 60 psi			
Gravity tank type water closets	1.6 gallons/flush	1 flush	1 male ³ 3 female	
Flushometer tank water closets	1.6 gallons/flush	1 flush	1 male ³ 3 female	
Flushometer valve water closets	1.6 gallons/flush	1 flush	1 male ³ 3 female	
Electromechanical hydraulic water closets	1.6 gallons/flush	1 flush	1 male ³ 3 female	
Urinals	1.0 gallons/flush	1 flush	2 male	

Fixture “Water Use” = Flow rate x Duration x Occupants x Daily uses

1. Use Worksheet WS-1 to calculate baseline water use.
2. For low-rise residential occupancies, the number of occupants shall be based on two persons for the first bedroom, plus one additional person for each additional bedroom.
3. The daily use number shall be increased to three if urinals are not installed in the room.

**TABLE 4.303.2
FIXTURE FLOW RATES**

FIXTURE TYPE	BASELINE FLOW RATE	MAXIMUM FLOW RATE AT ≥ 20 PERCENT REDUCTION
Showerheads	2.5 gpm @ 80 psi	2 gpm @ 80 psi
Lavatory faucets, residential	2.2 gpm @ 60 psi	1.5 gpm @ 60 psi ¹
Lavatory faucets, nonresidential	0.5 gpm @ 60 psi	0.4 gpm @ 60 psi ²
Kitchen faucets	2.2 gpm @ 60 psi	1.8 gpm @ 60 psi ³
Gravity tank type water closets	1.6 gallons/flush	1.28 gallons/flush ⁴
Flushometer tank water closets	1.6 gallons/flush	1.28 gallons/flush ⁴
Flushometer valve Water Closets	1.6 gallons/flush	1.28 gallons/flush ⁴
Electromechanical hydraulic water closets	1.6 gallons/flush	1.28 gallons/flush ⁴
Urinals	1.0 gallons/flush	.5 gallons/flush

1. Lavatory faucets shall not have a flow rate less than 0.8 gpm at 20 psi.
2. Where complying faucets are unavailable, aerators rated at .35 gpm or other means may be used to achieve reduction.
3. Kitchen faucets may temporarily increase flow above the maximum rate, but not above 2.2 gpm @ 60 psi and must default to a maximum flow rate of 1.8 gpm @ 60 psi.
4. Includes single and dual flush water closets with an effective flush of 1.28 gallons or less.

Single flush toilets - The effective flush volume shall not exceed 1.28 gallons (4.8 liters). The effective flush volume is the average flush volume when tested in accordance with ASME A112.19.2.

Dual flush toilets - The effective flush volume shall not exceed 1.28 gallons (4.8 liters). The effective flush volume is defined as the composite, average flush volume of two reduced flushes and one full flush. Flush volumes will be tested in accordance with ASME A112.19.2 and ASME A112.19.14.

Note: Flow rates in the second column are baseline flow rates from Table 4.303.1.

Background:

Provisions for a 20 percent reduction in indoor water use were introduced in the 2008 CALGreen Code. These provisions utilized the minimum appliance flow rates for showerheads, faucets and other plumbing fixtures and fittings pursuant to the California Appliance Efficiency Regulations (California Code of Regulations, Title 20). For implementation purposes, HCD provided a prescriptive 20 percent reduction in the flow rate of each fixture based on requirements in the 2010 Appliance Efficiency Regulations and a performance-based calculation method. With the 2010 CALGreen Code, 20 percent water reduction for indoor water use was mandated on or after July 1, 2011. The 2010 CALGreen Code also permits indoor water use reduction in excess of the 20 percent.

MEDIUM HOME SIZE EXAMPLE

No. of Stories: 2
 Square Footage: 2,400
 Bedrooms: 4
 Occupants: 5 (2 for first bedroom + 1 for each additional bedroom per WS-1)
 Daily uses = 3 male + 3 female = 6 per WS-1 per Footnote 1
 (no urinals in structure)

**SAMPLE BASELINE WATER USE CALCULATION TABLE FOR
MEDIUM SIZE HOME EXAMPLE**

BASELINE WATER USE CALCULATION TABLE									
FIXTURE TYPE	FLOW RATE (gpm)		DURATION		DAILY USES		OCCUPANTS ^{1,2}	=	GALLONS PER DAY
Showerheads	2.5	X	5 min.	X	1	X		=	N/A
Showerheads Residential	2.5	X	8 min.	X	1	X	5	=	100
Lavatory Faucets Residential	2.2	X	.25 min.	X	3	X	5	=	8.25
Lavatory Faucets Nonresidential	.5	X	.25 min.	X	3			=	
Kitchen Faucets	2.2	X	4 min.	X	1	X		=	N/A
Replacement Aerators	2.2	X		X		X		=	N/A
Wash Fountains	2.2	X		X		X		=	N/A
Metering Faucets	0.25	X	.25 min.	X	3	X		=	N/A
Metering Faucets for Wash Fountains	2.2	X	.25 min.	X		X		=	N/A
Gravity tank type Water Closets	1.6	X	1 flush	X	6	X	5	=	48
Flushometer Tank Water Closets	1.6	X	1 flush	X	1 male ³ 3 female	X		=	N/A
Flushometer Valve Water Closets	1.6	X	1 flush	X	1 male ³ 3 female	X		=	N/A
Electromechanical Hydraulic Water Closets	1.6	X	1 flush	X	1 male ³ 3 female	X		=	N/A
Urinals	1.0	X	1 flush	X	2 male	X		=	N/A

Fixture "Water Use" = Flow rate x Duration x Occupants x Daily Uses

Example Baseline Calculation:

Showerheads = 2.5 gpm x 8 min x 1 (daily use) x 5 (occupants) = 100 Gallons per day
 Lavatory Faucets = 2.2 gpm x 0.25 min x 3 (daily uses) x 5 (occupants) = 8.25 Gallons per day
 Water Closets = 1.6 gpm x 1 gal/flush x 6 (daily uses) x 5 (occupants) = 48 Gallons per day
 Urinals = Not included in calculation
Total Daily Baseline Water Use = 156.25 Gallons per day

**SAMPLE 20 PERCENT REDUCTION WATER USE CALCULATION TABLE FOR
MEDIUM SIZE HOME EXAMPLE**

20 PERCENT REDUCTION WATER USE CALCULATION TABLE									
FIXTURE TYPE	FLOW RATE (gpm) ¹		DURATION		DAILY USES		OCCUPANTS ^{2,3}		GALLONS PER DAY
Showerheads		X	5 min.	X	1	X		=	N/A
Showerheads Residential	2.0	X	8 min.	X	1	X	5	=	80
Lavatory Faucets Residential	1.5	X	.25 min.	X	3	X	5	=	5.63
Lavatory Faucets Nonresidential		X	.25 min.	X	3	X		=	
Kitchen Faucets		X	4 min.	X	1	X		=	N/A
Replacement Aerators		X		X		X		=	N/A
Wash Fountains		X		X		X		=	N/A
Metering Faucets		X	.25 min.	X	3	X		=	N/A
Metering Faucets for Wash Fountains		X	.25 min.	X		X		=	N/A
Gravity tank type Water Closets	1.28	X	1 flush	X	6	X	5	=	38.4
HET ⁴ High Efficiency Toilet	1.28	X	1 flush	X	1 male ⁵ 3 female	X		=	N/A
Flushometer Tank Water Closets		X	1 flush	X	1 male ⁵ 3 female	X		=	N/A
Flushometer Valve Water Closets		X	1 flush	X	1 male ⁵ 3 female	X		=	N/A
Electromechanical Hydraulic Water Closets		X	1 flush	X	1 male ⁵ 3 female	X		=	N/A
Urinals		X	1 flush	X	2 male	X		=	N/A
Urinals Non-Water Supplied	0.0	X	1 flush	X	2 male	X		=	N/A

Example Proposed Calculation: 20 Percent Reduction

Showerheads = 2.0 gpm x 8 min x 1 (daily use) x 5 (occupants) = 80 Gallons per day

Lavatory Faucets = 1.5 gpm x 0.25 min x 3 (daily uses) x 5 (occupants) = 5.63 Gallons per day

Water Closets = 1.28 gpm x 1 gal/flush x 6 (daily uses) x 5 (occupants) = 38.4 Gallons per day

Urinals = Not included in calculation

Total Daily Proposed Water Use = 124.03 Gallons per day ≤ 125 Gallons per day (20 Percent Reduction of 156.25 Gallons per day Baseline)

SMALL HOME SIZE EXAMPLE

No. of Stories: 1
 Square Footage: 1,200
 Bedrooms: 3
 Occupants: 4 (2 for first bedroom + 1 for each additional bedroom per WS-1)
 Daily uses = 3 male + 3 female = 6 per WS-1 per Footnote 1
 (no urinals in structure)

**SAMPLE BASELINE WATER USE CALCULATION TABLE FOR
 SMALL SIZE HOME EXAMPLE**

BASELINE WATER USE CALCULATION TABLE									
FIXTURE TYPE	FLOW RATE (gpm)		DURATION		DAILY USES		OCCUPANTS ^{1,2}	=	GALLONS PER DAY
Showerheads	2.5	X	5 min.	X	1	X		=	N/A
Showerheads Residential	2.5	X	8 min.	X	1	X	4	=	80
Lavatory Faucets Residential	2.2	X	.25 min.	X	3	X	4	=	6.6
Lavatory Faucets Nonresidential	0.5	X	.25 min.						
Kitchen Faucets	2.2	X	4 min.	X	1	X		=	N/A
Replacement Aerators	2.2	X		X		X		=	N/A
Wash Fountains	2.2	X		X		X		=	N/A
Metering Faucets	0.25	X	.25 min.	X	3	X		=	N/A
Metering Faucets for Wash Fountains	2.2	X	.25 min.	X		X		=	N/A
Gravity tank type Water Closets	1.6	X	1 flush	X	6	X	4	=	38.4
Flushometer Tank Water Closets	1.6	X	1 flush	X	1 male ³ 3 female	X		=	N/A
Flushometer Valve Water Closets	1.6	X	1 flush	X	1 male ³ 3 female	X		=	N/A
Electromechanical Hydraulic Water Closets	1.6	X	1 flush	X	1 male ³ 3 female	X		=	N/A
Urinals	1.0	X	1 flush	X	2 male	X		=	N/A

Example Baseline Calculation:

Showerheads = 2.5 gpm x 8 min x 1 (daily use) x 4 (occupants) = 80 Gallons per day
 Lavatory Faucets = 2.2 gpm x 0.25 min x 3 (daily uses) x 4 (occupants) = 6.6 Gallons per day
 Water Closets = 1.6 gpm x 1 gal/flush x 6 (daily uses) x 4 (occupants) = 38.4 Gallons per day
 Urinals = Not included in calculation
Total Daily Baseline Water Use = 125 Gallons per day

**SAMPLE 20 PERCENT REDUCTION WATER USE CALCULATION TABLE FOR
SMALL SIZE HOME EXAMPLE**

20 PERCENT REDUCTION WATER USE CALCULATION TABLE									
FIXTURE TYPE	FLOW RATE (gpm) ¹		DURATION		DAILY USES		OCCUPANTS ^{2,3}		GALLONS PER DAY
Showerheads		X	5 min.	X	1	X		=	N/A
Showerheads Residential	2.0	X	8 min.	X	1	X	4	=	64
Lavatory Faucets Residential	1.5	X	.25 min.	X	3	X	4	=	4.5
Lavatory Faucets Nonresidential	0.5	X	.25 min.	X	3	X		=	
Kitchen Faucets		X	4 min.	X	1	X		=	N/A
Replacement Aerators		X		X		X		=	N/A
Wash Fountains		X		X		X		=	N/A
Metering Faucets		X	.25 min.	X	3	X		=	N/A
Metering Faucets for Wash Fountains		X	.25 min.	X		X		=	N/A
Gravity tank type Water Closets	1.28	X	1 flush	X	6	X	4	=	30.72
HET ⁴ High Efficiency Toilet	1.28	X	1 flush	X	1 male ⁵ 3 female	X		=	N/A
Flushometer Tank Water Closets		X	1 flush	X	1 male ⁵ 3 female	X		=	N/A
Flushometer Valve Water Closets		X	1 flush	X	1 male ⁵ 3 female	X		=	N/A
Electromechanical Hydraulic Water Closets		X	1 flush	X	1 male ⁵ 3 female	X		=	N/A
Urinals		X	1 flush	X	2 male	X		=	N/A
Urinals Non-Water Supplied	0.0	X	1 flush	X	2 male	X		=	N/A

Example Proposed Calculation: 20 Percent Reduction

Showerheads = 2.0 gpm x 8 min x 1 (daily use) x 4 (occupants) = 64 Gallons per day

Lavatory Faucets = 1.5 gpm x 0.25 min x 3 (daily uses) x 4 (occupants) = 4.5 Gallons per day

Water Closets = 1.28 gpm x 1 gal/flush x 6 (daily uses) x 4 (occupants) = 30.72 Gallons per day

Urinals = Not included in calculation

Total Daily Proposed Water Use = 99.22 Gallons per day ≤ 100 Gallons per day (20 Percent Reduction of 125 Gallons per day Baseline)

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

4.303.2 Multiple showerheads serving one shower. When a shower is served by more than one showerhead, the combined flow rate of all the showerheads controlled by a single valve shall not exceed the Maximum Flow Rates at ≥ 20 Percent Reduction column in Table 4.303.2 or the shower shall be designed to only allow one showerhead to be in operation at a time.

Exception: The maximum flow rate for showerheads when using the performance method specified in Section 4.303.1, Item 2, is 2.5 gpm @ 80 psi.

COMMENTARY

The maximum flow rate established in Table 4.303.2, Maximum Flow Rate at ≥ 20 Percent Reduction column, also covers applications 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 fixtures). For example, if only one water line or valve supplies a shower enclosure or space, the maximum amount of resulting water flow, regardless of the number of showerheads, is 2 gpm @ 80 psi. If two separate valves provide water to separate showerheads, the maximum flow for each valve would be 2 gpm @ 80 psi. If the operation of two showerheads, controlled by one valve, results in more than 2 gpm @ 80 psi total water flow, then only one showerhead may operate at one time.

An exception to Section 4.303.2 provides for the maximum water flow rate, as allowed by the California Plumbing Code, to be at 2.5 gpm @ 80 psi. However, this flow rate is only allowed when using the "performance method" for 20 percent reduction for indoor water use.

4.303.3 Plumbing fixtures and fittings. Plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall meet the standards referenced in Table 4.303.3.

COMMENTARY

Purpose:

This section provides specifications for plumbing fixtures and fittings referencing the US Environmental Protection Agency's WaterSense label, for fixture types that could be used to meet the 20 percent reduction criteria.



Graphic from US Environmental Protection Agency WaterSense Program.
Website: <http://www.epa.gov/watersense/products/index.htm>

**SECTION 4.304
OUTDOOR WATER USE**

4.304.1 Irrigation controllers. Automatic irrigation system controllers for landscaping provided by the builder and installed at the time of final inspection shall comply with the following:

1. Controllers shall be weather- or soil moisture-based controllers that automatically adjust irrigation in response to changes in plants' needs as weather conditions change.
2. Weather-based controllers without integral rain sensors or communication systems that account for local rainfall shall have a separate wired or wireless rain sensor which connects or communicates with the controller(s). Soil moisture-based controllers are not required to have rain sensor input.

Note: More information regarding irrigation controller function and specifications is available from the Irrigation Association.

COMMENTARY

Purpose:

Water savings can be achieved by eliminating water use when not needed such as during periods of rain or when soils are holding enough moisture for support of landscaping. Controlled water use can also reduce damage from over watering such as erosion and runoff, foundation damage, mold, and premature death of plants.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Applies to controllers installed at time of final inspection. This section does not mandate that controllers be installed.*
- *Smart irrigation control systems are manufactured and supplied by many companies and are easily accessible in stores or online.*
- *Other acceptable control systems that utilize rain sensors and automatically delay watering due to rain.*
- *Systems may be communication-based, based on plant watering needs, or soil moisture.*

Background:

Some automatic irrigation systems are often referred to as “smart irrigation control systems” and will either have a single control system or a secondary add-on device that can interface with the controller. Smart controllers estimate or measure depletion of available plant soil moisture in order to operate an irrigation system, replenishing water as needed while minimizing excess water use. The irrigation system is monitored by either soil or moisture-based devices that allow irrigation when water is required and not by a preprogrammed time clock.

The choice of irrigation system emitters should be established during the design phase and based on evaluation of the land topography (slope), soil type, water availability and pressure, plant type, and climate conditions.

Weather-based smart irrigation control systems evaluate current weather conditions and adjust schedules based on several parameters; weather conditions, plant types, and site conditions. The system will continually monitor the parameters and adjust the irrigation schedule as required.

Soil moisture-based smart irrigation control systems monitor soil moisture conditions on-site with one or multiple moisture sensors. The key is to maintain an appropriate level of moisture for each plant species zone. Wilting will occur if moisture level within the soil decreases to a point the species cannot recover during the night.

Users should be aware that both fully- and semi-automatic systems are available. Smart irrigation systems require the user to participate in the baseline irrigation schedule, and then the system will determine the days and run time of irrigation. Automatic controllers that determine irrigation run times are preprogrammed with the crop coefficients established by the manufacturers. Users who decide to modify the coefficients due to geographical variations should consult a professional to make sure their revised coefficients do not cause under- or over-irrigating.

NOTES:

1. Automatic irrigation controllers utilizing either evapotranspiration or soil moisture sensor data are required for all irrigation systems if they are subject to a local water efficient landscape ordinance or to the Department of Water Resources' California Model Water Efficient Landscape Ordinance (MWELO).
2. More information regarding irrigation controller function and specifications may be obtained from local water districts, the Irrigation Association, California Landscape Contractors Association, California Department of Water Resources and Metropolitan Water District of Southern California or other available sources.

Frequently Asked Questions

Q: What is the effective date of the indoor water use requirements for nonresidential occupancies? (The Checklist for residential occupancies indicates an effective date of July 1, 2011, while the Checklist for nonresidential occupancies is silent.)

A: The effective date for **residential** indoor water reduction is July 1, 2011.
The effective date for **nonresidential** indoor water reduction is January 1, 2011.

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. $(R+R+F)/3 = \text{Average flow}$. This flow must be 1.28 gallons per flush or less to meet the reduced flow requirements.

Q: Does CALGreen require a "smart" irrigation system to be installed prior to the final inspection?

A: No. Section 4.304.1 requires either weather- or soil moisture-based controllers for automatic irrigation systems only if controllers are installed at the time of final inspection. Automatic irrigation controllers utilizing either evapotranspiration or soil moisture sensor data may be required for irrigation systems subject to a local water efficient landscape ordinance or the California Model Water Efficient Landscape Ordinance (MWELO).

DIVISION 4.4 – MATERIAL CONSERVATION AND RESOURCE EFFICIENCY

**SECTION 4.406
ENHANCED DURABILITY AND REDUCED MAINTENANCE**

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

4.406.1 Rodent proofing. 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.

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 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, disease and damage. The perceived reference to California Energy Code provisions has been deleted from CALGreen due to redundancy.

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 bottom plates, exterior wall openings around plumbing pipes, flues, exhaust vents, and HVAC conduits. Openings as small as ¼ 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 rodentproof 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**

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

4.408.1 Construction waste management. Recycle and/or salvage for reuse a minimum of 50 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; conservation of the original resources and reduces the burden on landfills.

Background:

Where a local jurisdiction has not adopted a greater than 50 percent waste reduction requirement, the mandatory 50 percent waste reduction established in Section 4.408.1 applies. Section 4.408 also provides choices for meeting the waste reduction requirement including alternate waste reduction methods developed in consultation with local agencies. An exception also recognizes that waste facilities may not exist, or be reasonably close to the jobsite, making compliance with the literal requirements and the benefits intended by this section unfeasible. Determination of "reasonably close" will vary by jurisdiction according to the location of a jobsite 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 several 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.

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

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. Projects that generate a total combined weight of construction and demolition waste disposed of in landfills, which do not exceed four (4) lbs./sq. ft. of the building area shall meet the minimum 50 percent construction waste reduction requirement in Section 4.408.1.

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

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 (Low-Rise Residential)" located at www.hcd.ca.gov/CALGreen.html 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 50 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 50 percent or greater construction waste diversion rate.

Examples of Acceptable Methods of Implementation and/or Compliance:

- Comply with a local waste management ordinance.
- Develop and submit a construction waste management plan (CWMP) for approval of the local enforcing agency.
- Transport all construction waste to a recycling facility having a 50 percent or greater diversion rate.
- Generate a total combined weight of construction and demolition waste disposed in landfills not to exceed 4 pounds per square foot of the building area.
- 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.

To reduce time and costs of completing a CWMP and/or other compliance documents, optional sample plans and worksheets, that may be used to show compliance with the waste diversion requirements, are available online by clicking on the CALGreen logo in the carousel on the HCD website home page at (<http://www.hcd.ca.gov>) or by using the hyperlinks in Chapter 8 of this guide. Local enforcing agencies may require completion of additional documents or additional information. Contact the local authority early to discuss and to ensure compliance.

Background:

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

Compliance Methods and Supporting Documentation

The 2010 CALGreen Code, Section 4.408.1 mandates a 50 percent reduction of construction and demolition (C & D) waste from newly constructed low-rise residential projects. During the planning stage of any new construction project, contact the local jurisdiction and review any local ordinances pertaining to the reduction of construction waste. If a local jurisdiction does not have a construction waste management ordinance providing for 50 percent or greater reduction in construction waste contact the local enforcing agency to determine an acceptable compliance method.

CALGreen, Section 4.408, recognizes several methods of compliance to meet 50 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 which may be used for providing documentation of construction waste diversion and compliance with CALGreen; hyperlinks to these documents are provided in Chapter 8.)

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 established diversion goals requirements 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 2010 CALGreen Code 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 construction project to be transported to a recycling facility or waste management company that has a waste diversion rate of 50 percent or more. A recycling facility sorts the construction waste it receives and reclaims and recycles 50 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 50 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 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 50 percent construction waste reduction requirements of CALGreen. Check with the local enforcing agency for specific requirements.

4 Pounds per Square Foot Method or Waste Stream Reduction Alternative. The total waste generated on an average home in California is 8.5 pounds per square foot. The 4 pounds per square foot net waste limit can be achieved through efficient design, careful and accurate material ordering, handling and storage, panelized/pre-fabricated 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 or preassembled.

Similar to the Volume or Weight Documentation Method discussed below, the facility where construction waste is transported will furnish tickets or receipts, which together with the completed Construction Waste Management Worksheets (4 Lbs. per Sq. Ft.) should be retained and provided to the local enforcing agency to demonstrate compliance with the construction waste reduction provisions of CALGreen.

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's 50 percent waste reduction requirement.

Other Documentation Methods

Additional documentation methods for verifying compliance with CALGreen's 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.

**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, 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 importance of diverting water at least 5 feet away from 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. (See hyperlink to form in Chapter 8.)*
- *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.*

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 bottom plates, to prevent entry of rodents and the resulting damage.

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 50 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 guest room in hotels/motels?

A: No. All operation and maintenance information for all applicable features of guest rooms and common areas shall be provided to whoever 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 Phase II emission limits where applicable. 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) Phase II emission standards. More information on “EPA-Certified” appliances and emission standards can be found at: <http://www.epa.gov/burnwise/choosing.html#certified-qualified>.*
- *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 (AQMD), which are also called air districts. There are currently 35 AQMD or APCD. These agencies are county or regional governing authorities that have primary responsibility for controlling air pollution from stationary source. 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 <http://www.arb.ca.gov/homepage.htm>.*

Background:

HCD first proposed to adopt fireplace regulations during the 2009 Triennial Code Adoption Cycle in development of the 2010 California Green Building Standards Code (CALGreen). 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 mandates, but do not address indoor air quality.

HCD’s proposed fireplace requirements do not conflict with or restate CEC requirements. HCD’s fireplace requirement goes further than Title 24, Part 6, by requiring gas fireplaces to be “direct-vent” sealed-combustion types. 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 “back draft” 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 “back drafting”. 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

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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 from entering the home and starting a fire.

The requirements of Section 4.503.1 do not place additional restrictions upon other types of fuel burning fireplaces. Section 4.503.1 provides reference to US EPA Phase II emission limits as guidance. EPA Phase II 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 published this additional language because it was deemed beneficial guidance to code officials and code users.

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.

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**SECTION 4.504
POLLUTANT CONTROL**

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

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 in a method that the protection 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 6 or 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 is not adversely affected by construction pollution.

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 Tables 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.

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."

If required by the enforcing agency proof of compliance may be required. Product manufacturers' information, material safety data sheets (MSDS), technical data sheets or compliance letters may be acceptable forms of compliance.

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

Less Water and Less Exempt Compounds in Grams per Liter

ARCHITECTURAL APPLICATIONS	CURRENT 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 adhesive 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.

**TABLE 4.504.2
SEALANT VOC LIMIT**

Less Water and Less Exempt Compounds in Grams per Liter

SEALANTS	CURRENT 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

**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	EFFECTIVE 1/1/2010	EFFECTIVE 1/1/2012
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	400	250
Shellacs		
Clear	730	
Opaque	550	
Specialty primers, sealers, and Undercoaters	350	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.

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)(3) and other requirements, including prohibitions on use of certain toxic compounds and ozone depleting substances, in Sections 94522(c)(2) and (d)(2) 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) suggested 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. Section 4.504.2.2 provides standards for paints and coatings.

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:

Builders should be ready to provide verification of compliance with any portion of this section to the enforcing agency. 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.

- *Product specifications should be easily accessible from the product and material suppliers. Make these available at time of inspection.*
- *Contractors should be cognizant that field 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 inspectors verification until such time the inspector deems they are not required.*
- *Hyperlinks to supporting sample documentation forms are included in Chapter 8. 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.*

The regulatory text for Sections 4.504.3 and 4.504.3.1 was amended in July 2011 and is effective July 1, 2012

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.

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 accessible from the product and material suppliers. Make these available at time of inspection.*
- *Contractors should be cognizant 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.*
- *Hyperlinks to supporting sample documentation forms are included in Chapter 8. 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:

All carpet systems, 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, respectively. This practice will help reduce indoor emission levels thereby improving the overall healthfulness of indoor and outdoor air quality. Installed products used are third party-certified and installed in a manner acceptable to the manufacturer's requirements.

Note: *All website addresses, especially those that are document-specific, may change over time. If there is a problem with accessing specific websites, the needed information may be found by typing in the most basic website address for the organization (e.g., www.carpet-rug.org), and then searching for keywords, such as "NSF".*

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

4.504.4 Resilient flooring systems. Where resilient flooring is installed, at least 50 percent of floor area receiving resilient flooring shall comply with one or more of the following:

1. VOC emission limits defined in the Collaborative for High Performance Schools (CHPS) High Performance Products Database.
2. Products compliant with CHPS criteria certified under 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 based on the Collaborative for High Performance Schools (CHPS) Low-emitting Materials List, Resilient Floor Covering Institute (RFCI) FloorScore program, and other acceptable standards. Compliance with these VOC limits will help improve indoor and outdoor air quality and reduce occupants' exposure to chemicals that can have adverse effects on human health at higher levels.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *50 percent or more of the total area of resilient flooring is VOC-emissions compliant.*
- *Flooring and adhesives that meet the VOC limits defined by CHPS for low-emitting materials in their High Performance Products Database.*
- *Products compliant with CHPS criteria under the Greenguard Children and 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.)*
- *Provide documentation of product certification and compliance.*
- *Hyperlinks to supporting sample documentation forms are included in Chapter 8. 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:

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 make it a logical choice for use in homes.

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.

COMMENTARY

Purpose:

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

Background:

The following information is an excerpt from ARB'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 ARB 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 ARB to take action to reduce human exposure to all TACs."

There are many products available that meet the limits specified in Table 4.504.5. Table 4.504.5 will be updated for the 2013 CALGreen code since the 2012 "early" compliance dates will have already occurred during the effective period of the 2010 CALGreen. In addition, ARB's Air Toxics Control Measure for Composite Wood regulations may also be updated during the effective period of the 2010 CALGreen to include input from stakeholders and to align federal and state programs related to composite wood products.

ARB has also established "sell through" provisions which allow the sale of composite wood products that may not meet the specified formaldehyde limits for specified effective dates. This is summarized in ARB's Regulatory Guidance, updated February 2012, Composite Wood Products ATCM Sell-through Provisions That Apply to Manufacturers, Importers, Distributors, Fabricators, and Retailers of Composite Wood Products Panels and Finished Goods: "Under the sell-through provisions, composite wood products and finished goods manufactured before each effective date may legally be sold, supplied, or offered for sale in California for specified periods of time after the effective date." Sell through provisions are primarily for the purpose of reducing excess inventories due to slow sales.

HCD recommends that the ARB's Regulatory Guidance document cited above and Regulatory Advisory, February 2012, Composite Wood Products Regulation Advisory: 12-01 Extension of Sell-Through Dates for Retailers of Pre-Phase 1 Finished Goods and Distributors, Fabricators, and Retailers of Phase 1 Finished Goods, be consulted for further detail. These documents are available at ARB's Composite Wood Products ATCM website at www.arb.ca.gov.

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>.

**TABLE 4.504.5
FORMALDEHYDE LIMITS¹**

Maximum formaldehyde emissions in parts per million.

PRODUCT	CURRENT LIMIT	JANUARY 1, 2012	JULY 1, 2012
Hardwood plywood veneer core	0.05		
Hardwood plywood composite core	0.08		0.05
Particleboard	0.09		
Medium density fiberboard	0.11		
Thin medium density fiberboard ²	0.21	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 E1333-96 (2002). 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 8 millimeters.

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

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 or European 636 3S standards.
5. Other methods acceptable to the enforcing agency.

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. 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 accessible 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. Therefore, documenting compliance should be straightforward for compliant products.*
- *Contractors should be cognizant that field inspectors can request to field verify that products meet the requirements of Section 4.504.5. It is recommended that contractors keep available any packaging and/or product labels for inspector verification until such time the inspector deems they are not required.*
- *Hyperlinks to supporting sample documentation forms are included in Chapter 8. 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**

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

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 (101.6 mm) thick base of ½ 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. The size of the base material is specified. The vapor retarder is also required to be in direct contact with the concrete. Equivalent alternate methods or designed systems are also permitted.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Follow prescriptive requirements in this section.*
- *Use appropriate concrete mix design and cure periods for 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 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 when protecting indoor air quality. This practice provides a method to address the growing concern of water intrusion through the slab and foundation walls. A capillary break will provide a discontinuity and prevent 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's "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 E1643-10.

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

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 protection 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 construction is the most commonly used form of building construction in single-family and multi-family homes today. Freshly cut wood often displays moisture content levels of 30 percent and higher. Levels of this magnitude, especially when enclosed and prevented from drying, could cause serious problems with constructability as well as long-term building and occupant health.

Commonly used by building inspectors as a criteria for serviceability and performance of wood products; the maximum allowable 19 percent moisture level is the performance threshold for kiln-drying for many building codes. Section 4.505.3 details the requirements and methods to insure that the supplied building materials are safe for installation.

SECTION 4.506 INDOOR AIR QUALITY AND EXHAUST

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

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% 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 Low-Rise 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 for bathroom exhaust fans ensure that 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

<p>4.507.1 Openings. Whole house exhaust fans shall have insulated louvers or covers which close when the fan is off. Covers or louvers shall have a minimum insulation value of R-4.2.</p>
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COMMENTARY

Purpose:

This section, in conjunction with Section 4.406, addresses the importance of sealing or separating conditioned space from nonconditioned space and maintaining temperature control.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Install a whole house fan with insulated louvers.*
- *Install a whole house fan with an insulated cover.*
- *Use a whole house fan with an insulated duct connected to penetrations in the conditioned envelope.*

Background:

A whole house fan, sometimes called whole house cooling or comfort ventilator, works by drawing in cooler outside air and exhausting warmer inside air through the attic and to the outside. The fan is typically sized on the amount of conditioned space to be exhausted. The large openings associated with whole house fans provide a potential area for loss of energy especially during the winter and summer months when the building is heated or cooled. Therefore, CALGreen requires that the louvers or covers be insulated.

Whole house fans, for purposes of energy efficiency, should be sized appropriately for the structure, have sufficient openings for intake of cooler air and exhaust of warmer air, and scheduled for use when outside air is cooler than inside air. Penetrations between the attic and living space should be sealed to prevent attic air from being forced into living spaces. In addition, since the whole house fan is capable of moving large amounts of air to the exterior, users must ensure that adequate openings, e.g., windows, are available for intake. If any combustion appliances are used in the living space, they should have adequate air for combustion and means of exhausting combustion products in the appropriate direction even when the whole house fan is operating.

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

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 – 2004 (*Residential Load Calculation*), ASHRAE handbooks or other equivalent design software or methods.
2. Duct systems are sized according to ANSI/ACCA 1 Manual D – 2009 (*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 – 2004 (*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 calculation using software (available on the Internet) or hand calculations or an equivalent.
- Duct system design to ensure adequate air flow is provided to address the heat loss and gain in each area of the home.
- Select equipment which will provide the necessary air flow and level of conditioning to satisfy the loads, function within the duct design criteria and within the equipment limitations.
- The referenced 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 Reference Appendices for the 2008 Building Energy Efficiency Standards for Residential and Nonresidential Buildings or a successor document.

Background:

The Air Conditioning Contractors of America's (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 multi-unit structures, condominiums, town houses 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: Do the VOC (volatile organic compounds) 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, either below or 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 of ASTM E 96 as follows:

Class I: 0.1 perm or less.
Class II: $0.1 < \text{perm} \leq 1.0$ perm.
Class III: $1.0 < \text{perm} \leq 10$ perm.

The *CALGreen* Code 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: Does the requirement for 19 percent maximum moisture content of building materials (Section 4.505.3) apply to pressure 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. *CALGreen* and the *California Building Code* do not make distinctions between regular lumber and pressure treated lumber. Pursuant to 2010 CBC (Section 2303.1.8.2), 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 less for wood structural panels, before use.

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

A: Yes. The text in Section 4.506, effective July 1, 2012, requires exhaust fans in each bathroom. This intent was initially stated only in the Residential Occupancies Application Checklist in *CALGreen*, Section A4.602, and identified as a mandatory feature. However, the requirement for mechanical ventilation is also required/mandated in other building codes.

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 the *CALGreen* code. As used in this section, “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 this section 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. This section 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 check list 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. This section specifically states that “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 this section 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 this section?

A: Yes. At the time of frame inspection, the building envelope should be weather tight. In the case of severe rainstorms, entire jobsites 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 to wait a certain period of time to re-test for moisture content contained in this section.

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 pressure 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, the CALGreen code, as well as the *California Building Code*, does not make distinctions between regular lumber and pressure treated lumber. Pursuant to 2010 CBC (Section 2303.1.8.2), where preservative-treated wood is used in enclosed locations where drying in service cannot readily occur, such wood shall be a moisture content of 19 percent or less before being covered with insulation, interior wall finish, floor covering or other materials. One way for complying 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 Department of Housing and Community Development?

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 find) must be adopted via open public proceedings and the local amendment cannot take effect until both the ordinance and finding of local conditions have been duly filed with the California Building Standards Commission.

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 filed with the California Building Standards Commission.

Q: Why did the Department of Housing and Community Development (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 a 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 18 percent moisture content



LOW-RISE RESIDENTIAL MANDATORY MEASURES EFFECTIVE JULY 1, 2012

SECTION	MEASURES	REQUIREMENTS
Division 4.1 - PLANNING AND DESIGN (SITE DEVELOPMENT)		
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 shall manage storm water drainage during construction.
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.
Division 4.2 - ENERGY EFFICIENCY		
4.201.1	Scope	Standards for residential buildings do not require compliance with levels of minimum energy efficiency beyond those required by the 2010 California Energy Code. The most recent set of changes to the California Energy Commission's Energy Efficiency Standards for Residential Buildings took effect on January 1, 2010.
Division 4.3 - WATER EFFICIENCY AND CONSERVATION (INDOOR WATER USE)		
4.303.1	20% Savings	Fixtures and fixture fittings reducing the overall use of potable water within the building by at least 20% shall be provided. The 20% reduction shall be demonstrated by one of the following methods: 1 - Prescriptive Method: Showerheads (≤ 2.0 gpm @ 80 psi); Residential Lavatory Faucets (≤ 1.5 gpm @ 60 psi); Nonresidential Lavatory Faucets ($\leq .4$ gpm @ 60 psi); Kitchen Faucets (≤ 1.8 gpm @ 60 psi); Toilets (≤ 1.28 gal/flush); and urinals (≤ 0.5 gal/flush). 2 - Performance Method: Provide a calculation demonstrating a 20% reduction of indoor potable water using the baseline values set forth in Table 4.303.1. The calculation will be limited to the total water usage of showerheads, lavatory faucets, water closets and urinals within the dwelling.
4.303.2	Multiple Showerheads Serving One Shower	When a shower is served by more than one showerhead, the combined flow rate of all the showerheads controlled by a single valve shall not exceed the Maximum Flow Rate specified in the $\geq 20\%$ reduction column contained in Table 4.303.2 or the shower shall be designed to only allow one showerhead to be in operation at a time. Exception: The maximum flow rate for showerheads when using the performance method specified in Section 4.303.1, Item 2, is 2.5 gpm @ 80psi.
Division 4.3 - WATER EFFICIENCY AND CONSERVATION (OUTDOOR WATER USE)		
4.304.1	Irrigation Controllers	Automatic irrigation system controllers for landscaping provided by the builder and installed at the time of final inspection shall comply with the following: 1 - Controllers shall be weather- or soil moisture-based controllers that automatically adjust irrigation in response to changes in plants' watering needs as weather or soil conditions change. 2 - Weather-based controllers without integral rain sensors or communication systems that account for rainfall shall have a separate wired or wireless rain sensor which connects or communicates with the controller(s).
Division 4.4 - MATERIAL CONSERVATION & RESOURCE EFFICIENCY (ENHANCED DURABILITY & REDUCED MAINTENANCE)		
4.406.1	Rodent proofing	Annular spaces around pipes, electric cables, conduits, or other openings in plates at exterior walls shall be closed with cement mortar, concrete masonry or a similar method acceptable to the enforcing agency to prevent passage of rodents.
Division 4.4 - MATERIAL CONSERVATION & RESOURCE EFFICIENCY (CONSTRUCTION WASTE REDUCTION, DISPOSAL & RECYCLING)		
4.408.1	Construction Waste Reduction of at least 50%	Recycle and/or salvage for reuse a minimum of 50% 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. Documentation is required per Section 4.408.5. Exceptions: 1 - Excavated soil and land-clearing debris. 2 - Alternate waste reduction methods developed by working with local enforcing 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 jobsites are located in areas beyond the haul boundaries of the diversion facility.
4.408.2	Construction Waste Management Plan	Submit a construction waste management plan meeting Items 1 through 5 in Section 4.408.2. Plans shall be updated as necessary and shall be available for examination during construction..
4.408.3	Waste Management Company	Utilize a waste management company, approved by the enforcing agency, which can provide verifiable documentation that diverted construction and demolition waste materials meet the requirements in Section 4.408.1.
4.408.4	Waste Stream Reduction Alternative	Generate a total combined weight of construction and demolition waste disposed in landfills that does not exceed 4 pounds per square-foot of the building area.
Division 4.4 - MATERIAL CONSERVATION & RESOURCE EFFICIENCY (BUILDING MAINTENANCE & 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 covers 10 specific subject areas shall be placed in the building.
Division 4.5 - ENVIRONMENTAL QUALITY (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 Phase II emission limits where applicable. Woodstoves, pellet stoves and fireplaces shall also comply with all applicable local ordinances.
Division 4.5 - ENVIRONMENTAL QUALITY (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 intake and distribution component openings shall be covered. Tape, plastic, sheetmetal or other methods acceptable to the enforcing agency to reduce the amount of water, dust and debris entering the system may be used.
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 Tables 4.504.1 or 4.504.2 as applicable. Such products shall also comply with 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.

Acknowledgement: This document is an updated version of an original checklist prepared by the California Building Industry Association for summarizing CALGreen's mandatory measures for low-rise residential structures. This checklist includes CALGreen provisions approved by the California Building Standards Commission on July 20, 2011.

SECTION	MEASURES	REQUIREMENTS
Division 4.5 - ENVIRONMENTAL QUALITY (POLLUTANT CONTROL Continued)		
4.504.2.2	Paints and Coatings	Architectural paints and coatings shall comply with VOC limits in Table 1 of the Air Resources Board 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 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)(3) and other requirements, including prohibitions on use of certain toxic compounds and ozone depleting substances, in Section 94522(c)(2) and (d)(2) 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.
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 adhesives shall meet the requirements of Table 4.504.1.
4.504.4	Resilient Flooring Systems	Where resilient flooring is installed, at least 50% of floor area receiving resilient flooring shall comply with one or more of the following: 1 - VOC emission limits defined in the Collaborative for High Performance Schools (CHPS) High Performance Products Database. 2 - Products compliant with CHPS criteria certified under 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.)
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 Air Resources Board's Air Toxics Control Measure for Composite Wood (17 CCR 93120 et. seq.), on or before the dates specified in those sections shown in Table 4.504.5. Documentation is required per Section 4.504.5.1. Definition of Composite Wood Products: Composite wood products include hardwood plywood, particleboard, and medium density fiberboard. "Composite wood products" do not include hardboard, structural plywood, structural panels, structural composite lumber, oriented strand board, glued laminated timber, prefabricated wood I-joists, or finger-jointed lumber, all as specified in CCR, Title 17, Section 93120.1(a).
Division 4.5 - ENVIRONMENTAL QUALITY (INTERIOR MOISTURE CONTROL)		
4.505.2	Concrete Slab Foundations	Concrete slab foundations or concrete slab-on-ground floors required to have a vapor retarder by the California Building Code, Chapter 19, or the California Residential Code, Chapter 5, respectively, 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 (101.6 mm) thick base of 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.
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% 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. 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.
Division 4.5 - ENVIRONMENTAL QUALITY (INDOOR AIR QUALITY & 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 manual or automatic adjustment between a relative humidity range of less than 50% to a maximum of 80%. b) A humidity control may be a separate component to the exhaust fan and is not required to be integral or built-in. Note: For CALGreen a bathroom is a room which contains a bathtub, shower, or tub/shower combination. Fans are required in each bathroom.
Division 4.5 - ENVIRONMENTAL QUALITY (ENVIRONMENTAL COMFORT)		
4.507.1	Openings	Whole house exhaust fans shall have insulated louvers or covers which close when the fan is off. Covers or louvers shall have a minimum insulation value of R-4.2.
4.507.2	Heating and Air Conditioning System Design	Heating and air conditioning systems shall be sized, designed, and equipment selected using the following methods: 1 - The heat loss and heat gain is established according to ANSI/ACCA 2 Manual J - 2004 (Residential Load Calculation), ASHRAE handbooks or other equivalent design software or methods. 2 - Duct systems are sized according to ANSI/ACCA 1 Manual D - 2009 (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 - 2004 (Residential Equipment Selection) or other equivalent design software or methods. Exception: Use of alternate design temperatures necessary to ensure the system functions are acceptable.
CHAPTER 7 - INSTALLER & SPECIAL INSPECTOR QUALIFICATIONS (QUALIFICATIONS, VERIFICATIONS)		
702.1	Installer Training	HVAC system installers shall be trained and certified in the proper installation of HVAC systems and equipment by a recognized training or certification program. 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 statewide energy consulting or verification organizations. 4 - Programs sponsored by manufacturing organizations. 5 - Other programs acceptable to the enforcing agency.
702.2	Special Inspection	Special inspectors must be qualified and able to demonstrate competence to the enforcing agency in the discipline in which they are inspecting.
703.1	Documentation	Documentation of compliance shall include, but is not limited to, construction documents, plans, specifications, builder or installer certification, inspection reports, or other methods acceptable to the local enforcing agency. Other specific documentation or special inspections necessary to verify compliance are specified in appropriate sections of CALGreen.



CHAPTER 5. NONRESIDENTIAL MANDATORY MEASURES

NOTE: 2010 CALGreen Code Chapter 5 “Nonresidential Mandatory Measures,” effective July 1, 2012, is divided into seven separate divisions and contains measures adopted by the California Building Standards Commission (CBSC) and the Division of the State Architect – Structural Safety (DSA-SS). CALGreen, Chapter 5, addresses green building standards for nonresidential structures and is not discussed in this guide.

For information on CALGreen Chapter 5, see “*Guide to the (Non-Residential) California Green Building Standards Code*” and “*Guide to the California Green Building Standards Code – Non-Residential (Commissioning)*” prepared by the California Building Standards Commission (www.bsc.ca.gov.)



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 the CALGreen section(s) where the standard is noted or referenced.

As noted in 2010 CALGreen Code Section 101.5, referenced codes and standards are considered part of the requirements of the code to the prescribed extent of each 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.



CHAPTER 7. INSTALLER AND SPECIAL INSPECTOR QUALIFICATIONS FOR LOW-RISE RESIDENTIAL PROJECTS

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CHAPTER 7. INSTALLER AND SPECIAL INSPECTOR QUALIFICATIONS

SECTION 702 QUALIFICATIONS

702.1 Installer training [HCD]. 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 statewide 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-venting 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.

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. [HCD, BSC] 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.

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 located 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. Hyperlinks to these forms are located in Chapter 8 “Compliance Forms and Worksheets”.

Background:

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

Frequently Asked Questions

Q: CALGreen Section 702.2 is entitled “Special Inspection” includes language that reads “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 AND WORKSHEETS

CALGreen Chapter 8 provides sample worksheets, compliance forms and other supporting documents for implementing CALGreen measures. Copies of forms found in the CALGreen code as well as additional simplified optional forms developed by HCD are available on the following HCD website.

<http://www.hcd.ca.gov/CALGreen.html>

Use of these forms is not mandated for compliance with CALGreen. These forms serve as templates or guides for users and may be modified for user convenience. It is also HCD's intent to move these nonregulatory forms from the CALGreen regulatory text and to develop and maintain these forms on our website. This also facilitates downloading and customization of forms; interactive forms, and more efficient maintenance.

The regulatory text for this chapter, in the form of a note, was added in July 2011 and is effective July 1, 2012.

[HCD 1] Sample forms found in "A Guide to the California Green Building Standards Code (Low-Rise Residential)" located at www.hcd.ca.gov/CALGreen.html may be used to assist in documenting compliance with the waste management plan.

The following forms are available for downloading from HCD's website under the heading "Compliance Forms and Worksheets." Individual links are also provided for each of the forms in both PDF; or Microsoft Word or Excel formats. Forms that appear in "read only" format may be downloaded and saved to another file name to enable editing.

The forms marked with an **asterisk (*)** are new forms. The forms marked with a **plus sign (+)** have been expanded and/or reflect amendments to the 2010 CALGreen adopted during the annual code adoption cycle and effective July 1, 2012.

Water Use Calculation Forms (Section 4.303)

- Worksheet (WS 1) – Baseline Water Use Calculation Table⁺
 - <http://www.hcd.ca.gov/codes/calgreen/WS-1.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/WS-1.docx>

- Worksheet (WS 2) – 20 Percent Reduction Water Use Calculation Table⁺
 - <http://www.hcd.ca.gov/codes/calgreen/WS-2.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/WS-2.docx>

Construction Waste Management Forms (Section 4.408)

- CW 1 – Construction Waste Management Plan (CWMP)⁺
 - <http://www.hcd.ca.gov/codes/calgreen/CW-1.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/CW-1.docx>
- CW 2 – Construction Waste Management Worksheet (Volume Method) and Instructions
 - <http://www.hcd.ca.gov/codes/calgreen/CW-2.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/CW2.xls>
- CW 3 – Construction Waste Management Worksheet (Weight Method) and Instructions⁺
 - <http://www.hcd.ca.gov/codes/calgreen/CW-3.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/CW-3.xls>
- CW 4 – Weight or Volume Summary Worksheet⁺
 - http://www.hcd.ca.gov/codes/calgreen/CW-4_WtVolSummary.pdf
 - http://www.hcd.ca.gov/codes/calgreen/CW-4_WtVolSummary.xls
- CW 5 – Construction Waste Management Worksheet (4 Lbs. per Sq. Ft.) and Instructions⁺
 - http://www.hcd.ca.gov/codes/calgreen/CW-5_4lbs.pdf
 - http://www.hcd.ca.gov/codes/calgreen/CW-5_4LbsperSqFt.xls
- CW 6 – 4 Lbs. per Sq. Ft. Summary Worksheet⁺
 - http://www.hcd.ca.gov/codes/calgreen/CW-6_4lbSummary.pdf
 - http://www.hcd.ca.gov/codes/calgreen/CW-6_4LbSummaryWorksheet.xls
- CW 7 – Construction Waste Management Plan (CWMP) Acknowledgement⁺
 - http://www.hcd.ca.gov/codes/calgreen/CW-7_CWMPAcknowledgement.pdf
 - http://www.hcd.ca.gov/codes/calgreen/CW-7_CWMPAcknowledgement.xls

Building Maintenance and Operation Forms (Section 4.410)

- Operation and Maintenance Manual^{*}
 - http://www.hcd.ca.gov/codes/calgreen/BldgOp_MaintenanceManual.pdf
 - http://www.hcd.ca.gov/codes/calgreen/BldgOp_MaintenanceManual.doc

Pollutant Control Forms (Section 4.504)

- PC 1 – Adhesives, Sealants and Caulks - Product Information^{*}
 - <http://www.hcd.ca.gov/codes/calgreen/PC1.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC1.xls>
- PC 2 – Adhesives, Sealants and Caulks - Room/Location Matrix^{*}
 - <http://www.hcd.ca.gov/codes/calgreen/PC2.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC2.xls>
- PC 3 – Adhesives, Sealants and Caulks - Declaration Statement^{*}
 - <http://www.hcd.ca.gov/codes/calgreen/PC3.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC3.xls>
- PC 4 – Sample Worksheet^{*}
 - <http://www.hcd.ca.gov/codes/calgreen/PC4.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC4.xls>

- PC 5 – Paints and Coatings - Product Information*
 - <http://www.hcd.ca.gov/codes/calgreen/PC5.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC5.xls>
- PC 6 – Paints and Coatings - Room/Location Matrix*
 - <http://www.hcd.ca.gov/codes/calgreen/PC6.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC6.xls>
- PC 7 – Paints and Coatings - Declaration Statement*
 - <http://www.hcd.ca.gov/codes/calgreen/PC7.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC7.xls>
- PC 8 – Sample Worksheet*
 - <http://www.hcd.ca.gov/codes/calgreen/PC8.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC8.xls>
- PC 9 – Finish Flooring Materials - Product Information*
 - <http://www.hcd.ca.gov/codes/calgreen/PC9.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC9.xls>
- PC 10 – Finish Flooring Materials - Room/Location Matrix*
 - <http://www.hcd.ca.gov/codes/calgreen/PC10.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC10.xls>
- PC 11 – Finish Flooring Materials - Declaration Statement*
 - <http://www.hcd.ca.gov/codes/calgreen/PC11.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC11.xls>
- PC 12 – Sample Worksheet*
 - <http://www.hcd.ca.gov/codes/calgreen/PC12.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC12.xls>
- PC 13 – Composite Wood Products - Product Information*
 - <http://www.hcd.ca.gov/codes/calgreen/PC13.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC13.xls>
- PC 14 – Composite Wood Products - Room/Location Matrix*
 - <http://www.hcd.ca.gov/codes/calgreen/PC14.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC14.xls>
- PC 15 – Composite Wood Products - Declaration Statement*
 - <http://www.hcd.ca.gov/codes/calgreen/PC15.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC15.xls>
- PC 16 – Sample Worksheet*
 - <http://www.hcd.ca.gov/codes/calgreen/PC16.pdf>
 - <http://www.hcd.ca.gov/codes/calgreen/PC16.xls>

Documentation and Verification Forms (Section 703.1 and others)

- RMM 1 – Installation Certificate*
 - http://www.hcd.ca.gov/codes/calgreen/RMM_1.pdf
 - http://www.hcd.ca.gov/codes/calgreen/RMM_1.doc

Recycled Content Forms (Section A4.405.3)

- RCV Table 1 - Recycled Content Value Calculations*
 - http://www.hcd.ca.gov/codes/calgreen/Table1_RCVCalculations.pdf
 - http://www.hcd.ca.gov/codes/calgreen/Table1_RCVCalculations.xls

- RCV Table 2 - Assembly Product Recycled Content Calculations*
 - http://www.hcd.ca.gov/codes/calgreen/Table2_AssemblyCalculations.pdf
 - http://www.hcd.ca.gov/codes/calgreen/Table2_AssemblyCalculations.xls

- RCV Table 3 - Recycled Content Conversion Table (Pounds to %)*
 - http://www.hcd.ca.gov/codes/calgreen/Table3_ConversionTable.pdf
 - http://www.hcd.ca.gov/codes/calgreen/Table3_ConversionTable.xls

- RCV 4 - Recycled Content - Declaration Statement*
 - http://www.hcd.ca.gov/codes/calgreen/RCV_Table_4.pdf
 - http://www.hcd.ca.gov/codes/calgreen/RCV_Table_4.xlsx



APPENDIX A4. RESIDENTIAL VOLUNTARY MEASURES

This chapter discusses select “voluntary measures” found in the 2010 CALGreen Code, Appendix A4. The measures provide enhanced levels of green building construction and sustainability that are not mandatory at the state level, 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 pre-determined number of electives have also been established for each tier (See Division A4.6 for a discussion of CALGreen's 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’s enhanced tier measures or they may adopt other green building standards or other green programs altogether. Enhanced or elevated green building requirements may vary from jurisdiction to jurisdiction, but CALGreen Chapter 4 “Residential Mandatory Measures” are required on a statewide basis.

For clarity, section numbers referenced in this chapter correspond with chapters, sections and headings in the 2010 CALGreen Code. Full text of CALGreen voluntary items are shown in a box. Pre-selected (prerequisite) items for implementing the voluntary Tier 1 and Tier 2 levels are shown in bold above each box. Code text and tables will be followed by non-regulatory commentary in italics, when applicable. 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 chapter.

Finally, it is important that the code user reference the most current version of CALGreen applicable to each project and be aware that lawfully enacted and approved local amendments may require additional and/or more restrictive green building standards than the statewide CALGreen.

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APPENDIX A4
RESIDENTIAL VOLUNTARY MEASURES

DIVISION A4.1 – PLANNING AND DESIGN

SECTION A4.103
SITE SELECTION

An elective measure for Planning and Design:

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

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 existing lands surrounded by development, lands formerly used for development or formerly hazardous lands that have been properly remediated. Implementation of this measure will reduce development pressures on the urban fringe resulting in conservation of natural resources, including agricultural, open space and habitat 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 sites, for example, may have significant redevelopment potential due to their large size, existing infrastructure, and established community presence. Development of these sites may 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 areas may also reduce large impermeable areas by breaking up the site into parks, open space or buffer areas.

Utilization of remediated brownfield sites supports mitigation of the original environmental threats, 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 Section A4.102. 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.

**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 practices. This measure requires all associated parties to receive written information on the green goals for the project. Identification of the project's goals will also aid in coordination of activities and pre-planning to avoid conflicts and to help ensure that 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.*
- *Require training sessions or meetings providing education on green building concepts and implementation measures especially as related to the project.*
- *Conducting regular meetings to implement appropriate timing and coordination of project activities, review project activity deadlines, and to ensure achievement of green goals.*

**SECTION A4.106
SITE DEVELOPMENT**

An elective measure for Planning and Design:

<p>A4.106.1 Building orientation. Orient buildings to optimize the use of solar energy with the long side of the house oriented within 30 degrees of south.</p>
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COMMENTARY

Purpose:

Requires buildings to be located with the maximum roof area facing in a southerly direction. This orientation would provide the maximum roof exposure relative to the sun's path in the northern hemisphere.

Examples of Methods of Implementation and/or Compliance:

- *Orientation of buildings with the longer side oriented 30 degrees of south.*
- *Exposure of sufficient roof area in a southerly direction for efficient future photovoltaic performance when the required orientation of the longer side cannot be achieved.*
- *Consider shade impacts of mature trees and shrubs on adjacent photovoltaic systems and select species appropriate for the location.*

Background:

Efficient operation of photovoltaic systems involves providing the maximum exposure to the sun's path, ensuring that the sun's rays are not blocked by vegetation, adjacent buildings or geographic features. As such, a southern exposure allows the maximum exposure to the sun's path and rays in California. Go Solar California recommends about 100 square foot of unobstructed roof area for each kilowatt (kW) of system capacity for crystalline technologies and about 175 square feet for each kilowatt for thin film photovoltaic products. These amounts may vary depending on roof angle and panel angle and with changing technology. The potential use of photovoltaic systems should be considered in the design and building siting process. In addition, use of these systems could also be supported through a homeowner's association or covenants, conditions and restrictions documents, and local ordinances.

This elective measure may require some site-specific exemptions due to topography, transportation infrastructure, location of adjacent buildings or other conditions preventing the required orientation. These are most often regional, local or site-specific issues and should be carefully considered prior to wholesale adoption of this elective measure.

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:

CALGreen requires that the soil be protected utilizing at least one of three methods. These 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 above requirements, especially in subdivisions, may not 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.

The California Building Code, Chapter 18, and California Residential Code, Chapter 4, require 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 codes and the State Housing Law (Health and Safety Code Section 17953) allow a waiver of the soil report requirement based on the enforcing agency's knowledge of local soil conditions.

The CRC also provides a table for determining load-bearing capacity based on class of material (e.g., crystalline bedrock, clay, etc.) in lieu of a soil report.

Mandatory 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:

- *Topsoil that is removed should be stockpiled in designated areas and protected from erosion. See CALGreen text for specified methods of protection. (Tier 1 and Tier 2)*
- *Fencing or clearly flagging topsoil stockpile areas to be protected from construction activities. (Tier 2)*
- *Restricting heavy equipment or vehicle traffic 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.

Soil removed and stockpiled for future reuse should be protected from erosion and compaction. In addition to protecting the soil resource, this prevents erosion of the soil and the resulting runoff and sedimentation downstream. Builders should check with local enforcing agencies for any ordinances related to soil removal and erosion and sedimentation control.

Although not required by CALGreen, homeowners may consider further treatment of stockpiled topsoil depending on its final use. For gardening purposes, the soil may need 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.

An elective measure for Planning and Design:

A4.106.3 Landscape design. Post construction 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. Limit turf areas to the greatest extent possible.

Tier 1. Not more than 50 percent of the total landscaped area.

Tier 2. Not more than 25 percent of the total landscaped area.

3. Utilize at least 75 percent native California or drought tolerant plant and tree species appropriate for the climate zone region.
4. Hydrozoning irrigation techniques are incorporated into the landscape design.

COMMENTARY

Purpose:

Reduces disturbance of native vegetation, use of native California or drought tolerant plants appropriate for the site, and reduces high-water use turf areas.

Examples of Acceptable Methods of Implementation and/or Compliance:

- **If adopted for Tier 1:** limit turf areas to not more than 50 percent of the total landscaped area.
- **If adopted for Tier 2:** limit turf areas to not more than 25 percent of the total landscaped area.
- Restore disturbed areas to native vegetative conditions.
- Use at least 75 percent native California or drought-tolerant plants suitable for the climate zone.
- Design landscape to group plants with similar water and other environmental (hydrozoning) needs.

Background:

Turf provides benefits such as preventing soil erosion and runoff; reducing radiant heat, noise and glare; and providing recreational spaces. However, it can also contribute to green waste by increased water use and associated costs. Reducing turf areas, using water efficient varieties and locating turf areas to take advantage of runoff are some methods to save water and related costs.

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

Hydrozoning involves the planned placement of plants or trees with similar water requirements in areas having appropriate water requirements. For example, plants with high water requirements could be placed closer to the house to provide an additional cooling effect as well as save costs in extending irrigation lines and fixtures. Additional conditions to be considered for successful plant performance should include consideration of soil, light, and temperature needs for the selected plants.

Gardening books, the local nursery, the local water or conservation district, or the University of California Cooperative Extension Offices are good sources of information for appropriate plant species for the area.

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

The regulatory text for Section A4.106.5 was amended in July 2011 and is effective July 1, 2012

A4.106.5 Cool roof. Roofing materials for Tier 1 and Tier 2 buildings shall comply with this section:

Exception: Roof constructions that have a thermal mass over the roof membrane with a weight of at least 25 lb/sf.

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 Table A4.106.5(1) for Tier 1 and Table A4.106.5(2) for Tier 2.

If CRRC testing for 3-year aged reflectance is not available for any roofing products, the 3-year aged value shall be determined using the Cool Roof Rating Council (CRRC) certified initial value using the equation $R_{aged} = [0.2 + 0.7 \rho_{initial} - 0.2]$, where $\rho_{initial}$ = the initial Solar Reflectance.

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

A4.106.5.2 Thermal emittance. Roofing materials shall have a CRRC initial or 3-year aged thermal emittance equal to or greater than those specified in Table A4.106.5(1) for Tier 1 and Table A4.106.5(2) for Tier 2.

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

COMMENTARY

Purpose:

Increases building energy efficiency, reduces energy costs, reduces cooling equipment costs, and improves 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:

- *Install roofing materials with Solar Reflectance and Thermal Emittance values per Table A4.106.5(1) for Tier 1 and Table A4.106.5(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) for Tier 1 and Table A4.106.5(2) for Tier 2.*
- *Inspection by enforcing agency conducted 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 Worksheet and Calculator (formerly called Solar Reflective Index Worksheet and Calculator.)*

Background:

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

Cool Roofs have been used for more than 20 years in a variety of applications on flat or low-slope commercial roofs, as well as steep-sloped residential roofs, to reduce energy costs associated with operating cooling equipment. 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, 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 also 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 3 years exposure to environmental conditions, primarily UV exposure from the sun.

Solar reflectance index or (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 factor the cooler the roof.

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

A4.106.5.3 Solar reflectance index alternative. Solar Reflectance Index (SRI) equal to or greater than the values specified in Table A4.106.5(1) for Tier 1 and Table A4.106.5(2) 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 *California Energy Code*, Section 118(i)3. Solar reflectance values used in the SRI-WS shall be based on the 3-year aged reflectance value of the roofing product or the equation in Section A4.106.5.1 if the CRRC certified aged solar reflectance are not available. Certified thermal emittance used in the SRI-WS may be either the initial value or the three year 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, Section 10-113.

Note: The Solar Reflectance Index Calculation Worksheet (SRI-WS) is available by contacting the Energy Standards Hotline at 1-800-772-3300, website at www.energy.ca.gov or by email at Title24@energy.state.ca.us.

TABLE A4.106.5 (1)
Tier 1

Roof Slope	Roof Weight	Climate Zone	Minimum 3-year Aged Solar Reflectance	Thermal Emittance	SRI
≤ 2 : 12	N.A	13 & 15	0.55	0.75	64
> 2 : 12	< 5 lbs./ft ²	10-15	0.20	0.75	16
	≥ 5 lbs./ft ²	1-16	0.15	0.75	10

TABLE A4.106.5 (2)
Tier 2

Roof Slope	Roof Weight	Climate Zone	Minimum 3-year Aged Solar Reflectance	Thermal Emittance	SRI
≤ 2 : 12	N/A	2,4,6-15	0.65	0.85	78
> 2 : 12	N/A	2,4,6-15	0.23	0.85	20

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 as well as instructions for sites on the boundaries or overlapping climate zones.

An elective measure for Planning and Design:

The regulatory text for the A4.106.6 section was added in July 2011 and is effective July 1, 2012.

A4.106.6. Electric vehicle (EV) charging. Dwellings shall comply with the following requirements for the future installation of electric vehicle supply equipment (EVSE).

A4.106.6.1 One-and two-family dwellings. Install a listed raceway to accommodate a dedicated branch circuit. The raceway shall not be less than trade size 1. The raceway shall be securely fastened at the main service or subpanel and shall terminate in close proximity to the proposed location of the charging system into a listed cabinet, box or enclosure. Raceways are required to be continuous at enclosed or concealed areas and spaces. A raceway may terminate in an attic or other approved location when it can be demonstrated that the area is accessible and no removal of materials is necessary to complete the final installation.

Exception: Other pre-installation methods approved by the local enforcing agency that provide sufficient conductor sizing and service capacity to install Level 2 EVSE.

Note: Utilities and local enforcing agencies may have additional requirements for metering and EVSE installation, and should be consulted during the project design and installation.

A4.106.6.1.1 Labeling requirement. A label stating "EV CAPABLE" shall be posted in a conspicuous place at the service panel or subpanel and next to the raceway termination point.

A4.106.6.2 Multi-family dwellings. At least 3 percent of the total parking spaces, but not less than one, shall be capable of supporting future electric vehicle supply equipment (EVSE).

A4.106.6.2.1 Single charging space required. When only a single charging space is required, install a listed raceway capable of accommodating a dedicated branch circuit. The raceway shall not be less than trade size 1. The raceway shall be securely fastened at the main service or subpanel and shall terminate in close proximity to the proposed location of the charging system into a listed cabinet, box or enclosure.

Exception: Other pre-installation methods approved by the local enforcing agency that provide sufficient conductor sizing and service capacity to install Level 2 EVSE.

A4.106.6.2.2. Multiple charging spaces required. When multiple charging spaces are required, plans shall include the location(s) and type of the EVSE, raceway method(s), wiring schematics and electrical calculations to verify that the electrical system has sufficient capacity to simultaneously charge all the electrical vehicles at all designated EV charging spaces at their full rated amperage. Plan design shall be based upon Level 2 EVSE at its maximum operating ampacity. Only underground raceways and related underground equipment are required to be installed at the time of construction.

Note: Utilities and local enforcing agencies may have additional requirements for metering and EVSE installation, and should be consulted during the project design and installation.

A4.106.6.2.3 Labeling requirement. A label stating "EV CAPABLE" shall be posted in a conspicuous place at the service panel or subpanel and the EV charging space.

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 pre-installation 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:

- Installation of not less than a listed trade size 1 (1-inch inside diameter) raceway secured at the panel but terminating in an accessible location, as specified in Sections A4.106.6.1 or A4.106.6.2.1.
- Other approved wiring methods with sufficient conductors sizing, ampacity and service capacity to install Level 2 EVSE. (For example, a dedicated 240V/40A (240 Volts/40 amperes) branch circuit. See Sections A4.106.6.1 or A4.106.2.1 Exceptions).
- Multiple charging spaces only require the underground raceways and related underground equipment to be installed at the time of initial construction. See Section A4.106.6.2.2.
- A label stating "EV CAPABLE" posted in a conspicuous place at the service panel (or subpanel) and at the EV charging space.
- Electrical load calculations, schematics (main service panel, subpanel(s), circuit breakers, conductors, etc.), site plan indicating the location(s) and type of each EVSE. (This application is typical to multi-family dwellings where multiple EV charging spaces are required).
- Prior to construction, in the planning phase, consultation with the electric utility and the local enforcing agency to determine any special conditions, additional requirements, rate structure, infrastructure capability or whether a second meter would be required.

Background:

Section A4.106.6 was developed in response to numerous requests by stakeholders to provide building standards that meet current and future demands for EVSE in single-family residences and the parking facilities of multi-family dwellings. HCD's initial proposal was largely based upon language provided by the California Air Resources Board (ARB), who 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. 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 provisions for EVSE are intended to provide low-cost strategies that offer choice and savings in design for the future use of electrical vehicles and for homeowners wishing to purchase an electric vehicle necessitating retroactive installation of higher capacity electrical wiring and supply equipment for charging electrical vehicles. In addition, these provisions can assist in the reduction of petroleum products and other natural resources leading to further reduction of greenhouse gases. HCD intends to monitor and revisit its voluntary EV requirements as more vehicles enter the market in the coming decade.

Discussion

Section A4.106.6 is an elective measure 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.

HCD believed that a pre-wired dedicated 40A branch circuit, while sufficient for fast 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 pre-wired 40A dedicated branch circuit could create increased or unnecessary expenses. For instance, based upon several load calculations performed by HCD, the California Electrical Code would generally require upgrade of the electrical service panel in homes 2000 sq. ft. 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 the initial requirement for an advanced load calculation and/or expensive service panel upgrades. A trade size 1(1-inch internal diameter) raceway is adequate for installation of a 40A branch circuit, but allows for branch circuits larger than 40A. 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 electric vehicles (EV), equipped with bigger and/or more efficient batteries.

Multi-family 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 the electrical vehicles at all designated EV charging spaces. HCD considered those complexities and subsequently required plans indicating the location of future EV charging stations and justification that the electrical system had sufficient capacity. In addition, all underground raceways and/or other concealed or related underground equipment shall be installed at initial construction.

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 EV's and anticipated future technologies' needs, and to provide compatibility with the nation's electric transmission and distribution system.

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. The charging time with Level 1 EVSE can be very long - more than 20 hours for some batteries.

Level 2

Level 2 is typically described as the "primary" or "preferred" method for both private and publicly available facilities. Level 2 specifies a single-phase branch circuit; the J1772-approved 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.

Level 3 [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 - recharge is rapid. Typically, DC Fast Charge would provide 50% 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, 480, or 600V.

Location of EVSE

Section A4.106.6 requires the raceway to terminate in close proximity to the proposed location of the charging system. It does not specify the exact location. Installation and proper location of EVSE 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 choice must also be taken into account.

**SECTION A4.107
INNOVATIVE CONCEPTS AND LOCAL ENVIRONMENTAL CONDITIONS**

An elective measure(s) for Planning and Design:

A4.107.1 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, however, 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 with 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 A4.203
PERFORMANCE APPROACH**

Mandatory measure for Energy Efficiency for Tier 1 and Tier 2 as specified:

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

A4.203.1 Energy performance. Using an Alternative Calculation Method (ACM) approved by the California Energy Commission, calculate the annual Time Dependent Valuation (TDV) energy for each proposed building and compare it to the TDV energy budget (standard building) to achieve the following:

Tier 1. Exceed the 2010 *California Energy Code* requirements by 15 percent.

Tier 2. Exceed the 2010 *California Energy Code* requirements by 30 percent.

Field verify and document the measures and calculations used to reach the desired level of efficiency following the requirements specified in the Title 24 Reference Appendices.

COMMENTARY

Purpose:

To increase energy efficiency in buildings when compared to the State's mandatory minimum energy efficiency standards.

Background:

Energy savings can be achieved by either reducing the home's energy consumption or by increasing the home's energy efficiency. The California Energy Commission's Alternative Calculation Method (ACM) uses a standard design (budget building) to determine how much energy a certain building type should use. Using the ACM, a performance-based calculation will enable a home designer to predict a project's energy use prior to construction.

Energy efficient design also contributes to reduced greenhouse gas emissions. Additional reductions will be achieved by adopting measures that go beyond current California Energy Code requirements. A list of various measures that may qualify for compliance credits under the Performance Method is included in the California Energy Commission's 2008 Residential Compliance Manual.

Statute (Public Resources Code Section 25402.1(h)(2) and California building standards (California Energy Code Section 10-106) establish a process for local adoption of energy standards more stringent than statewide requirements. This process requires local agencies to apply to the California Energy Commission for approval of the ordinance(s). The supporting analysis must demonstrate how the local government has determined that the proposed standards will save more energy than the current statewide standards and the basis of the local government's determination that the local standards are cost-effective. Local ordinances are legally enforceable only after final approval by the Commission.

**SECTION A4.205
BUILDING ENVELOPE**

Mandatory measure for Energy Efficiency for Tier 1 and Tier 2 as specified:

A4.205.1 Radiant roof barriers. Radiant roof barrier is installed in Climate Zones 2, 4, and 8 through 15. The radiant barrier must be tested according to ASTM C-1371-98 or ASTM E408-71(2002) and must be certified by the Department of Consumer Affairs. Radiant barriers must also meet installation criteria specified in Appendix D, Section RA 4.2.2 of the *California Energy Commission Residential Compliance Manual*.

COMMENTARY

Purpose:

To reduce summer heat gain and winter heat loss while decreasing the energy consumption of a structure.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Installation of reflective foil under the roof sheathing or to the bottom of the roof rafters.*
- *Reflective laminated roof sheathing installed under roof membrane or over ceiling insulation.*
- *Reflective metal roof shingles.*
- *Reflective chips, which can be applied over loose-fill insulation.*
- *Reflective insulation systems.*
- *Must meet CALGreen specified standards and installation requirements as stated in Appendix D, Section RA 4.2.2, of the California Energy Commission's Residential Compliance Manual. See Note 2.*

Background:

Radiant heat transfer occurs when warmer surfaces emit more radiation than cooler surfaces. When the sun heats a roof, it is primarily the sun's radiant energy that makes the roof hot. A large portion of this heat travels by conduction through the roofing materials to the attic side of the roof. The hot roof material then radiates its gained heat energy onto the cooler attic surfaces, including the air ducts and the attic floor/ceiling below. A radiant roof barrier reduces the radiant heat transfer from the underside of the roof to the other surfaces in the attic and the dwelling.

Based on information from the U.S. Department of Energy, radiant barriers are more effective in hotter climates than in cooler climates, especially when cooling air ducts are located in the attic. Some studies show that radiant barriers can lower cooling costs between 5 –10 percent when used in a warm, sunny climate.

Radiant barriers, which do not provide a significant amount of thermal insulation, can also be combined with many types of insulation materials. These combinations are called reflective insulation systems. In these combinations, radiant barriers can also act as facing material for the insulation.

Note: *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 as well as instructions for sites on the boundaries or in overlapping climate zones.*

An elective measure for Energy Efficiency:

A4.205.2 Window shading. Exterior shading at least 18 inches in depth is provided on south and west windows by at least one of the following methods:

1. Moveable or removable exterior awnings or louvers.
2. Porch or patio covers.
3. Overhangs.

COMMENTARY

Purpose:

To decrease radiant or solar heat gain through windows and glass doors that can increase a building's air conditioning cost or reduce occupant comfort.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Exterior shading, of at least 18 inches, for south and west facing windows with moveable awnings, louvers, covers, or overhangs.*
- *Increased depth of roof overhang to 18 inches or more.*

Note: *Verify local buildings set-back or separation requirements with local enforcing agency.*

Background:

Windows provide dwellings with light, warmth and ventilation. Windows can also negatively impact a building's energy efficiency. Exterior shading can block up to 95 percent of the sun's heat and reduce energy costs. Moveable shading features can also accommodate changes in sun exposure through the seasons.

**SECTION A4.206
AIR SEALING PACKAGE**

An elective measure for Energy Efficiency:

A4.206.1 Reduced infiltration. Infiltration is reduced and verified by third party testing to comply with requirements contained in the *California Energy Code*.

COMMENTARY

Purpose:

The reduction of air infiltration into a dwelling.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Install air retarding house wrap.*
- *Seal gaps and holes between the inside conditioned space and the outside.*
- *Interior and exterior wall coverings shall be installed without gaps or large excesses.*
- *Sealant should be installed carefully around sliding glass doors and vinyl windows.*
- *Verification by third party testing to comply with the California Energy Code.*

Background:

Reduction in building envelope air infiltration can result in significant energy savings, especially in climate zones with more severe winter and summer conditions. It is also one of the simplest cost-effective energy efficiency measures to install. Whether summer or winter, energy moves through the walls, roof and cracks of a building wasting valuable energy. The U.S. Department of Energy states that a home that is not sealed for air infiltration will be uncomfortable due to drafts and will use about 30% more energy than a relatively air-tight home. Reduced infiltration results in improved building comfort, reduced moisture intrusion, and fewer air pollutants entering a home.

**SECTION A4.207
HVAC DESIGN, EQUIPMENT AND INSTALLATION**

An elective measure for Energy Efficiency:

A4.207.1 Innovative systems. Radiant, hydronic, ground source and other innovative space heating and cooling systems included in the proposed design shall be designed using generally accepted industry-approved guidelines and design criteria.

COMMENTARY

Purpose:

To recognize and encourage the use of less common or innovative methods for heating and cooling.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Radiant floor, wall or ceiling heating systems.*
- *Geothermal (ground source) conditioned air or water heating and cooling systems.*
- *Alternate space heating and cooling systems not addressed in the code, but acceptable to the local enforcing agency.*

Background:

The heating, ventilating and air conditioning (HVAC) system uses more energy than any other system in a home and is a major reason to consider innovative systems for reducing overall energy demand.

Hydronic (water-based) radiant heating systems installed in residences provide superior thermal comfort. This is because the systems are typically installed as a concrete core conditioning system embedded in concrete and provide good heat transfer due to their mass. Hydronic radiant heating is the most common application, but these systems can also be used for cooling. These systems avoid recirculation of stale indoor air and eliminate cycling of the air handling system. Additionally, there is no duct leakage which can waste as much as 30% of conditioning energy. When designed and installed properly, hydronic radiant systems can operate close to design room air temperatures.

Heating or cooling systems using geothermal or ground source heat pumps are high efficiency alternatives to furnaces, boilers, and air conditioners. Ground source heat pumps take advantage of the moderate temperatures of the earth several feet or more below the surface. During the heating season, ground source heat pumps move heat energy from the earth to the structure. In the cooling season, the pumps move heat energy from the structure to the earth. Unlike an air-source heat pump that transfers heat to or from the outside air, a ground source heat pump exchanges heat with the ground with less need for maintenance, less noise and greater energy efficiency. The initial costs for these systems, including drilling costs, may be more than traditional heating and cooling systems, however, the costs can be recovered over time through savings in energy costs.

Elective measures for Energy Efficiency:

A4.207.2 Commissioning. A commissioning plan shall be developed to document specified building components meet the project design and performance goals.

A4.207.2.1 Commissioning of HVAC Systems. In addition to other items in the commissioning plan, the following items, as appropriate, pertaining to the heating, ventilating, and cooling systems shall be inspected and certified by an independent third party that is trained or certified to inspect and test building systems as specified in Section 702.2.

1. Verify compliance with the manufacturer's recommended start-up procedures.
2. Verify refrigerant charge by super-heat or other methods specified by the manufacturer.
3. Burner is set to fire at the nameplate input rating.
4. Temperature drop across the evaporator is within the manufacturer's recommended range.
5. Test and verify air flow to be within 10 percent of the initial design air flow.
6. Static pressure within the duct system is within the manufacturer's acceptable range.
7. Verify that the whole house and exhaust ventilation systems meet Title 24 requirements.
8. Verify that the recommended maintenance procedures and schedules are documented and provided to the home owner.

A4.207.2.3 Commissioning Checklist. Results of the commissioning inspection shall be included in the Operation and Maintenance Manual required in Section 4.410.1.

COMMENTARY

Purpose:

A systematic process to ensure that a designed system operates at optimum efficiency and satisfies stringent indoor air quality and comfort expectations of the building's owner.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Develop a commissioning plan based on the building owner's expectations for quality, efficiency, functionality, and meets the CALGreen requirements.*
- *Ensure completion of inspection and certification of appropriate components and performance of systems as specified.*
- *Include results of the commissioning inspection in the operation and maintenance manual required in Section 4.410.1.*

Background:

The number one complaint reported by owners of newly constructed buildings involves HVAC systems that do not meet expectations. Development of a commissioning plan along with system inspections and verifications are significant steps in ensuring proper installation and function of HVAC systems to achieve reductions of energy usage. In addition, the commissioning plan and identification of specified activities facilitate coordination of project activities and identifies clear goals for installation, start up and performance of the system.

An elective measure for Energy Efficiency:

A4.207.4 Gas-fired heating equipment. Install gas-fired (natural or propane) space heating equipment with an Annual Fuel Utilization Ratio (AFUE) of .90 or higher.

An elective measure for Energy Efficiency:

A4.207.5 Heat pumps. If an electric heat pump must be used, select equipment with a Heating Seasonal Performance Factor (HSPF) of 8.0 or higher.

An elective measure for Energy Efficiency:

A4.207.6 Cooling equipment. When climatic conditions necessitate the installation of cooling equipment, select cooling equipment with a Seasonal Energy Efficiency Ratio (SEER) higher than 13.0 and an Energy Efficiency Ratio (EER) of at least 11.5.

COMMENTARY

Purpose:

Reduces energy consumption by exceeding minimum efficiency thresholds for heating and air conditioning equipment.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Increase the furnace AFUE to 90 percent or higher.*
- *Increase the electric heat pump HSPF to 8 HSPF or higher.*
- *Increase the air conditioning SEER to higher than 13 SEER.*
- *Increase the air conditioning EER to at least 11.5 EER.*

Background:

The HVAC system in a home uses more energy and energy dollars than any other system and accounts for approximately 45 percent of a home's energy bill. The federal government estimates that the average homeowner spends more than \$10,000 for heating and air conditioning over a ten-year period. This is a major reason that, over the past decade, great focus has been directed at requiring more efficient HVAC and related equipment to reduce energy use.

Increases in the AFUE, HSPF, SEER and EER ratings also represent an increase in the energy efficiency of the equipment. For example, a 90 percent AFUE furnace is 10 percent more efficient than an 80 percent AFUE furnace.

The following definitions are excerpted from the California Energy Commission's 2008 Building Energy Efficiency Standards:

Annual Fuel Utilization Efficiency (AFUE) is a measure of the percentage of heat from the combustion of gas or oil which is transferred to the space being heated during a year, as determined using the applicable test method in the Appliance Efficiency Regulations or Section 112.

Energy Efficiency Ratio (EER) is the ratio of net cooling capacity (in Btu/hr) to total rate of electrical energy input (in watts), of a cooling system under designated operating conditions, as determined using the applicable test method in the Appliance Efficiency Regulations or Section 112.

Heating Seasonal Performance Factor (HSPF) is the total heating output of a central air-conditioning heat pump (in Btu) during its normal use period for heating divided by the total electrical energy input (in watt-hours) during the same period, as determined using the applicable test method in the Appliance Efficiency Regulations.

Seasonal Energy Efficiency Ratio (SEER) is the total cooling output of an air conditioner in Btu during its normal usage period for cooling divided by the total electrical energy input in watt-hours during the same period, as determined using the applicable test method in the Appliance Efficiency Regulations.

Two elective measures for Energy Efficiency:

A4.207.7 Ducts location. Install ductwork to comply with at least one of the following:

1. Install ducts within the conditioned envelope of the building.
2. Install ducts in an underfloor crawl space.
3. Use ducts with an R-6 insulation value or higher.
4. Install ductwork which is buried in the ceiling insulation.

A4.207.8 Duct leakage. Perform duct leakage testing to verify a total leakage rate of less than 6 percent of the total fan flow.

COMMENTARY

Purpose:

To minimize loss of conditioned air and reduce energy required to maintain desired temperatures.

Examples of Acceptable Methods of Implementation and/or Compliance:

- Install ducts within the conditioned envelope of the structure, such as a conditioned attic/crawl space.
- Install ducts in an underfloor crawl space.
- Install ductwork with an R-6 insulation value or higher.
- Install ductwork below the attic insulation when possible.
- Perform duct leakage test to verify total duct leakage is less than 6 percent of total fan volume.

Background:

The U.S. Department of Energy states that heating and cooling account for about 56 percent of the energy use in a typical U.S. residence making it the largest energy expense. Ductwork that is not sealed properly leaks valuable conditioned air into the attic instead of to the inside of the building and may cause condensation problems during the cooling cycle. By installing the ductwork in a conditioned space, any air that leaks from the ductwork winds up conditioning the building regardless.

An elective measure for Energy Efficiency:

A4.207.9 Whole house fans. In Climate Zones 2, 4, and 8 through 15, install a whole-house fan with insulated louvers or an insulated cover.

An elective measure for Energy Efficiency:

A4.207.10 Ceiling fans. ENERGY STAR ceiling fans are installed in all bedrooms and living areas.

COMMENTARY

Purpose:

Reduces energy use and increases building comfort levels by promoting use of whole house fans in designated climate zones and ceiling fans. Both measures are economical to operate in comparison to air conditioning.

Examples of Acceptable Methods of Implementation and/or Compliance:

- Install a whole house fan with insulated louvers or insulated cover in specified climate zones.
- Install ENERGY STAR ceiling fans in all bedrooms and living areas.

Background:

When the outside evening temperature drops below the temperature inside a home, the whole house fan exhausts stale/warm air to the outside by drawing in the cool evening air.

The U.S. Department of Energy states that when using air conditioning, a ceiling fan will allow raising the thermostat setting about 4°F with no reduction in comfort. In temperate climates, or during moderately hot weather, ceiling fans may replace air conditioner use. Installing ceiling fans in all bedrooms and living areas produces a wind chill effect and add to a home's comfort level at a minimal expense. Ceiling fans should be turned off when not needed for additional energy savings.

Note: 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 (<http://www.energy.ca.gov/>). This website provides options for detailed site searches by cities and zip codes as well as instructions for sites on the boundaries or in overlapping climate zones.

**SECTION A4.208
WATER HEATING DESIGN, EQUIPMENT AND INSTALLATION**

Two elective measures for Energy Efficiency:

A4.208.1 Tank type water heater efficiency. The Energy Factor (EF) for a gas-fired storage water heater is higher than .60.

A4.208.2 Tankless water heater efficiency. The Energy Factor (EF) for a gas-fired tankless water heater is .80 or higher.

COMMENTARY

Purpose:

To reduce energy consumption by exceeding minimum Energy Factor ratings for gas-fired water heaters.

Examples of Acceptable Methods of Implementation and/or Compliance:

- Installation of gas-fired storage or tank water heaters meeting or exceeding Energy Factor .60.
- Installation of gas-fired on demand or tankless water heaters meeting or exceeding Energy Factor .80.

Background:

According to the U.S. Environmental Protection Agency, heating water accounts for approximately 15 percent of a home's energy use and high efficiency water heaters use 10 to 50 percent less energy than conventional gas models. The variance is due to differences in family size, heater location, and the size and placement of plumbing.

The efficiency of a water heater is quantified by an Energy Factor (EF), which is usually noted on the appliance's Energy Guide label or on the product specifications. The EF is based on the amount of hot water produced per unit of fuel consumed over a typical day. Higher EF numbers indicate greater efficiency of the water heater.

Conventional gas water heaters include the "storage" or tank water heater. The storage/tank water heaters consume more energy since it is keeping the water hot at all times. An "on demand" or a tankless water heater has no storage tank and heats water on an as-needed basis. A drawback to the tankless system is possible limitation on the number of fixtures using hot water at the same time.

An elective measure for Energy Efficiency:

A4.208.3 Distribution systems. Where the hot water source is more than 10 feet from a fixture, the potable water distribution system shall convey hot water using one of the following methods:

1. A central manifold plumbing system with parallel piping configuration (“home-run system”) is installed using the smallest diameter piping allowed by the *California Plumbing Code* or an approved alternate.
2. The plumbing system design incorporates the use of a demand controlled circulation pump.
3. A gravity-based hot water recirculation system is used.
4. A timer-based hot water recirculation system is used.
5. Other methods approved by the enforcing agency.

COMMENTARY

Purpose:

To reduce overall energy demand by reducing the amount of energy required to supply residential fixtures with hot water.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Central manifold plumbing system with parallel piping configuration.*
- *Demand controlled circulation or timer-based water recirculation system.*
- *Gravity-based water recirculation system.*
- *Timer-based hot water recirculation system.*
- *Other methods approved by the enforcing agency.*

Background:

These energy reducing methods are economical to install. Home-run or manifold water systems are typically less expensive to install and result in less energy loss. Gravity-based recirculation systems have no moving parts to maintain and the systems cost very little to install. A demand controlled water circulation pump system draws hot water through the water line while simultaneously purging the water line of cold water and sending it back to the hot water source. Timer-based systems recirculate hot water during designated higher-use time periods, e.g., mornings or meal times, reducing wait time and wasted cool water during the designated time periods.

**SECTION A4.210
APPLIANCES**

An elective measure for Energy Efficiency:

A4.210.1 Appliance rating. Each appliance provided by the builder meets ENERGY STAR if an ENERGY STAR designation is applicable for that appliance.

COMMENTARY

Purpose:

- *Supports reduction in energy use through installation of ENERGY STAR domestic appliances, if an ENERGY STAR rating is available for the appliance.*

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Install ENERGY STAR appliances if ENERGY STAR labeling is available for the appliance.*

Background:

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy. According to the ENERGY STAR program, energy efficient choices can reduce energy bills by about a third and also result in similar savings of greenhouse gas emissions, without sacrificing features, style or comfort.

Domestic (home) appliances qualify for the ENERGY STAR label by meeting the energy efficiency requirements set forth in ENERGY STAR product specifications. Types of domestic appliances which may have ENERGY STAR labels include clothes washers, dishwashers, freezers, refrigerators, heating and cooling equipment, etc. The ENERGY STAR website (www.energystar.gov) includes access to a database of ENERGY STAR qualified appliances which may be searched by energy efficiency, size, brand or model number.

SECTION A4.211 RENEWABLE ENERGY

An elective measure for Energy Efficiency:

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

A4.211.1 New solar homes partnership. Install a solar photovoltaic (PV) system in compliance with the California Energy Commission New Solar Homes Partnership (NSHP).^{1,2,3} Install energy efficiency measures meeting either Tier I or Tier II below.

Tier I. Exceed the 2010 *California Energy Code* requirements by 15 percent.

Tier II. Exceed the 2010 *California Energy Code* requirements by 30 percent.

Solar water heating may be used to assist in meeting the energy efficiency requirements of either Tier I or Tier II.

1. In addition, for either Tier I or II, each appliance provided by the builder must be ENERGY STAR if an ENERGY STAR designation is applicable for that appliance.
2. Tier II requires a 30 percent reduction in the building's space cooling (air conditioning) energy compared to the 2010 *California Energy Code*.
3. Information on NSHP incentives available through the California Energy Commission may be obtained at the "Go Solar California" website.

COMMENTARY

Purpose:

Supports the State's New Solar Homes Partnership (NSHP) primary goal to create a self-sustaining market for energy efficient, new solar homes, whereby builders incorporate high levels of energy efficiency and high performing solar energy systems. This will reduce energy use as well as promote systems that utilize renewable energy sources.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *A solar photovoltaic (PV) system in compliance with the NSHP.*
- *Exceed the California Energy Code requirements based on the 2008 Energy Efficiency Standards by 15 percent or 30 percent to meet NSHP Tier I or Tier II requirements, respectively.*
- *Install ENERGY STAR appliances if ENERGY STAR labeling is available for the appliance.*
- *Use solar water heating to assist in achieving either Tier I or Tier II listed above.*
- *Field verification and supporting documents of implemented measures shall be provided to the local enforcement agency.*

Background:

A solar home in accordance with the NSHP is a highly energy efficient home that uses PV modules to generate electricity from the sun. A solar home offers clean, renewable energy, savings in utility costs, predictable utility costs, and protection against future rising electricity costs.

The NSHP is part of a comprehensive statewide solar program known as the California Solar Initiative (CSI). Three goals of the CSI are: (1) to install 3,000 megawatts (MW) of distributed

solar electric capacity in California by the end of 2016; (2) to establish a self-sufficient solar industry in which solar energy systems are a viable mainstream option in 10 years; and (3) to place solar energy systems on 50 percent of new homes in 13 years. The NSHP also provides financial incentives and non-financial assistance in the form of builder and market support to accomplish this goal.

Notes: The NSHP Tier I and Tier II references are separate and different from CALGreen's Tier 1 and Tier 2 references.

Tier II also requires an additional 30 percent reduction in the building's space cooling (air conditioning) energy compared to the 2010 California Energy Code.

An elective measure for Energy Efficiency:

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

A4.211.2 Solar water heating system. A Solar Rating and Certification Corporation (SRCC) OG 100 solar collector or OG 300 solar water heating system is installed. The SRCC Solar Energy Factor (SE) shall be used to determine the Solar Fraction (SF), which shall be at least 0.5 as determined using the California F-Chart available at the "gosolarcalifornia" website or through the California Energy Commission.

COMMENTARY

Purpose:

To reduce a building's energy consumption by providing minimum thresholds for solar water heating systems.

Examples of Acceptable Methods of Implementation and/or Compliance:

- Install a solar collector that meets Solar Rating and Certification Corporation (SRCC) OG 100 solar collector rating.
- Install a solar water heating system that meets Solar Rating and Certification Corporation (SRCC) OG 300 solar water heating system rating.
- The SRCC Solar Energy Factor (SEF) shall be used to determine the Solar Fraction (SF). The SF shall be at least 0.5.

Background:

Solar water heaters, also called solar domestic hot water systems, can be a cost-effective way to generate hot water for buildings utilizing renewable solar energy.

The SRCC is a non-profit organization that develops and implements certification programs and national rating standards for solar energy equipment. SRCC's programs are the direct result of combined efforts of state organizations involved in the administration of standards.

The Solar Energy Factor (SEF) is used by SRCC as its performance rating for solar domestic water heating systems. The SEF is defined as the energy delivered by the system divided by the electrical or gas energy put into the system. The SEF can then be converted to an equivalent Solar Fraction (SF), which is the portion of the total conventional hot water heating load (delivered energy and tank standby losses) provided by solar energy. The California Energy Commission's (CEC) California F-Chart has been designed to calculate solar thermal water heating contributions for built up solar systems and is available on the CEC's website at www.energy.ca.gov. Additional information on definitions, including SEF, the OG-100 Operating Guidelines for Certifying Solar Collectors and the SRCC OG-300 Operating Guidelines and Minimum Standards for Certifying Solar Water Heating Systems are available on the SRCC website (www.solar-rating.org).

Local utilities, local enforcing agencies and the California Energy Commission should also be consulted for additional requirements or possible incentives for using solar water heating systems.

An elective measure for Energy Efficiency:

A4.211.3 Space for future solar installation. A minimum of 300 square feet of unobstructed roof area facing within 30° of south is provided for future solar collector or photovoltaic panels. Rough-in penetrations through the roof surface within 24 inches (610 mm) of the boundary of the unobstructed roof area are provided for electrical conduit and water piping.

An elective measure for Energy Efficiency:

A4.211.4 Future access for solar system. A minimum one-inch (25.4 mm) electrical conduit is provided from the electrical service equipment to an accessible location in the attic or other location approved by the enforcing agency.

COMMENTARY

Purpose:

To promote space and access allocation to facilitate future installation of solar systems.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Provide a minimum of 300 square feet of unobstructed roof area facing within 30° of south for future solar collector.*
- *Provide a minimum one inch (25.4 mm) electrical conduit from the electrical service equipment to an accessible location in the attic or other accessible location approved by the enforcing agency for future solar use.*

Background:

The optimal performance of a solar system is dependent on many factors, including hours of exposure to direct sunlight, unobstructed exposure to sunlight, angle of exposure, and proper sizing of the system in relation to electrical loads. Although CALGreen provides for specific conditions, there may be some allowances for variance in the available roof space and building orientation depending on the geographic location of the structure, length and time of exposure to unobstructed sunlight, size (kilowatts) of the system needed to support the electrical loads for the structure, and advances in photovoltaic technology.

When planning for photovoltaic installations, it is important to consider building features that may not be possible or cost prohibitive to modify after initial construction of a home has been completed. Builders and designers should also contact the local enforcing agency and electrical utility for any local requirements that may need to be accommodated for solar system installations.

DIVISION A4.3 – WATER EFFICIENCY AND CONSERVATION

**SECTION A4.303
INDOOR WATER USE**

Mandatory measure for Water Efficiency and Conservation for Tier 1 and Tier 2 as specified (Tier 2 requires both measures):

A4.303.1 Kitchen faucets and dishwashers. Kitchen faucets and dishwashers in Tier 1 and Tier 2 buildings shall comply with this section.

Tier 1. The maximum flow rate at a kitchen sink faucet shall not be greater than 1.5 gallons per minute at 60 psi.

Note: Rated flow rates for the default function of the faucet shall be used to demonstrate compliance with this section.

Tier 2. In addition to the kitchen faucet requirements for Tier 1, dishwashers in Tier 2 buildings shall be ENERGY STAR qualified and not use more than 5.8 gallons of water per cycle.

COMMENTARY

Purpose:

To further reduce the consumption of potable water.

Examples of Acceptable Methods of Implementation and/or Compliance:

- *Installation of kitchen faucets with rated flow rate of 1.5 gpm @ 60 psi (Tier 1 and Tier 2.)*
- *Installation of ENERGY STAR dishwashers that use 5.8 gallons (or less) per cycle (Tier 2.)*

Background:

Faucets and dishwashers account for up to 20 percent or more of the total water used in dwellings units. Further reducing the maximum allowable kitchen faucet flow rates from the mandatory requirements in Division 4.3 will decrease consumption of potable water and help promote increased water conservation.

An elective measure for Water Efficiency and Conservation:

A4.303.2 Nonwater supplied urinals and waterless toilets. Nonwater supplied urinals or composting toilets are installed.

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 waterless urinals.*
Special Note: *The California Plumbing Code requires water distribution and fixture supply piping to be roughed-in immediately adjacent to each waterless urinal fixture.*
- *Installation of composting toilets or toilets using dehydration and evaporation technology.*

Background:

Toilets are the single biggest user of water of all plumbing fixtures commonly found in dwellings, attributing to more than 20 percent of all water used in a single-family home. (See Section 4.303 of this guide for a diagram of indoor water use in California.) Although water use has decreased with 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. Waterless 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.)

Waterless 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. Waterless urinals only require periodic water rinsing during normal maintenance and cleaning.

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 non-electric. 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 ground water, 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.

**SECTION A4.304
OUTDOOR WATER USE**

An elective measure for Water Efficiency and Conservation:

A4.304.2 Rainwater systems. A rainwater capture, storage and reuse system is designed and installed to use rainwater generated by at least 65 percent of the available roof area.

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 or driveway) 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 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 recommended 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.

An elective measure for Water Efficiency and Conservation:

A4.304.3 Water budget. When landscaping is provided by the builder, a water budget shall be developed for landscape irrigation use that conforms to the local water efficient landscape ordinance or to the California Department of Water Resources Model Water Efficient Landscape Ordinance where no local ordinance is applicable.

Mandatory measure for Water Efficiency and Conservation Tier 1 and Tier 2 as specified:

A4.304.4 Potable water reduction. When landscaping is provided by the builder, a water efficient landscape system shall be installed that reduces potable water use. The potable water use reduction shall be calculated beyond the initial requirements for plant installation and establishment. Calculations for the reduction shall be based on the water budget developed pursuant to Section A4.304.3.

Tier 1. Reduce the use of potable water to a quantity that does not exceed 65 percent of *ETo* times the landscape area.

Tier 2. Reduce the use of potable water to a quantity that does not exceed 60 percent of *ETo* times the landscape area.

Note: Methods used to comply with this section must be designed to meet the requirements of the other parts of the *California Building Standards Code* and may include, but are not limited to, the following:

1. Plant coefficient.
2. Irrigation efficiency and distribution uniformity.
3. Use of captured rainwater.
4. Use of recycled water.
5. Water treated for irrigation purposes and conveyed by a water district or public entity.
6. Use of graywater.

A4.304.4.1 Verification. A calculation demonstrating the applicable potable water use reduction required by this section shall be provided.

COMMENTARY

Purpose:

To promote water efficient landscape design and installation and to achieve compliance with any adopted local water efficient landscape ordinances.

Examples of Acceptable Methods of Implementation and/or Compliance:

- Compliance with a local water efficient landscape ordinance or the California Department of Water Resources Model Water Efficient Landscape Ordinance.
- Use of a water budget calculation, including the Maximum Applied Water Allowance (MAWA) calculation and the Estimated Total Water Use (ETWU) calculation. (Refer to Section A4.304.3.)
- Submission of calculations demonstrating specified potable water reductions.

Background:

The Water Conservation in Landscaping Act of 2006 (Assembly Bill 1881, Chapter 559, Statutes of 2006) required cities and counties to adopt landscape water conservation ordinances by January 1, 2010. This law applies to new residential landscapes of 2,500 square feet and larger (for developers), and new residential landscapes of 5,000 square feet or larger (for homeowners), and requires a Water Efficient Landscape Worksheet and, specifically, water budget calculations.

The CALGreen measure, Section A4.304.3 "Water Budget", applies to all residential projects regardless of who installs them or how large of an area the landscape covers and is used for calculating the water budget referenced in Section A4.304.4.

Note: Section A4.304.4 focuses on reduction of potable water used for landscapes. Section A4.304.5 focuses on elimination of potable water used for landscapes. Methods of compliance for both sections are similar.

**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 Chapter 16A of the California Plumbing Code.

COMMENTARY

Purpose:

To minimize the volume of waste water 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 Health and Safety Code Section 17922.12 and in the California Plumbing Code, Chapter 16A, Part I, as follows:

"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 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 (Senate Bill 1258, Chapter 172, Statutes of 2008) directing the Department of Housing and 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 from manufacturers, over the internet, 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, is addressed in the California Plumbing Code, Chapter 16A, Part II, 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 Frost-Protected Shallow Foundation (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 three to four 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.

Mandatory 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 C 618), blast furnace slag (pursuant to ASTM C 989), 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, 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

Voluntary measure for Material Conservation and Resource Efficiency for Tier 1 and Tier 2 as specified. Section A4.405.3 is discussed in several sections for ease of comprehension.

The regulatory text for the entire A4.405.3 section was amended in July 2011 and is effective July 1, 2012. See CALGreen Section A4.402 for new definitions related to recycled content.

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 www.hcd.ca.gov/CALGreen.html 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 interactive versions, are available on HCD's website. Hyperlinks to these documents are provided in Chapter 8 of this guide.*
 - *Table 1 - Recycled Content Value Calculations*
 - *Table 2 - Assembly Product Recycled Content Calculations*
 - *Table 3 - Recycled Content Conversion Table (Pounds to %)*
- *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's 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 legislation (law):

- *Assembly Bill 1343 (Chapter 420/Statutes of 2010) which recognizes that architectural paint is the largest volume (35%) 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.*
- *Assembly Bill 2398 (Chapter 681/Statutes of 2010) - Product Stewardship for 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.*

Discussion:

CALGreen requires Tier 1 and Tier 2 residential projects to include a specified value for recycled content value 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. Hyperlinks to these forms are included in Chapter 8 of this guide and also are available on our website as interactive and modifiable forms. These forms incorporate the formulas in this section and are discussed on the following pages.

Although the proposed amendments to Section A4.403.5 are not effective until July 1, 2012, it is possible to use the associated formulas and forms for documentation and compliance purposes. The recent amendments did not change the Tier 1 or Tier 2 requirements. The amendments provided further clarification on how to determine recycled content, recycled content value and calculation of cost of materials.

Compliance Methods and Supporting Documents

The 2010 CALGreen Code sections mandate 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

$$\text{\$135,000} \times .10 = \text{\$13,500 minimum RCV needed} \quad (\text{See Equation A4. 4-1})$$

Tier 2 15% RCV required

$$\text{\$135,000} \times .15 = \text{\$20,250 minimum RCV needed} \quad (\text{See Equation A4. 4-2})$$

Note that the target RCV is identified in dollars as a percentage of the total materials 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 Recycled Content Value. 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/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 Table A4.405.3 or as 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)**

**TABLE A4.405.3
SQUARE FOOT VALUATION**

Type of Structure	Square Foot Construction Costs
Residential, one- and two-family	\$101.90
Residential, multiple family	\$92.94

Note: Minimum square foot construction costs for residential one- and two-family and multi-family dwellings are from the International Code Council's (ICC) *Building Valuation Data (BVD)* -- February 2011.

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 materials 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:

$$\text{Project square footage} \times \text{square foot valuation} \times 45 \text{ percent} \quad (\text{Equation A4.4-3A})$$

**TABLE A4.405.3
SQUARE FOOT VALUATION**

Type of Structure	Square Foot Construction Costs
Residential, one- and two-family	\$101.90
Residential, multiple family	\$92.94

Note: Minimum square foot construction costs for residential single-family; and multi-family dwellings are from the International Code Council's (ICC) *Building Valuation Data (BVD)* -- February 2011.

This option provides for calculation of materials cost using the square footage of the residential structure, the square foot valuation as determined by the International Code Council (ICC) building valuation data, 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 six months. The codified values are current for February 2011, however, calculations should use the most current values. Local jurisdictions may also modify this number to accommodate regional cost differences.

An example calculation for a 3200 square-foot single-family residence follows:

$$\text{Example: } 3200 \text{ square foot} \times \$101.90/\text{square foot} \times .45 = \$146,736 = \text{total material cost}$$

Simplified method Option 2:

$$\text{Total estimated or actual cost of project} \times 45 \text{ percent} \quad (\text{Equation A4.4-3B})$$

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:

$$\text{Example: } \$300,000 \times .45 = \$135,000 = \text{total material cost}$$

HCD has also identified and clarified use of a detailed method for determining total material if this method was preferable to the builder or owner. To use this method for determining total material costs, 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.

$$\text{Total Recycled Content Value (percent)} = \frac{[\text{Total Recycled Content Value (dollars)} \div \text{Total Material Cost (dollars)}] \times 100}{\text{(Equation A4.4-5)}}$$

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.

$$\text{RCV}_M \text{ (dollars)} = \text{Material cost (dollars)} \times \text{RC}_M \text{ (percent)} \quad \text{(Equation A4.4-6)}$$

$$\text{RC}_M \text{ (percent)} = \text{Postconsumer content percentage} + (\frac{1}{2}) \text{ Preconsumer content percentage} \quad \text{(Equation A4.4-7)}$$

Notes:

1. 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.
2. If the manufacturer reports total recycled content of a material as one percentage in lieu of separately reporting preconsumer and postconsumer values, one-half of the total shall be considered preconsumer recycled material and one-half of the total shall be considered postconsumer recycled material.

Determining Recycled Content (RC) of materials

CALGreen Section A4.403.3.1.3 provides a formula for calculating recycled content of materials:

$$\text{RC}_M \text{ (percent)} = \text{Postconsumer content percentage} + (\frac{1}{2}) \text{ Preconsumer content percentage} \quad \text{(Equation A4.4-7)}$$

Example: Company X gypsum board consists of 6.2% postconsumer RC and 93% preconsumer RC. In accordance with Equation A4.4-7, RC_M 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 (RC_M) = 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 that half of the recycled content is preconsumer and the other half is postconsumer.

Example: Company Y identifies windows as having a total recycled content of 40%, but does not provide breakdowns for preconsumer and postconsumer recycled content. Therefore, recycled content for purposes of CALGreen is calculated as 20% postconsumer recycled content + one-half of 20% preconsumer recycled content = 30% total 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.

$$\text{RCV}_A \text{ dollars} = \text{Assembly cost (dollars)} \times \text{Total RC}_A \text{ (percent)} \quad \text{(Equation A4.4-8)}$$

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.

$$\text{RC}_A = \sum \text{PRC}_M \quad \text{(Equation A4.4-9)}$$

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

$$\text{PRC}_M \text{ (percent)} = \text{Weight of material (percent)} \times \text{RC}_M \text{ (percent)} \quad \text{Equation A4.4-10}$$

$$\text{Weight of material (percent)} = [\text{Weight of material (lbs)} \div \text{Weight of assembly (lbs)}] \times 100 \quad \text{(Equation A4.4-11)}$$

$$\text{RC}_M \text{ (percent)} = \text{Postconsumer content percentage} + (\frac{1}{2}) \text{ Preconsumer content percentage} \quad \text{(See Equation A4.4-7)}$$

Method 2: Recycled content (postconsumer and preconsumer) provided in pounds

$$\text{PRC}_M \text{ (percent)} = [\text{RC}_M \text{ (lbs)} \div \text{Weight of material (lbs)}] \times 100 \quad \text{(Equation A4.4-12)}$$

$$\text{RC}_M \text{ (lbs)} = \text{Postconsumer content (lbs)} + (\frac{1}{2}) \text{ Preconsumer content (lbs)} \quad \text{(Equation A4.4-13)}$$

NOTE: If the manufacturer reports total recycled content of a material as one percentage in lieu of separately reporting preconsumer and postconsumer values, one-half of the total shall be considered preconsumer recycled material and one-half of the total shall be considered postconsumer 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:

$$RC_A = \sum PRC_M \quad \text{(Equation A4.4-9)}$$

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 3 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	Post-Consumer Recycled Content	Pre-Consumer 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, similar to 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 that half of the recycled content is preconsumer and the other half is postconsumer.

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)

Table 1 - Recycled Content Value Calculations

http://www.hcd.ca.gov/codes/calgreen/Table1_RCVCalculations.xls

- *This form is used as summary form showing recycled content of materials and assembly items. Items shown on this table cannot include components of the structural frame. Additional instructions are provided on the form.*

Table 2 - Assembly Product Recycled Content Calculations

http://www.hcd.ca.gov/codes/calgreen/Table2_AssemblyCalculations.xls

- *This form is used for calculating recycled content of assembly products. The calculated values on this form need to be transferred onto Table 1 for the appropriate calculation of recycled content value for purposes of CALGreen.*
- *Items shown on this table cannot include components of the structural frame. Additional instructions are provided on the form.*

Table 3 - Recycled Content Conversion Table (Pounds to %)

http://www.hcd.ca.gov/codes/calgreen/Table3_ConversionTable.xls

- *This form is used when recycled content is provided in pounds and calculations are needed in percentages. Additional instructions are provided on the form.*

DIVISION A4.5 – ENVIRONMENTAL QUALITY

**SECTION A4.504
POLLUTANT CONTROL**

Mandatory measure for Environmental Quality Tier 1 and Tier 2 as specified:

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

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. VOC emission limits defined in the Collaborative for High Performance Schools (CHPS) High Performance Products Database.
2. Products compliant with CHPS criteria certified under 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 80 percent of the total area of resilient flooring installed shall comply.

Tier 2. At least 90 percent of the total area of resilient flooring installed shall comply.

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 – 80 percent or more of the total area of resilient flooring shall be CALGreen compliant.*
- *Tier 2 – 90 percent or more of the total area of resilient flooring shall be CALGreen compliant.*
- *Flooring and adhesives that meet the VOC limits defined by CHPS for low-emitting materials in their High Performance Products Database.*
- *Products compliant with CHPS criteria under the Greenguard Children and 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.)*
- *Provide documentation of product certification and compliance.*
- *Hyperlinks to supporting sample documentation forms are included in Chapter 8. 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:

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. The referenced CHPS Low-emitting Materials List has been recently replaced by the CHPS High Performance Products Database. This database can be searched for the "Low-emitting Material" attribute; however, it is still in the process of being populated with products.

Mandatory measure for Environmental Quality Tier 1 and Tier 2 as specified:

The regulatory text for this section was amended in July 2011 and is effective July 1, 2012

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 VOC-emission limits defined in Collaborative for High Performance Schools (CHPS) High Performance Products Database; products compliant with CHPS criteria certified under the 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 in compliance with the VOC limits of CHPS High Performance Products Database for Low-emitting Materials, CHPS criteria under the Greenguard Children and Schools 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.)
- 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-gassed into indoor air.

Note: *The referenced CHPS Low-emitting Materials List has been recently replaced by the CHPS High Performance Products Database. This database can be searched for the "Low-emitting Material" attribute; however, it is still in the process of being populated with products.*

DIVISION A4.6 – TIER I 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, use of these tiers include 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 statewide, 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. Low-rise 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. (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.

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 Section A4.601.4.2 was amended in July 2011 and is effective July 1, 2012

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 at least two elective measures selected from Division A4.1.
2. From Division A4.2, Energy Efficiency.
 - 2.1 Exceed the 2010 *California Energy Code* requirements by 15 percent.
 - 2.2 Comply with at least four elective measures selected from Division A4.2.
3. From Division A4.3, Water Efficiency and Conservation.
 - 3.1 Comply with the reduced flow rate for kitchen sink faucets in Section A4.303.1.
 - 3.2 Comply with the landscape irrigation water budget requirement in Section A4.304.3.
 - 3.3 Comply with the Tier 1 potable water use reduction for landscape irrigation design in Section 4.304.4.
 - 3.4 Comply with at least one elective measure 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 80 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 Prerequisite and Elective Measures for Tier 2 (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 Section A4.601.5.2 was amended in July 2011 and is effective July 1, 2012

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 at least four elective measures selected from Division A4.1.
2. From Division A4.2, Energy Efficiency.
 - 2.1 Exceed the 2010 *California Energy Code* requirements by 30 percent.
 - 2.2 Comply with at least six elective measures selected from Division A4.2.
3. From Division A4.3, Water Efficiency and Conservation.
 - 3.1 Comply with the Tier 1 reduced flow rate for kitchen sink faucets in Section A4.303.1.
 - 3.2 Comply with the Tier 2 dishwasher requirements in Section A4.303.1.
 - 3.3 Comply with the landscape irrigation water budget requirement in Section A4.304.3.
 - 3.4 Comply with the Tier 2 potable water use reduction for landscape irrigation design in Section A4.304.4.
 - 3.5 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 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 90 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.

CALGreen's Residential Occupancies Application Checklist

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 using the following hyperlinks:

http://www.hcd.ca.gov/codes/calgreen/Residential_Occupancies_App_Checklist_7-1-12.pdf
http://www.hcd.ca.gov/codes/calgreen/Residential_Occupancies_App_Checklist_7-1-12.docx

Using the Residential Occupancies Application Checklist

Identify Mandatory Measures. Review all checked (☒) measures in the column labeled "Mandatory." These measures are required (prerequisite) 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., increasing energy efficiency by 15 percent) 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

[DELETED 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 for

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. This sample indicates different waste diversion rates for each tier. 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.

- 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.
- Required prerequisite for this Tier.

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 its 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.

Q: *CALGreen has mandatory provisions and optional 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 pre-determined) and call it, for example, "The County of XX Tier Measures"?*

A: Yes, as long as express findings are filed with the California Building Standards Commission 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: *Residential Voluntary Measure A4.211.1 for Renewable Energy requires a third party verification for Tier 1 and Tier 2 energy efficiency measures. What is a third party verification and who is the verifier?*

A: The New Solar Homes Partnership (NSHP) requires a third party inspector, called a Home Energy Rating System (HERS) rater, to provide field verification for certain energy efficiency measures and the photovoltaic (PV) system in an NSHP home.



TIER 1 LOW-RISE RESIDENTIAL MEASURES EFFECTIVE JULY 1, 2012

This list focuses on Tier 1 measures. See specific referenced sections for complete details on CALGreen mandatory requirements.

	TYPE	SECTION	MEASURES	REQUIREMENTS
Divisions 4.1 and A4.1 - PLANNING AND DESIGN (SITE DEVELOPMENT)				
S I T E D E V E L O P M E N T	MAND.	4.106.2	Storm Water Drainage and Retention	Projects disturbing less than one acre shall manage storm water drainage during construction.
	MAND.	4.106.3	Grading & Paving	Construction plans shall indicate how the site grading or drainage system will manage all surface water flows to keep water from entering buildings.
	TIER 1 PREREQ.	A4.106.2.3	Topsoil Protection	Tier 1. Displaced topsoil shall be stockpiled for reuse in a designated area and covered or protected from erosion.
	TIER 1 PREREQ.	A4.106.4	Water Permeable Surfaces	Tier 1. Not less than 20% of the total parking, walking, or patio surfaces shall be permeable.
	TIER 1 PREREQ.	A4.106.5 & Table A4.106.5(1)	Cool Roof	Roof covering materials shall have a minimum 3-year aged solar reflectance and thermal emittance or a minimum aged Solar Reflectance Index (SRI) equal to or greater than the values specified in Table A4.106.5(1).
	ELECTIVES (≥ 2)	A4.601.4.2 (1)(1.4)	--	Comply with at least two elective measures selected from Division A4.1.
Divisions 4.2 and A4.2- ENERGY EFFICIENCY				
E N E R G Y E F F	MAND.	4.201.1	Scope	Meet minimum residential building energy efficiency standards as required by the 2010 California Energy Code.
	TIER 1 REREQ.	A4.203.1	Energy Performance	Tier 1. Exceed the 2010 California Energy Code requirements by 15%.
	ELECTIVES (≥ 4)	A4.601.4.2 (2)(2.2)	--	Comply with at least four elective measures selected from Division A4.2.
Divisions 4.3 and A4.3 - WATER EFFICIENCY AND CONSERVATION (INDOOR WATER USE) (OUTDOOR WATER USE)				
I N D O O R W A T E R	MAND.	4.303.1	20% Savings	Fixtures and fixture fittings reducing the overall use of indoor potable water by at least 20% using either the prescriptive or performance method in Section 4.303.1.
	TIER 1 PREREQ.	A4.303.1	Kitchen Faucets	Comply with the reduced flow rate (≤ 1.5 gpm @ 60 psi) for kitchen sink faucets in Section A4.303.1.
	MAND.	4.303.2	Multiple Showerheads Serving One Shower	Combined flow rate of all showerheads controlled by a single valve shall not exceed 2 gpm @ 80 psi. See complete details in Section 4.303.2. Exception: Maximum flow rate for showerheads when using the performance method specified in Section 4.303.1, Item 2 is 2.5 gpm @ 80psi.
W O A T E R D R O U S E	MAND.	4.304.1	Irrigation Controllers	Automatic irrigation system controllers for landscaping installed at the time of final inspection shall meet specified requirements. See complete details in Section 4.304.1.
	TIER 1 PREREQ.	A4.304.4	Potable Water Reduction	Tier 1. Reduce potable water use to ≤ 65% of Eto (reference evapotranspiration) times the landscape area.
	ELECTIVES (≥ 1)	A4.601.4.2 (3)(3.3)		Comply with at least one elective measure selected from Division A4.3.
Divisions 4.4 and A4.4 - MATERIAL CONSERVATION & RESOURCE EFFICIENCY (FOUNDATION SYSTEMS) (MATERIAL SOURCES) (ENHANCED DURABILITY & REDUCED MAINTENANCE) (CONSTRUCTION WASTE REDUCTION, DISPOSAL & RECYCLING) (BUILDING MAINTENANCE & OPERATION)				
F D N	TIER 1 PREREQ.	A4.403.2	Reduction in Cement Use	Tier 1. Reduce cement content in foundation mix designs to not less than 20% per Section A4.403.2.
M A T	TIER 1 PREREQ.	A4.405.3	Recycled Content	Tier 1. Use materials, equivalent in performance to virgin materials, with a total (combined) recycled content value (RCV) of not less than 10% per Section A4.405.3.1.
D U R	MAND.	4.406.1	Rodent Proofing	Annular spaces around pipes, electric cables, conduits, or other openings in plates at exterior walls shall be closed to prevent passage of rodents. See complete details in Section 4.406.1.
C O N S T R U C T I O N W A S T E R E D U C T I O N	MAND.	4.408.1	Construction Waste Reduction of at least 50%	Recycle and/or salvage for reuse a minimum of 50% 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. Documentation is required per Section 4.408.5. Exceptions: 1 - Excavated soil and land-clearing debris. 2 - Alternate waste reduction methods developed by working with local enforcing 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 jobsites are located in areas beyond the haul boundaries of the diversion facility.
	TIER 1 PREREQ.	A4.408.1	Reduction of at least 65%	Tier 1. Reduce non-hazardous construction waste by at least 65%.
	MANDATORY IF NO EXISTING LOCAL ORDINANCE (See 4.408.1)	4.408.2	Construction Waste Management Plan	Submit a construction waste management plan meeting Items 1 through 5 in Section 4.408.2. Plans shall be updated as necessary and shall be available for examination during construction..
		4.408.3	Waste Management Company	Utilize a waste management company, approved by the enforcing agency, which can provide verifiable documentation that diverted construction and demolition waste materials meet the requirements in Section 4.408.1.
	4.408.4	Waste Stream Reduction Alt.	Generate a total combined weight of construction and demolition waste disposed in landfills that does not exceed 4 pounds per square-foot of the building areas.	
M A I N T	MAND.	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 covers 10 subject areas shall be placed in the building. See complete details in Section 4.410.1.
	ELECTIVES (≥ 2)	A4.601.4.2 (4)(4.4)		Comply with at least two elective measures selected from Division A4.4.

Note: Mandatory CALGreen measures with more restrictive Tier 1 and Tier 2 requirements are noted in gray font color.



TIER 1 LOW-RISE RESIDENTIAL MEASURES EFFECTIVE JULY 1, 2012

	TYPE	SECTION	MEASURES	REQUIREMENTS	
Divisions 4.5 and A4.5 - ENVIRONMENTAL QUALITY (FIREPLACES) (POLLUTANT CONTROL) (INTERIOR MOISTURE CONTROL) (INDOOR AIR QUALITY & EXHAUST) (ENVIRONMENTAL COMFORT)					
P L A C E S	MAND.	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 Phase II emission limits where applicable. Woodstoves, pellet stoves and fireplaces shall also comply with all applicable local ordinances.	
	P O L L U T A N T C O N T R O L	MAND.	4.504.1	Covering of Duct Openings and Protection of Mechanical Equipment	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. Tape, plastic, sheetmetal or other methods acceptable to the enforcing agency to reduce the amount of water, dust and debris entering the system may be used.
		MAND.	4.504.2.1	Adhesives, Sealants and Caulks	Adhesives, sealants and caulks used on the project shall meet the VOC and other toxic compound requirements as specified in Section 4.504.2.1.
		MAND.	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. See complete details in Section 4.504.2.2.
		MAND.	4.504.2.3	Aerosol Paints and Coatings	Aerosol paints and coatings shall meet the Product-Weighted MIR Limits for ROC and other requirements as specified in Section 4.504.2.3.
		MAND.	4.504.3	Carpet Systems	All carpet installed in the building interior shall meet the specified testing and product requirements. See complete details in Section 4.504.3.
		MAND.	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.
		MAND.	4.504.3.2	Carpet Adhesive	All carpet adhesives shall meet the requirements of Table 4.504.1.
		MAND.	4.504.4	Resilient Flooring Systems	Where resilient flooring is installed, at least 50% of floor area receiving resilient flooring shall comply with the VOC emission limits defined in the Collaborative for High Performance Schools (CHPS) High Performance Materials Database or certified under the Resilient Floor Covering Institute (RFCI) FloorScore Program.
		PREREQ.	A4.504.2	Resilient Flooring Systems	Tier 1. At least 80% of total areas of resilient flooring shall comply with specified VOC limits. See complete details in Section A4.504.2.
		TIER 1 PREREQ.	A4.504.3	Thermal Insulation	Tier 1. Comply with the thermal insulation requirements for VOC-emission limits in Collaborative for High Performance Schools (CHPS) High Performance Materials Database; products compliant with CHPS criteria certified under the 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).
MAND.	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. See complete details in Section 4.504.5.		
I M O I S T U R E	MAND.	4.505.2	Concrete Slab Foundations	Concrete slab foundations or concrete slab-on-ground floors required to have a vapor retarder by the California Building Code, Chapter 19, or the California Residential Code, Chapter 5, respectively, shall also comply with this section.	
	MAND.	4.505.2.1	Capillary Break	A capillary break shall be installed. See complete details in Section 4.505.2.1.	
	MAND.	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% moisture content. Moisture content shall be verified as specified. See complete details in Section 4.505.3.	
A I R Q U A L I T Y	MAND.	4.506.1	Bathroom Exhaust Fans	Mechanical exhaust fans which exhaust directly from bathrooms shall meet requirements as specified in Section 4.506.1.	
	C O M F O R T	MAND.	4.507.1	Openings	Whole house exhaust fans shall have insulated louvers or covers which close when the fan is off. Covers or louvers shall have a minimum insulation value of R-4.2.
MAND.		4.507.2	Heating and Air Conditioning System Design	Heating and air conditioning systems shall be sized, designed, and equipment selected using specified methods. See complete details in Section 4.507.2.	
	ELECTIVES (≥ 1)	A4.601.4.2 (5)(5.3)		Comply with at least one elective measure selected from Division A4.5.	
CHAPTER 7 - INSTALLER & SPECIAL INSPECTOR QUALIFICATIONS (QUALIFICATIONS) (VERIFICATIONS)					
Q U A L	MAND.	702.1	Installer Training [HCD]	HVAC system installers shall be trained and certified in the proper installation of HVAC systems and equipment by a recognized training or certification program. See complete details in Section 702.1.	
	MAND.	702.2	Special Inspection	Special inspectors must be qualified and able to demonstrate competence to the enforcing agency in the discipline in which they are inspecting. See complete details in Section 702.2.	
V E R	MAND.	703.1	Documentation	Documentation of compliance. See complete details in Section 703.1.	



TIER 2 LOW-RISE RESIDENTIAL MEASURES EFFECTIVE JULY 1, 2012

This list focuses on Tier 2 measures. See specific referenced sections for complete details on CALGreen mandatory requirements.

	TYPE	SECTION	MEASURES	REQUIREMENTS
Divisions 4.1 and A4.1 - PLANNING AND DESIGN (SITE DEVELOPMENT)				
S I T E D E V E L O P M E N T	MAND.	4.106.2	Storm Water Drainage and Retention	Projects disturbing less than one acre shall manage storm water drainage during construction.
	MAND.	4.106.3	Grading & Paving	Construction plans shall indicate how the site grading or drainage system will manage all surface water flows to keep water from entering buildings.
	TIER 2 PREREQ.	A4.106.2.3	Topsoil Protection	Tier 2. Displaced topsoil shall be stockpiled for reuse in a designated area and covered or protected from erosion (as required for Tier 1); and construction area should be identified and delineated by flagging or fencing to limit construction activities to designated areas; and traffic and storage limited to future paved areas.
	TIER 2 PREREQ.	A4.106.4	Water Permeable Surfaces	Tier 2. Not less than 30% of the total parking, walking, or patio surfaces shall be permeable.
	TIER 2 PREREQ.	A4.106.5 & Table A4.106.5(2)	Cool Roof	Roof covering materials shall have a minimum 3-year aged solar reflectance and thermal emittance or a minimum aged Solar Reflectance Index (SRI) equal to or greater than the values specified in Table A4.106.5(2).
	ELECTIVES (≥ 4)	A4.601.5.2 (1)(1.4)	--	Comply with at least four elective measures selected from Division A4.1.
Divisions 4.2 and A4.2- ENERGY EFFICIENCY				
E N E R G Y	MAND.	4.201.1	Scope	Meet minimum residential building energy efficiency standards as required by the 2010 California Energy Code.
	TIER 2 PREREQ.	A4.203.1	Energy Performance	Tier 2. Exceed the 2010 California Energy Code requirements by 30%.
	ELECTIVES (≥ 6)	A4.601.5.2 (2)(2.2)	--	Comply with at least six elective measures selected from Division A4.2.
Divisions 4.3 and A4.3 - WATER EFFICIENCY AND CONSERVATION (INDOOR WATER USE) (OUTDOOR WATER USE)				
I N D O O R W A T E R O U T D O O R U S E	MAND.	4.303.1	20% Savings	Fixtures and fixture fittings reducing the overall use of indoor potable water by at least 20% using either the prescriptive or performance method in Section 4.303.1.
	PREREQ.	A4.303.1	Kitchen Faucets & Dishwashers	Tier 2. Comply with the reduced flow rate (≤ 1.5 gpm @ 60 psi) for kitchen sink faucets in Section A4.303.1 (as required for Tier 1); plus use ENERGY STAR dishwashers that use ≤ 5.8 gallons water per cycle.
	MAND.	4.303.2	Multiple Showerheads Serving One Shower	Combined flow rate of all showerheads controlled by a single valve shall not exceed 2 gpm @ 80psi. See complete details in Section 4.303.2. Exception: Maximum flow rate for showerheads when using the performance method specified in Section 4.303.1, Item 2 is 2.5 gpm @ 80psi.
	MAND.	4.304.1	Irrigation Controllers	Automatic irrigation system controllers for landscaping installed at the time of final inspection shall meet specified requirements. See complete details in Section 4.304.1.
	TIER 2 PREREQ.	A4.304.4	Potable Water Reduction	Tier 2. Reduce potable water use to ≤ 60% of Eto (reference evapotranspiration) times the landscape area.
ELECTIVES (≥ 2)	A4.601.5.2 (3)(3.4)		Comply with at least two elective measure selected from Division A4.3.	
Divisions 4.4 and A4.4 - MATERIAL CONSERVATION & RESOURCE EFFICIENCY (FOUNDATION SYSTEMS) (MATERIAL SOURCES) (ENHANCED DURABILITY & REDUCED MAINTENANCE) (CONSTRUCTION WASTE REDUCTION, DISPOSAL & RECYCLING) (BUILDING MAINTENANCE & OPERATION)				
F D N	TIER 2 PREREQ.	A4.403.2	Reduction in Cement Use	Tier 2. Reduce cement content in foundation mix designs to not less than 25% per Section A4.403.2.
	TIER 2 PREREQ.	A4.405.3	Recycled Content	Tier 2. Use materials, equivalent in performance to virgin materials, with a total (combined) recycled content value (RCV) of not less than 15% per Section A4.405.3.1.
M A T	MAND.	4.406.1	Rodent Proofing	Annular spaces around pipes, electric cables, conduits, or other openings in plates at exterior walls shall be closed to prevent passage of rodents. See complete details in Section 4.406.1.
	C O N S T R U C T I O N W A S T E R E D U C T I O N	MAND.	4.408.1	Construction Waste Reduction of at least 50%
PREREQ.		A4.408.1	Reduction of at least 75%	Tier 2. Reduce non-hazardous construction waste by at least 75%.
MANDATORY IF NO EXISTING LOCAL ORDINANCE (See 4.408.1)		4.408.2	Construction Waste Management Plan	Submit a construction waste management plan meeting Items 1 through 5 in Section 4.408.2. Plans shall be updated as necessary and shall be available for examination during construction.
		4.408.3	Waste Management Company	Utilize a waste management company, approved by the enforcing agency, which can provide verifiable documentation that diverted construction and demolition waste materials meet the requirements in Section 4.408.1.
	4.408.4	Waste Stream Reduction Alt.	Generate a total combined weight of construction and demolition waste disposed in landfills that does not exceed 4 pounds per square-foot of the building areas.	
B M L A D I T G N	MAND.	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 covers 10 subject areas shall be placed in the building. See complete details in Section 4.410.1.
	ELECTIVES (≥ 4)	A4.601.5.2 (4)(4.4)		Comply with at least four elective measures selected from Division A4.4.

Note: Mandatory CALGreen measures with more restrictive Tier 1 and Tier 2 requirements are noted in gray font color.



TIER 2 LOW-RISE RESIDENTIAL MEASURES EFFECTIVE JULY 1, 2012

	TYPE	SECTION	MEASURES	REQUIREMENTS	
Divisions 4.5 and A4.5 - ENVIRONMENTAL QUALITY (FIREPLACES) (POLLUTANT CONTROL) (INTERIOR MOISTURE CONTROL) (INDOOR AIR QUALITY & EXHAUST) (ENVIRONMENTAL COMFORT)					
P L A N E E S	MAND.	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 Phase II emission limits where applicable. Woodstoves, pellet stoves and fireplaces shall also comply with all applicable local ordinances.	
	P O L L U T A N T C O N T R O L	MAND.	4.504.1	Covering of Duct Openings and Protection of Mechanical Equipment	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. Tape, plastic, sheetmetal or other methods acceptable to the enforcing agency to reduce the amount of water, dust and debris entering the system may be used.
		MAND.	4.504.2.1	Adhesives, Sealants and Caulks	Adhesives, sealants and caulks used on the project shall meet the VOC and other toxic compound requirements as specified in Section 4.504.2.1.
		MAND.	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. See complete details in Section 4.504.2.2.
		MAND.	4.504.2.3	Aerosol Paints and Coatings	Aerosol paints and coatings shall meet the Product-Weighted MIR Limits for ROC and other requirements as specified in Section 4.504.2.3.
		MAND.	4.504.3	Carpet Systems	All carpet installed in the building interior shall meet the specified testing and product requirements. See complete details in Section 4.504.3.
		MAND.	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.
		MAND.	4.504.3.2	Carpet Adhesive	All carpet adhesives shall meet the requirements of Table 4.504.1.
		MAND.	4.504.4	Resilient Flooring Systems	Where resilient flooring is installed, at least 50% of floor area receiving resilient flooring shall comply with the VOC emission limits defined in the Collaborative for High Performance Schools (CHPS) High Performance Materials Database or certified under the Resilient Floor Covering Institute (RFCI) FloorScore Program.
		TIER 2 PREREQ.	A4.504.2	Resilient Flooring Systems	Tier 2. At least 90% of total areas of resilient flooring shall comply with specified VOC limits. See complete details in Section A4.504.2.
		TIER 2 PREREQ.	A4.504.3	Thermal Insulation	Tier 2. Meet VOC-emission limits as required for Tier 1; <u>and</u> does not contain any added formaldehyde. See complete Tier 1 details in Section A4.504.3.
MAND.	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. See complete details in Section 4.504.5.		
I N T E R I O R M O I S T U R E	MAND.	4.505.2	Concrete Slab Foundations	Concrete slab foundations or concrete slab-on-ground floors required to have a vapor retarder by the California Building Code, Chapter 19, or the California Residential Code, Chapter 5, respectively, shall also comply with this section.	
	MAND.	4.505.2.1	Capillary Break	A capillary break shall be installed. See complete details in Section 4.505.2.1.	
	MAND.	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% moisture content. Moisture content shall be verified as specified. See complete details in Section 4.505.3.	
A I R Q U A L I T Y	MAND.	4.506.1	Bathroom Exhaust Fans	Mechanical exhaust fans which exhaust directly from bathrooms shall meet requirements as specified in Section 4.506.1.	
	C O M F O R T	MAND.	4.507.1	Openings	Whole house exhaust fans shall have insulated louvers or covers which close when the fan is off. Covers or louvers shall have a minimum insulation value of R-4.2.
MAND.		4.507.2	Heating and Air Conditioning System Design	Heating and air conditioning systems shall be sized, designed, and equipment selected using specified methods. See complete details in Section 4.507.2.	
	ELECTIVES (≥ 1)	A4.601.5.2 (5)(5.3)		Comply with at least one elective measure selected from Division A4.5.	
CHAPTER 7 - INSTALLER & SPECIAL INSPECTOR QUALIFICATIONS (QUALIFICATIONS) (VERIFICATIONS)					
Q U A L	MAND.	702.1	Installer Training [HCD]	HVAC system installers shall be trained and certified in the proper installation of HVAC systems and equipment by a recognized training or certification program. See complete details in Section 702.1.	
	MAND.	702.2	Special Inspection	Special inspectors must be qualified and able to demonstrate competence to the enforcing agency in the discipline in which they are inspecting. See complete details in Section 702.2.	
V E R	MAND.	703.1	Documentation	Documentation of compliance. See complete details in Section 703.1.	

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 or template for local agency convenience when adopting CALGreen's voluntary appendices. Local agencies may also develop their own resolutions for adopting the voluntaries measures in CALGreen.



APPENDIX A5. NONRESIDENTIAL VOLUNTARY MEASURES

NOTE: 2010 CALGreen Code Appendix A5 “Nonresidential Voluntary Measures” is divided into seven separate divisions and contains measures adopted by the California Building Standards Commission (CBSC), the Division of the State Architect – Structural Safety (DSA-SS), and the Office of Statewide Health Planning and Development (OSHDP). CALGreen Appendix A5 addresses voluntary green building standards for nonresidential structures and is not discussed in this guide.

For information on CALGreen Appendix A5, see “*Guide to the (Non-Residential) California Green Building Standards Code*” and “*Guide to the California Green Building Standards Code – Non-Residential (Commissioning)*” prepared by the California Building Standards Commission (www.bsc.ca.gov).



CONTACT AND PURCHASING INFORMATION

California Green Building Standards for Low-Rise Residential Buildings

California Department of Housing and Community Development

State Housing Law Program

1800 Third Street, Room 260

Sacramento, CA 95811-6942

Telephone: (916) 445-9471 FAX: (916) 327-4712

Website: www.hcd.ca.gov

Questions: Use "Submit a Comment" form.

Free access to CALGreen: Look for



California Residential Energy Efficiency Standards

California Energy Efficiency Hotline

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

Email: 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.bsc.ca.gov

Email: cbsc@dgs.ca.gov

Free access to CALGreen: Look for



Purchasing Information for 2010 CALGreen (loose-leaf or eCode)

International Code Council

5360 Workman Mill Road

Whittier, CA 90601

Telephone: 1-888-ICC-SAFE (422-7233); FAX: 1-866-891-1695

Website: www.iccsafe.org