

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

**CAL Green**

**June 2010  
First Edition**



# A Guide to *CAL*Green 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.

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Provided by

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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). 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 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: [www.hcd.ca.gov](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."



## 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 Title 24, Part 11, the California Green Building Standards Code.

This module will provide helpful tools and information about CALGreen mandatory measures, regulations, other laws and construction codes related to green building standards 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's "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.

### **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, these bills were 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 standards and 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 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 resulting in the Commission's adoption of the 2008 California Green Building Standards Code (CGBC). Effective August 1, 2009, the 2008 California Green Building Standards Code regulations were primarily voluntary building standards although mandatory provisions that were, in part, required in other building standards codes or had future implementation dates were included.

Introduction of the 2008 California Green Building Standards Code (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 California Green Building Standards Code publication would provide a framework and first step toward establishing 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, the California Building Standards Code. CALGreen is not based upon a model building code nor adopted by reference, but the same rulemaking process applies. The newly adopted 2008 California Green Building Standards Code was used as a base document, analyzed and evaluated during the 2009 triennial adoption cycle for necessary updates to the 2010 CALGreen Code. There are significant changes in the 2010 CALGreen provisions, including mandatory requirements, introduction of Tier 1 and Tier 2 performance levels, and the reorganization of the code provisions to easily distinguish low-rise residential provisions from the non-residential provisions. The 2010 CALGreen Code becomes effective January 1, 2011.

Building standards addressed in the 2010 CALGreen Code are not isolated and must be used in conjunction with other parts of Title 24, the California Building Standards Code 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 brief discussions of administration for purposes of the code, definitions, broad-based provisions for green building pursuant to CALGreen and 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 non-residential 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, on a statewide basis.

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
- Accessory buildings, facilities and uses related to the above residential uses

\*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 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 identifies the following parts of the California Code of Regulations, Title 24, 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. Tiers may be adopted by a city, county, or city and county consistent with other building standards. CALGreen does not limit the authority of local agencies to make necessary changes to CALGreen based on climatic, topographical or geological conditions. See CALGreen Section 101.7 for further details on procedures and requirements for adopting local amendments.

## **Alternate Materials, Designs and Methods of Construction**

CALGreen 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".
- Does the occupancy involve a residential use.
- Is the building three stories or less. (HCD's CALGreen provisions apply to low-rise, three stories or less, residential uses.)
- 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 implementation.
- Note that CALGreen Chapter 5 and Appendix A5 may also apply in mixed occupancies (e.g., commercial use combined with residential uses.)
- Always use the most current version of CALGreen and check for local amendments. 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. This guide 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: No.** The U. S. Green Building Council (USGBC) and Build it Green are working on analyses comparing CALGreen with other green building standards.

**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.** All four story and taller residential buildings are not low-rise residential buildings by definition, but are still residential occupancies. Only three stories or less residential buildings are covered by the scope of CALGreen (Section 101.3.1, #3).

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

**A: Yes.** 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: Section 102.3 of CALGreen is “Verification”, which requires that “Documentation of conformance for applicable green building measures shall 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.**



## **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, 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 non-residential 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 non-residential 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 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 support 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 and 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 CALGreen mandatory items 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 selected sections shown in this chapter is current as of June 2010 and 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](http://www.iccsafe.org)). The CALGreen text may be viewed in draft form on HCD's website ([www.hcd.ca.gov](http://www.hcd.ca.gov)) or the California Building Standards Commission's website ([www.bsc.ca.gov](http://www.bsc.ca.gov)).

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

**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 our 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 onsite 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.*

**4.106.3 Surface drainage.** The site shall be planned and developed to keep surface water from entering buildings. Construction plans shall indicate how the site grading or drainage system will manage surface water flows. 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 building 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:*
  - *Roof overhangs.*
  - *Sloped ground.*
  - *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, as well as 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.*

## 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.*

*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](mailto: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**

**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.

**PRESCRIPTIVE METHOD**

1. Each plumbing fixture and fitting shall meet reduced flow rates specified in Table 4.303.2; or
2. 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: water closets, urinals, lavatory faucets and showerheads.

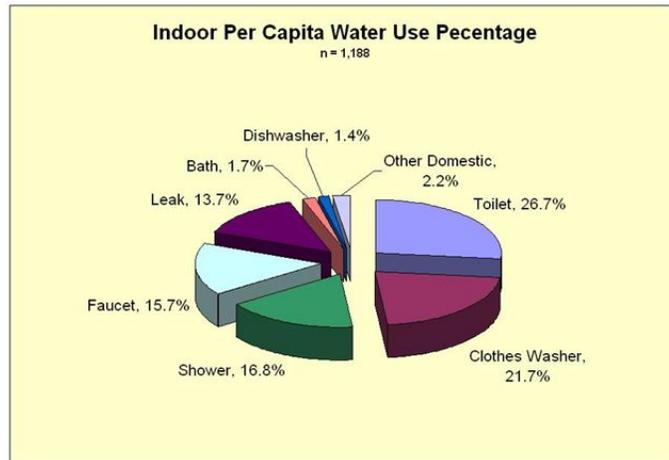
**PERFORMANCE METHOD**

**COMMENTARY**

**Purpose:**

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

*The following graphic shows an average 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.*



Examples of Acceptable Methods of Implementation and/or Compliance:  
Mandatory effective date for 20% reduction is July 1, 2011.

**PRESCRIPTIVE METHOD DISCUSSION:** The plumbing fixtures listed below must comply with Table 4.303.2.

- a) *Toilets (Water Closets): The standard single flush toilet (1.6 gal/flush) 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) x (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: Not commonly found in a low-rise residential application. However, 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% reduction. Many manufacturers are now producing low-flow, ultra low-flow, high efficiency and waterless urinals that are seeing water consumption ranges form 0 gal/flush to 0.125 gal/flush.*
- c) *Showerheads: Studies show that approximately 17 percent of indoor water use can be directly related to showering and even modest flow rate reductions can greatly reduce 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:** The 2010 California Plumbing Code references a higher acceptable flow rate for showerheads. If a showerhead with a higher flow rate is used, it will be necessary to use the performance-based calculation method to achieve the overall 20 percent indoor water reduction rate. Showerheads with a flow rate less than 2 gpm @ 80psi shall be equipped with scald protection that functions at that reduced rate.

- d) *Lavatory Faucets: Lavatory faucets provide an excellent source of water reduction. Aerators on reduced flow faucets inject air bubbles into the water stream creating the consumer appeal of large soft water flow with less water. 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. Faucets must also comply with the low-lead requirements of AB 1953 as summarized in the “INFORMATIVE NOTE”.*

***Note:** The 2010 California Plumbing Code references a higher acceptable flow rate for 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 @ 60psi as defined in Table 4.303.2 below. Faucets must also comply with the low-lead requirements of AB 1953 as summarized in the “INFORMATIVE NOTE”.*

***Note:** The 2010 California Plumbing Code references a higher acceptable flow rate for kitchen faucets.*

- 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) 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](http://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.*

**TABLE 4.303.2  
FIXTURE FLOW RATES**

<b>FIXTURE TYPE</b>	<b>FLOW-RATE</b>	<b>MAXIMUM FLOW RATE AT ≥ 20 PERCENT REDUCTION</b>
Showerheads	2.5 gpm @ 80 psi	2 gpm @ 80 psi
Lavatory faucets residential	2.2 gpm @ 60 psi	1.5 gpm @ 60 psi <sup>2</sup>
Kitchen faucets	2.2 gpm @ 60 psi	1.8 gpm @ 60 psi
Gravity tank type water closets	1.6 gallons/flush	1.28 gallons/flush <sup>1</sup>
Flushometer tank water closets	1.6 gallons/flush	1.28 gallons/flush <sup>1</sup>
Flushometer valve Water Closets	1.6 gallons/flush	1.28 gallons/flush <sup>1</sup>
Electromechanical hydraulic water closets	1.6 gallons/flush	1.28 gallons/flush <sup>1</sup>
Urinals	1.0 gallons/flush	.5 gallons/flush

<sup>1</sup> 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 A112.19.233.2. **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.

<sup>2</sup> Lavatory Faucets shall not have a flow rate less than 0.8 gpm at 20 psi.

**PERFORMANCE METHOD DISCUSSION:** A calculation demonstrating a 20% 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 BASELINE<sup>1</sup>**

<b>FIXTURE TYPE</b>	<b>FLOW-RATE<sup>2</sup></b>	<b>DURATION</b>	<b>DAILY USES</b>	<b>OCCUPANTS<sup>3</sup></b>
Showerheads residential	2.5 gpm @ 80 psi	8 min.	1	
Lavatory faucets residential	2.2 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 female	
Flushometer tank water closets	1.6 gallons/flush	1 flush	1 male <sup>4</sup> 3 female	
Flushometer valve water closets	1.6 gallons/flush	1 flush	1 male <sup>4</sup> 3 female	
Electromechanical hydraulic water closets	1.6 gallons/flush	1 flush	1 male <sup>4</sup> 3 female	
Urinals	1.0 gallons/flush	1 flush	2 male	

- <sup>1</sup> Use Worksheet WS-1 to calculate baseline water use.
- <sup>2</sup> The Flow-rate is from the CEC Appliance Efficiency Standards, Title 20 California Code of Regulations; where a conflict occurs, the CEC standards shall apply.
- <sup>3</sup> 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.
- <sup>4</sup> The daily use number shall be increased to three if urinals are not installed in the room.

**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 Standards in Title 20. For implementation purposes, HCD provided a prescriptive 20 percent reduction in the flow rate of each fixture based on requirements in the California Appliance Efficiency Standards in Title 20 and a performance-based calculation method. With the 2010 CALGreen Code, 20 percent water reduction for indoor water use is mandatory as of July 1, 2011. The 2010 CALGreen Code also permits indoor water use reduction in excess of the 20 percent.

The following worksheets are provided in the 2010 CALGreen Code, Chapter 8, and are reproduced here for reference. These worksheets are used to calculate a water usage baseline and a 20% reduction of water use based on this baseline. Two sets of sample calculations follow the worksheets.

**WORKSHEET (WS-1)  
BASELINE WATER USE**

BASELINE WATER USE CALCULATION TABLE								
Fixture Type	Flow-rate (gpm)		Duration		Daily uses		Occupants <sup>3,4</sup>	Gallons per day
Showerheads	2.5	X	5 min.	X	1	X		=
Showerheads Residential	2.5	X	8 min.	X	1	X		=
Lavatory Faucets Residential	2.2	X	.25 min.	X	3	X		=
Kitchen Faucets	2.2	X	4 min.	X	1	X		=
Replacement Aerators	2.2	X		X		X		=
Wash Fountains	2.2	X		X		X		=
Metering Faucets	0.25	X	.25 min.	X	3	X		=
Metering Faucets for Wash Fountains	2.2	X	.25 min.	X		X		=
Gravity tank type Water Closets	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=
Flushometer Tank Water Closets	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=
Flushometer Valve Water Closets	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=
Electromechanical Hydraulic Water Closets	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=
Urinals	1.0	X	1 flush	X	2 male	X		=

- <sup>1</sup> The daily use number shall be increased to three if urinals are not installed in the room.
- <sup>2</sup> The Flow-rate is from the CEC Appliance Efficiency Standards, Title 20 California Code of Regulations; where a conflict occurs, the CEC standards shall apply.
- <sup>3</sup> 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.
- <sup>4</sup> For non-residential occupancies, refer to Table A, Chapter 4, 2007 California Plumbing Code, for occupant load factors.

**WORKSHEET (WS-2)  
20% REDUCTION WATER USE**

20% REDUCTION WATER USE CALCULATION TABLE								
Fixture Type	Flow-rate (gpm) <sup>2</sup>		Duration		Daily uses		Occupants <sup>3,4</sup>	Gallons per day
Showerheads		X	5 min.	X	1	X		=
Showerheads Residential		X	8 min.	X	1	X		=
Lavatory Faucets Residential		X	25 min.	X	3	X		=
Kitchen Faucets		X	4 min.	X	1	X		=
Replacement Aerators		X		X		X		=
Wash Fountains		X		X		X		=
Metering Faucets		X	.25 min.	X	3	X		=
Metering Faucets for Wash Fountains		X	.25 min.	X		X		=
Gravity tank type Water Closets		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=
HET <sup>5</sup> High Efficiency Toilet	1.28	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=
Flushometer Tank Water Closets		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=
Flushometer Valve Water Closets		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=
Electromechanical Hydraulic Water Closets		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=
Urinals		X	1 flush	X	2 male	X		=
Urinals Non-Water Supplied	0.0	X	1 flush	X	2 male	X		=

- <sup>1</sup> The daily use number shall be increased to three if urinals are not installed in the room.
- <sup>2</sup> The Flow-rate is from the CEC Appliance Efficiency Standards, Title 20 California Code of Regulations; where a conflict occurs, the CEC standards shall apply.
- <sup>3</sup> 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.
- <sup>4</sup> For non-residential occupancies, refer to Table A, Chapter 4, 2007 California Plumbing Code, for occupant load factors.
- <sup>5</sup> 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 A112.19.233.2.  
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.

## 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 <sup>3,4</sup>		Gallons per day
Showerheads	2.5	X	5 min.	X	1	X		=	N/A
Showerheads Residential	2.5	X	8 min.	X	1	X	<b>5</b>	=	<b>100</b>
Lavatory Faucets Residential	2.2	X	.25 min.	X	3	X	<b>5</b>	=	<b>8.25</b>
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	1 male <sup>1</sup> 3 female	X	<b>5</b>	=	<b>48</b>
Flushometer Tank Water Closets	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	N/A
Flushometer Valve Water Closets	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	N/A
Electromechanical Hydraulic Water Closets	1.6	X	1 flush	X	1 male <sup>1</sup> 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:**

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

Lavatory Faucets = 2.2 gpm x 0.25 min x 3 (daily uses) x 5 (occupants) = 8.25 Gallons per day

Showerheads = 2.5 gpm x 8 min x 1 (daily use) x 5 (occupants) = 100 Gallons per day

**Total Daily Baseline Water Use = 156.25 Gallons per day**

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

20% REDUCTION WATER USE CALCULATION TABLE									
Fixture Type	Flow-rate (gpm) <sup>2</sup>		Duration		Daily uses		Occupants <sup>3,4</sup>		Gallons per day
Showerheads		X	5 min.	X	1	X		=	N/A
<b>Showerheads Residential</b>	<b>2.0</b>	X	8 min.	X	1	X	<b>5</b>	=	<b>80</b>
<b>Lavatory Faucets Residential</b>	<b>1.5</b>	X	25 min.	X	3	X	<b>5</b>	=	<b>5.63</b>
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
<b>Gravity tank type Water Closets</b>	<b>1.28</b>	X	1 flush	X	1 male <sup>1</sup> 3 female	X	<b>5</b>	=	<b>38.4</b>
HET <sup>5</sup> High Efficiency Toilet	1.28	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	N/A
Flushometer Tank Water Closets		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	N/A
Flushometer Valve Water Closets		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	N/A
Electromechanical Hydraulic Water Closets		X	1 flush	X	1 male <sup>1</sup> 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% Reduction**

*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*

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

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

**Total Daily Proposed Water Use = 124.03 Gallons per day ≤ 125 Gallons per day (20% 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 <sup>3,4</sup>		Gallons per day
Showerheads	2.5	X	5 min.	X	1	X		=	N/A
Showerheads Residential	2.5	X	8 min.	X	1	X	<b>4</b>	=	<b>80</b>
Lavatory Faucets Residential	2.2	X	.25 min.	X	3	X	<b>4</b>	=	<b>6.6</b>
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	1 male <sup>1</sup> 3 female	X	<b>4</b>	=	<b>38.4</b>
Flushometer Tank Water Closets	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	N/A
Flushometer Valve Water Closets	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	N/A
Electromechanical Hydraulic Water Closets	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	N/A
Urinals	1.0	X	1 flush	X	2 male	X		=	N/A

#### Example Baseline Calculation:

Water Closets = 1.6 gpm x 1gal/flush x 6 (daily uses) x 4 (occupants) = 38.4 Gallons per day

Urinals = Not included in calculation

Lavatory Faucets = 2.2 gpm x 0.25 min x 3 (daily uses) x 4 (occupants) = 6.6 Gallons per day

Showerheads = 2.5 gpm x 8 min x 1 (daily use) x 4 (occupants) = 80 Gallons per day

**Total Daily Baseline Water Use = 125 Gallons per day**

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

20% REDUCTION WATER USE CALCULATION TABLE									
Fixture Type	Flow-rate (gpm) <sup>2</sup>		Duration		Daily uses		Occupants <sup>3,4</sup>		Gallons per day
Showerheads		X	5 min.	X	1	X		=	N/A
Showerheads Residential	<b>2.0</b>	X	8 min.	X	1	X	<b>4</b>	=	<b>64</b>
Lavatory Faucets Residential	<b>1.5</b>	X	25 min.	X	3	X	<b>4</b>	=	<b>4.5</b>
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	<b>1.28</b>	X	1 flush	X	1 male <sup>1</sup> 3 female	X	<b>4</b>	=	<b>30.72</b>
HET <sup>5</sup> High Efficiency Toilet	1.28	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	N/A
Flushometer Tank Water Closets		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	N/A
Flushometer Valve Water Closets		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	N/A
Electromechanical Hydraulic Water Closets		X	1 flush	X	1 male <sup>1</sup> 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% Reduction**

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

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

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

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

**4.303.2 Multiple showerheads serving one shower.** When single shower fixtures are served by more than one showerhead, the combined flow rate of all the showerheads shall not exceed the maximum flow rates specified in the 20 percent 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 calculation method specified in Section 4.303.1, Item 2, is 2.5 gpm @ 80 psi.

### **COMMENTARY**

*The maximum flow rate established in the 20% reduction table covers all applications where water sprays from multiple sources at one time. Sources include but are not limited to showerheads, handshowers and bodysprayers.*

*This section also clarifies that no showerhead shall exceed a maximum flow of 2.5 gpm @ 80 psi.*

**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 fixtures 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/pubs/showerheads.html>

## 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 at <http://www.irrigation.org/SWAT/Industry/ia-tested.asp>.

### 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, foundation damage, mold, premature death of plants and runoff.*

#### 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.*
- *Acceptable control systems automatically delay watering due to rain.*
- *Systems may be communication-based, based on plant watering needs, or soil moisture.*

#### Background:

*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 base devices that allow irrigation to occur 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 system monitor soil moisture conditions onsite with one or multiple moisture sensors. It is key to maintain an appropriate level of moisture for each plant species zone. Wilting will occur if moisture level within the soil depletes 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.*

#### 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 with one full rate flush, then dividing by 3.  $(R+R+F)/3 =$  Average flow. This flow must be 1.28 gallons per flush or less to meet the reduced flow requirements.**

**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.**

**DIVISION 4.4 – MATERIAL CONSERVATION AND RESOURCE EFFICIENCY**

**SECTION 4.406 ENHANCED DURABILITY AND REDUCED MAINTENANCE**

**4.406.1 Joints and openings.** Openings in the building envelope separating conditioned space from unconditioned space needed to accommodate gas, plumbing, electrical lines and other necessary penetrations must be sealed in compliance with the *California Energy Code*.

**Exception:** 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 addresses the importance of sealing or providing barriers in openings to keep out rodents and preventing damage from rodents. This section also addresses an issue not addressed by the California Energy Code and provides acceptable materials for sealing.*

*Background (on Exception):*

*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.*

*It is also necessary for other penetrations, voids, joints and openings to be sealed to avoid the passage of rodents. Openings include, but are not limited to, cuts in bottom or top plates, exterior wall openings around plumbing pipes, flues, exhaust vents, and HVAC conduits. A cement mortar or similar method approved by the enforcing agent and capable of withstanding rodent penetration is required.*

**SECTION 4.408  
CONSTRUCTION WASTE REDUCTION, DISPOSAL AND RECYCLING**

**4.408.1 Construction waste reduction of at least 50 percent.** Recycle and/or salvage for reuse a minimum of 50 percent of the non-hazardous construction and demolition debris, or meet a local construction and demolition waste management ordinance, whichever is more stringent.

**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.

**COMMENTARY**

Purpose:

*These provisions 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. This section requires 50 percent of construction waste to be diverted from the landfill with options for calculating the reduction by weight or volume, but not both. This section also provides for alternate waste reduction methods.*

Background:

*Where a local jurisdiction has not adopted a minimum waste reduction requirement the 50% reduction established by Section 4.408.1 will apply. Section 4.408.1 also provides an exemption for alternate waste reduction methods developed in consultation with local agencies. This provision is to be used when waste facilities do not exist or are not reasonably close to the jobsite. The determination of what is "reasonably close" may vary according to the location of the jobsite and the nearest waste facility; and whether the type of waste in question is accepted at the facility. If utilizing the closest facility would result more use of more resources and energy than saved, the net savings to energy and resources may not be effective. In addition, the services may be prohibitively expensive or not available in certain areas.*

*Many local agencies will allow the use of a variety of public and private sector recycling options. Local authorities should be contacted during the preconstruction phase to obtain a list of approved haulers. Any successful recycling program will involve upfront due diligence and planning and the consideration of several factors. Many of these factors include, but are not limited to:*

- *Local authority approved hauler*
- *Location of site to recycler in carefully considered*
- *Method of recycling: onsite sorting or commingling*
- *Recycler has a good track record*
- *Clearly marked bins*
- *Bins are routinely checked for material accuracy*
- *Subcontractors are on board*
- *Tags are collected and recorded*

*Definitions for "Hazardous waste," "Recycle and Recycling," and "Re-use" are located in Chapter 2, Section 202, if needed for reference.*

*This section also supports legal requirements for local jurisdictions to divert 50 percent of solid waste through source reduction, recycling, and composting activities as required in the Public Resource Code Section 41780.*

**4.408.2 Construction waste management plan.** Where a local jurisdiction does not have a construction and demolition waste management ordinance, a construction waste management plan shall be submitted for approval to the enforcing agency that:

1. Identifies the materials to be diverted from disposal by recycling, reuse on the project or salvage for future use or sale.
2. Specifies if materials will be sorted on-site or mixed for transportation to a diversion facility.
3. Identifies the diversion facility where the material collected will be taken.
4. Identifies construction methods employed to reduce the amount of waste generated.
5. Specifies that the amount of materials diverted shall be calculated by weight or volume, but not by both.

**4.408.2.1 Documentation.** Documentation shall be provided to the enforcing agency which demonstrates compliance with Section 4.408.2, Items 1 through 5. The waste management plan shall be updated as necessary and shall be accessible during construction for examination by the enforcing agency.

## **COMMENTARY**

### *Purpose:*

*This section addresses use of a construction waste management plan intended to save raw materials and preserve landfill space, especially where local regulations do not apply.*

### *Examples of Acceptable Methods of Implementation and/or Compliance:*

1. *Comply with local waste management ordinance.*
2. *Develop a construction waste management plan and submit for approval to the local enforcing agency.*
  - *Provide evidence of compliance such as worksheets or documentation from waste management facility.*

*Supporting sample plans and worksheets are included in CALGreen Chapter 8 and in this document to reduce time and costs for completing CWM Plans. There may be items not listed within the worksheet that will be required to be added by the representative preparing the construction waste management plan. Please contact the local authority early to discuss any items that may be unclear.*

*Sample Forms and Templates:*

- 1) Construction Waste Management (CWM) Plan*
- 2) Construction Waste Management (CWM) Worksheet*
- 3) Construction Waste Management (CWM) Worksheet (Volume Method)\**
- 4) Construction Waste Management (CWM) Worksheet (Weight Method)\**
- 5) Construction Waste Management (CWM) Worksheet (Summary)\**
- 6) Construction Waste Management (CWM) Acknowledgement*

*\*Not part of the 2010 CALGreen Code – these are simplified optional forms.*

*Background:*

*The construction waste management (CWM) plan will provide a direct and clearly understood route to the successful diversion target of waste from landfills. With proper planning and on-site posting employees and subcontractors are further able to understand and participate in the process.*

*The CWM plan should be used to assist in identifying materials to be recycled and the method of their disposal. The CWM plan should also provide documentation and verification that the established diversion goals requirements have been satisfied.*

**4.408.2.2 Isolated jobsites.** 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.

**Notes:**

1. Sample forms found in Chapter 8 may be used to assist in documenting compliance with the waste management plan.
2. Mixed construction and demolition debris (C&D) processors can be located at <http://www.ciwmb.ca.gov/ConDemo>.

## **COMMENTARY**

*Purpose:*

*This provision provides an exception from Section 408, as approved by the enforcing agency, for job sites where construction and demolition waste processing facilities are not readily available.*

*Examples of Acceptable Methods of Implementation and/or Compliance:*

- If your project is located outside the haul boundaries of a diversion facility contact your local authority as soon as possible for resolution.*
- It is recommended that the owner/authorized agent research and discuss with the enforcing agency all logistical requirements early in the submittal process.*

## CONSTRUCTION WASTE MANAGEMENT (CWM) PLAN

**Note:** This sample form may be used to assist in documenting compliance with the waste management plan.

**Project Name:** \_\_\_\_\_  
**Job #:** \_\_\_\_\_  
**Project Manager:** \_\_\_\_\_  
**Waste Hauling Company:** \_\_\_\_\_  
**Contact Name:** \_\_\_\_\_

All Subcontractors shall comply with the project's Construction Waste Management Plan.  
All Subcontractor foremen shall sign the CWM Plan Acknowledgement Sheet.

Subcontractors who fail to comply with the Waste Management Plan will be subject to backcharges or withholding of payment, as deemed appropriate. For instance, Subcontractors who contaminate debris boxes that have been designated for a single material type will be subject to backcharge or withheld payment, as deemed appropriate.

1. The project's overall rate of waste diversion will be \_\_\_\_ %.
2. This project shall generate the least amount of waste possible by planning and ordering carefully, following all proper storage and handling procedures to reduce broken and damaged materials and reusing materials whenever possible. The majority of the waste that is generated on this jobsite will be diverted from the landfill and recycled for other use.
3. Spreadsheet 1, enclosed, identifies the waste materials that will be generated on this project, the diversion strategy for each waste type and the anticipated diversion rate.
4. Waste prevention and recycling activities will be discussed at the beginning of weekly subcontractor meetings. As each new subcontractor comes on-site, the WMP Coordinator will present him/her with a copy of the CWM Plan and provide a tour of the jobsite to identify materials to be salvaged and the procedures for handling jobsite debris. All Subcontractor foremen will acknowledge in writing that they have read and will abide by the CWM Plan. Subcontractor Acknowledgement Sheet enclosed. The CWM Plan will be posted at the jobsite trailer.
5. Salvage: Excess materials that cannot be used in the project, nor returned to the vendor, will be offered to site workers, the owner, or donated to charity if feasible.
6. [HAULING COMPANY] will provide a commingled drop box at the jobsite for most of the construction waste. These commingled drop boxes will be taken to [Sorting Facility Name and Location]. The average diversion rate for commingled waste will be \_\_\_\_%. As site conditions permit, additional drop boxes will be used for particular phases of construction (e.g. concrete and wood waste) to ensure the highest waste diversion rate possible.
7. In the event that the waste diversion rate achievable via the strategy described in (6) above, is projected to be lower than what is required, then a strategy of source-separated waste diversion and/or waste stream reduction will be implemented. Source separated waste refers to jobsite waste that is not commingled, but is instead allocated to a debris box designated for a single material type, such as clean wood or metal.

### Notes:

1. Waste stream reduction refers to efforts taken by the builder to reduce the amount of waste generated by the project to below four (4) pounds per square foot of building area.
2. When using waste stream reduction measures, the gross weight of the product is subtracted from a base weight of four (4) pounds per square foot of building area. This reduction is considered additional diversion and can be used in the waste reduction percentage calculations.
8. [HAULING COMPANY] will track and calculate the quantity (in tons) of all waste leaving the project and calculate the waste diversion rate for the project. [HAULING COMPANY] will provide Project Manager with an updated monthly report on gross weight hauled and the waste diversion rate being achieved on the project. [HAULING COMPANY's] monthly report will track separately the gross weights and diversion rates for commingled debris and for each source-separated waste stream leaving the project. In the event that [HAULING COMPANY] does not service any or all of the debris boxes on the project, the [HAULING COMPANY] will work with the responsible parties to track the material type and weight (in tons) in such debris boxes in order to determine waste diversion rates for these materials.
9. In the event that Subcontractors furnish their own debris boxes as part of their scope of work, such Subcontractors shall not be excluded from complying with the CWM Plan and will provide [HAULING COMPANY] weight and waste diversion data for their debris boxes.
10. In the event that site use constraints (such as limited space) restrict the number of debris boxes that can be used for collection of designated waste the project Superintendent will, as deemed appropriate, allocate specific areas onsite where individual material types are to be consolidated. These collection points are not to be contaminated with non-designated waste types.
11. Debris from jobsite office and meeting rooms will be collected by [DISPOSAL SERVICE COMPANY]. [DISPOSAL SERVICE COMPANY] will, at a minimum, recycle office paper, plastic, metal and cardboard.

### CONSTRUCTION WASTE MANAGEMENT (CWM) WORKSHEET

Note: This sample form may be used to assist in documenting compliance with the waste management plan.

<b>Project Name:</b>			
<b>Job Number:</b>			
<b>Project Manager:</b>			
<b>Waste Hauling Company:</b>			
<b>Construction Waste Management (CWM) Plan</b>			
	<b>Diversion Method:</b>		
<b>Waste Material Type</b>	<b>Commingled and Sorted Off-site</b>	<b>Source Separated Onsite</b>	<b>Projected Diversion Rate</b>
Asphalt			
Concrete			
Shotcrete			
Metals			
Wood			
Rigid Insulation			
Fiberglass Insulation			
Acoustic Ceiling Tile			
Gypsum Drywall			
Carpet/Carpet Pad			
Plastic Pipe			
Plastic Buckets			
Plastic			
Hardiplank Siding and Boards			
Glass			
Cardboard			
Pallets			
Job office trash, paper, glass & plastic bottles, cans, plastic			
Alkaline and rechargeable, batteries, toner cartridges, and electronic devices			
Other:			

## Construction Waste Management Worksheet (Volume Method)

Project Name:		Date:		Page		of
Project Location:						
Project Manager:						
Waste Hauler:						
Completed By:						
Signature:						

Waste Material Type	A B C D				Notes:
	Recycled	Reused	Diverted	Non-Recycled	
Insert cubic foot or cubic yard totals into proper category below					
Asphalt	+	=			
Asphalt Shingles	+	=			
Brick (broken)	+	=			
Cardboard	+	=			
Carpet/Carpet Pad	+	=			
Concrete	+	=			
Gypsum Board (Drywall)	+	=			
Masonry	+	=			
Metals	+	=			
Pallets	+	=			
Plastic	+	=			
Wood (engineered)	+	=			
Wood (solid sawn)	+	=			
Office Waste	+	=			
Other	+	=			
Other	+	=			
Other Non-Recyclable	+	=			
<b>Totals:</b>	+	=			

**Step 1** - Insert volume totals into Columns A, B, and D where appropriate.

**Step 2** - Add column A to Column B and insert total into Column C for total diverted volume.

**Step 3** - Add each Column down and enter totals in the boxes provided.

If multiple worksheets are used, transfer Column totals from each worksheet to the summary sheet.

If Column C is larger than Column D (on the summary sheet) Compliance with the 50% waste reduction requirement is achieved.

For additional instructions and information please see reverse.

**Instructions:**

- Choose which method of tracking to be used throughout the project. Either the weight method or the volume method can be used.
- You may need to use more than one worksheet to track all of your materials. When more than one worksheet is used, and upon completion of the project, transfer the data to the summary sheet.
- When performing demolition of an existing building, prior to the new construction, fill in any materials selected for reuse, such as doors or windows, in the reused column (Column B). For example, you can write doors or windows into the (Waste Material Type) column, on one of the “Other” lines, and then put the weight or volume of the material into (Column B).
- Once construction has commenced and materials are ready to be diverted, segregate materials whenever possible. Materials which are recycled, such as lumber, will be entered into the “Waste Material Type” under Wood, and then put the weight or volume of the material into the recycled (Column A). If some of your new construction material can be reused, write the appropriate information into Reused (Column B). Total the Recycled and Reused (Columns A + B) into the Diverted (Column C). Any material which does not get Reused or Recycled will go into the Non-Recycled (Column D).
- Total all of the columns from top to bottom of the Tracking Worksheet; if the Diverted Column is larger than the Non-Recycled Column you have met the 50% reduction requirement.

**Examples of weights and volumes of some typical construction waste materials\***

Material	Range of pounds per cubic yard	Typical pounds per cubic yard	Typical cubic yards per ton
Asphalt roofing material	250-460	360	5.5
Asphalt - paving	1300-2200	1750	1.1
Cardboard	70-135	85	23.5
Concrete	1300-2200	1750	1.1
Gypsum Board (Drywall)	315-470	400	5
Metals	220-1940	540	3.7
Wood	200-540	450	4.4

\* Source: Sacramento Regional Solid Waste

**Standard Conversions: 1 cubic yard (3’x3’x3’) equals 27 cubic feet. 1 ton equals 2000 pounds**

## Construction Waste Management Worksheet (Weight Method)

Project Name:		Date:		Page of
Project Location:				
Project Manager:				
Waste Hauler:				
		Completed By:		
		Signature:		

Waste Material Type	Insert weight totals into proper category below				
	A Recycled	B Reused	C Diverted	D Non-Recycled	
Asphalt	+	=			
Asphalt Shingles	+	=			
Brick (broken)	+	=			
Cardboard	+	=			
Carpet/Carpet Pad	+	=			
Concrete	+	=			
Gypsum Board (Drywall)	+	=			
Masonry	+	=			
Metals	+	=			
Pallets	+	=			
Plastic	+	=			
Wood (engineered)	+	=			
Wood (solid sawn)	+	=			
Office Waste	+	=			
Other	+	=			
Other	+	=			
Other Non-Recyclable	+	=			
<b>Totals:</b>	+	=			

Notes:

**Step 1** - Insert volume totals into Columns A, B, and D where appropriate.  
**Step 2** - Add column A to Column B and insert total into Column C for total diverted volume.  
**Step 3** - Add each Column down and enter totals in the boxes provided.  
 If multiple worksheets are used, transfer Column totals from each worksheet to the summary sheet.  
 If Column C is larger than Column D (on the summary sheet) Compliance with the 50% waste reduction requirement is achieved.  
 For additional instructions and information please see reverse.

**Instructions:**

- Choose which method of tracking to be used throughout the project. Either the weight method or the volume method can be used.
- You may need to use more than one worksheet to track all of your materials. When more than one worksheet is used, and upon completion of the project, transfer the data to the summary sheet.
- When performing demolition of an existing building, prior to the new construction, fill in any materials selected for reuse, such as doors or windows, in the reused column (Column B). For example, you can write doors or windows into the (Waste Material Type) column, on one of the “Other” lines, and then put the weight or volume of the material into (Column B).
- Once construction has commenced and materials are ready to be diverted, segregate materials whenever possible. Materials which are recycled, such as lumber, will be entered into the “Waste Material Type” under Wood, and then put the weight or volume of the material into the recycled (Column A). If some of your new construction material can be reused, write the appropriate information into Reused (Column B). Total the Recycled and Reused (Columns A + B) into the Diverted (Column C). Any material which does not get Reused or Recycled will go into the Non-Recycled (Column D).
- Total all of the columns from top to bottom of the Tracking Worksheet; if the Diverted Column is larger than the Non-Recycled Column you have met the 50% reduction requirement.

**Examples of weights and volumes of some typical construction waste materials\***

Material	Range of pounds per cubic yard	Typical pounds per cubic yard	Typical cubic yards per ton
Asphalt roofing material	250-460	360	5.5
Asphalt - paving	1300-2200	1750	1.1
Cardboard	70-135	85	23.5
Concrete	1300-2200	1750	1.1
Gypsum Board (Drywall)	315-470	400	5
Metals	220-1940	540	3.7
Wood	200-540	450	4.4

\* Source: Sacramento Regional Solid Waste

**Standard Conversions: 1 cubic yard (3’x3’x3’) equals 27 cubic feet. 1 ton equals 2000 pounds**

## Construction Waste Management Summary Worksheet

<b>Project Name:</b>		<b>Date:</b>
<b>Project Location:</b>		
<b>Project Manager:</b>		
<b>Waste Hauler:</b>		

Worksheets by page #	C	D	<u>Compliance Method</u> <input type="checkbox"/> Volume <input type="checkbox"/> Weight
	Insert Totals Below		
	Diverted	Non-Recycled	
Worksheet 1			<b>Notes:</b>
Worksheet 2			
Worksheet 3			
<b>Grand Totals:</b>			

**Step 1** - Insert totals from worksheets in Column C or D.  
**Step 2** - Add each Column down and enter grand totals in the boxes provided.  
 If Column C is larger than Column D Compliance with the 50% waste reduction requirement is achieved.

**Certification:**  
 The signature below represents that the information provided on this form is true and correct and certifies that I have tracked construction waste during the course of this project and that a minimum of 50% of the total waste has been diverted for either reuse or recycling.

Company Name: (general contractor, subcontractor, or homeowner)

Responsible Person's Name:	Responsible Person's Signature:
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CSLB License:	Date Signed:	Position with Company or Title:
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**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:**

*As construction practices become more sophisticated, a certain level of knowledge is required to maintain building systems and equipment. This section provides a minimum list of items to be included in a comprehensive homeowner manual. The manual is also intended to provide information on the home for homeowners who are not the builders or first occupants of the home.*

Examples of Acceptable Methods of Implementation and/or Compliance:

- *If a builder/developer does not currently have a manual then a single manual should be created, placed in the home at the time of final inspection, and provided to the purchaser. It should be noted on the manual cover that "Manual shall remain with the building for the life cycle of the structure."*
- *Media should be approved by the enforcing agency.*
- *Options for developing a home manual include use of web-based programs or templates that may be available for purchase or may be free share.*
- *HCD is developing an optional template or standard format for the manual.*
- *It is recommended that homeowners update or supplement the manual to keep information accurate.*

Background:

*Even the most efficient home can operate poorly when uninformed users are responsible for their continued maintenance and operation. Many homeowners continually fail to complete even the most minor maintenance tasks such as changing air filters or operating exhaust fans to prevent excess moisture in bathrooms. An operation and maintenance manual is a one-stop location for maintenance and operational information and will promote the continued health of the complete building system. The manual could also be used as a record for compliance if additional information is included. It is recommended that the manual remain with the building for the "life cycle" of the structure.*

*The manual will provide technical, operational, and educational resources so owners and occupants can make well informed decisions. Providing owner's information on green features, equipment operation, warranties, special inspection reports, sub-contractor names and phone numbers, utility information, landscape and irrigation plans, along with water and energy conservation ideas. Additionally, the manual will provide residence-related information such as transportation options, recycle opportunities, and energy incentive programs. This will also help the owners and occupants make environmentally conscientious decisions.*

**Frequently Asked Questions**

**Q: Section 4.406.1 requires the sealing of joints and openings in compliance with the California Energy Code. The exception in Section 4.406.1 applies to openings at exterior walls. Does the exception combine all openings through exterior walls or just the openings in the top and bottom plates?**

**A: The exception applies to all openings not covered by the California Energy Code unless specifically allowed, such as vents. The exception requires the sealing of openings to prevent entry of rodents and the resulting damage.**

## Frequently Asked Questions *(continued)*

**Q:** *The building department in my jurisdiction does not allow the re-use of previously used materials. Is re-use 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 re-used unless approved by the building official. This means that some materials cannot be re-used 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 re-used materials or products must comply with current building standards requirements or be an accepted alternate method or material.

### **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 US EPA Phase II emission limits where applicable. Woodstoves, pelletstoves 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 and is consistent with current Title 24, Part 6, California Energy Code.*

**Examples of Acceptable Methods of Implementation and/or Compliance:**

- *Install a direct-vent gas fireplace*
- *Install a pellet or wood stove which meets US EPA Phase II emission standards*
- *Comply with local ordinance*

**Background:**

*A direct-vent fireplace pulls outside air in to assist in combustion and then directly vents byproducts (fumes) outside. Contaminated air and any unused fuel cannot escape the sealed fireplace and therefore cannot contaminate quality of the indoor air.*

*Additional benefits of the fireplaces include energy efficiency. As a self-contained unit which requires no household air the direct-vent fireplace does not experience drafts or heat loss. Many sealed combustion direct-vent fireplaces can be found that operate near 90 percent efficiency and, in some cases, provide up to 40,000 BTUs.*

## SECTION 4.504 POLLUTANT CONTROL

**4.504.1 Covering of duct openings and protection of mechanical equipment during construction.** At the time of rough installation or during storage on the construction site and until final startup of the heating and cooling 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 dust or debris which may collect in the system.

### COMMENTARY

#### Purpose:

*This section provides protection for duct openings, permanent mechanical equipment and other components which are often used for conditioning purposes during construction. Protection would result in reduced recirculation of construction dust, debris and other airborne contaminants upon occupancy and increased 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 of 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.*
- *If the system is operated during construction, then it is recommended that a high efficiency filter such as a MERV 6 or 8 be used throughout the construction process. Prior to 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 natural 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 pollution 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 one 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.

**Note:** Title 17 may be found at <http://ccr.oal.ca.gov/>

## COMMENTARY

### Purpose:

*This section adopts 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 air quality.*

### Background:

*Volatile organic compounds (VOCs) 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 South Coast Air Quality Management District's Rule 1168:*

*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<sup>1, 2</sup>**

**Less Water and Less Exempt Compounds in Grams per Liter**

<b>ARCHITECTURAL APPLICATIONS</b>	<b>CURRENT VOC LIMIT</b>
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
<b>SPECIALTY APPLICATIONS</b>	
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
<b>SUBSTRATE SPECIFIC APPLICATIONS</b>	
Metal to metal	30
Plastic foams	50
Porous material (except wood)	50
Wood	30
Fiberglass	80

<sup>1</sup> If an adhesive is used to bond dissimilar substrates together, the adhesive with the highest VOC content should be allowed.

<sup>2</sup> For additional information regarding methods to measure the VOC content specified in this table, see South Coast Air Quality Management District Rule 1168, <http://www.arb.ca.gov/DRDB/SC/CURHTML/R1168.PDF>.

**TABLE 4.504.2  
SEALANT VOC LIMIT**

**Less Water and Less Exempt Compounds in Grams per Liter**

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

**TABLE 4.504.3  
VOC CONTENT LIMITS FOR ARCHITECTURAL COATINGS<sup>2, 3</sup>**

**Grams of VOC Per Liter of Coating,  
Less Water and Less Exempt Compounds**

<b>COATING CATEGORY</b>	<b>EFFECTIVE 1/1/2010</b>	<b>EFFECTIVE 1/1/2012</b>
Flat coatings	50	
Nonflat coatings	100	
Nonflat - high gloss coatings	150	
<b>Specialty coatings</b>		
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 <sup>1</sup>	120	
Magnesite cement coatings	450	
Mastic texture coatings	100	
Metallic pigmented coatings	500	
Multi-color coatings	250	
Pre-treatment 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	

<sup>1</sup> Grams of VOC per liter of coating, including water and including exempt compounds

<sup>2</sup> The specified limits remain in effect unless revised limits are listed in subsequent columns in the table.

<sup>3</sup> 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 at [http://www.arb.ca.gov/coatings/arch/approved\\_2007\\_scm.pdf](http://www.arb.ca.gov/coatings/arch/approved_2007_scm.pdf).

**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.

**Notes:**

1. Title 17 may be found at <http://ccr.oal.ca.gov/>.
2. See Bay Area Air Quality Management District Regulation 8 Rule 49 at <http://www.arb.ca.gov/DRDB/BA/CURHTML/R8-49.HTM>.

## **COMMENTARY**

**Purpose:**

*Section 4.504.2.2 adopts the California Air Resources Board's (ARB's) VOC limits for architectural paints and coatings. Compliance with ARB VOC limits or more restrictive local VOC limits, will help improve indoor air quality. Section 4.504.2.2 provides standards for paints and coatings.*

**Background:**

*The requirements of Section 4.504.2.2 only apply to the use of paints and coatings as an indoor application 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.*

**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 Practice for the testing of VOCs (Specification 01350)
3. NSF/ANSI 140 at the Gold level
4. Scientific Certifications Systems Indoor Advantage™ Gold

**Notes:**

1. For Green Label Plus, see <http://www.carpet-rug.com/>.
2. For NSF/ANSI 140, see <http://www.carpet-rug.org/carpet-and-rug-industry/sustainability/sustainable-carpetlist.cfm>.
3. For Indoor Advantage™ Gold, see <http://www.scscertified.com/iaq/indooradvantage.htm>.
4. Scientific Certifications Systems Indoor Advantage™  
<http://www.scscertified.com/iaq/indooradvantage.htm>.

**4.504.3.1 Carpet cushion.** All carpet cushion installed in the building interior shall meet the requirements of the Carpet and Rug Institute 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 4.504.2.1. 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.*

**Background:**

*All carpet systems, cushion, 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. This practice will help reduce indoor emission levels thereby improving the overall health of indoor 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, you may be able to access the needed information 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.*

<p><b>4.504.4 Resilient flooring systems.</b> 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) Low-emitting Materials List or certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.</p>
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## **COMMENTARY**

**Purpose:**

*This section adopts VOC limits for interior resilient flooring based on the CHPS Low-emitting Materials List or RFCI FloorScore program. Compliance with these VOC limits will help improve indoor air quality.*

**Background:**

*Resilient flooring is commonly used in kitchens, bathrooms, entryways, family rooms and slowly gaining traction for use in other areas. These systems are commonly made from materials such as cork, vinyl, linoleum and rubber providing a natural sturdiness, and springiness to the flooring system. Resilient flooring provides users a more comfortable standing surface due to its natural characteristics of “give” and “bounce back”. The ability for the material to be resistant to stains and microbial contamination make it a natural 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 VOC (formaldehyde) limits for specified composite wood products based on 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."*

**TABLE 4.504.5  
FORMALDEHYDE LIMITS<sup>1</sup>**

**Maximum formaldehyde emissions in parts per million.**

<b>PRODUCT</b>	<b>CURRENT LIMIT</b>	<b>JANUARY 1, 2012</b>	<b>JULY 1, 2012</b>
Hardwood plywood veneer core	0.05		
Hardwood plywood composite core	0.08		0.05
Particle board	0.09		
Medium density fiberboard	0.11		
Thin medium density fiberboard <sup>2</sup>	0.21	0.13	

<sup>1</sup> 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.

<sup>2</sup> Thin medium density fiberboard has a maximum thickness of 8 millimeters.

**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. 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.*
- *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.*
- *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 seizure, custody, control, transfer, analysis, and disposition of evidence, physical or electronic. Obtaining Chain of Custody certification assures the consumer that labeled products have been produced with wood or fiber sourced from a properly managed forest.*

## SECTION 4.505 INTERIOR MOISTURE CONTROL

**4.505.2 Concrete slab foundations.** Concrete slab foundations required to have a vapor retarder by *California Building Code*, CCR, Title 24, Part 2, Chapter 19, 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 barrier 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 (MVY), 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 CBC and CRC 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 barrier between the water wicked from the ground before it can be absorbed and transmitted through the concrete slab and foundation.*

*This section mandates the installation of a vapor retarder in all concrete slabs to achieve the capillary break. The break 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.*

**NOTE:** *A common mistake found in the application process is that the tape applied to the vapor retarder is not a vapor transmission barrier itself. Be sure to apply a moisture resistive tape to the vapor retarder.*

*CALGreen Section 4.505.2 specifically references concrete slab foundations required to have vapor retarders pursuant to the California Building Code. Since provisions of CALGreen will largely apply to low-rise residential buildings built according to the newly adopted California Residential Code, Section 4.505.2 should also apply to these structures.*

**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.

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.*

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% 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% 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**

**4.506.1 Bathroom exhaust fans.** Mechanical exhaust fans which exhaust directly from bathrooms 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 humidistat which shall be readily accessible.

Humidistat controls shall be capable of adjustment between a relative humidity range of 50 to 80 percent.

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

**COMMENTARY**

Purpose:

*This provision is intended to reduce moisture inside the residence. Clarifies that whole house ventilation systems can be used to comply with this section.*

Methods of Implementation and/or Compliance:

- *Install a whole house ventilation system.*
- *Install ENERGY STAR fans with humidistat control in each bathroom.*

Background:

**ENERGY STAR** states that, “qualified ventilation fans use **70%** 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.”

A **humidistat** is a sensor used to control various pieces of equipment meant to regulate humidity levels. Often used on ventilation systems to control fans and other equipment when the humidity level reaches unwanted levels. A humidistat can control an exhaust fan based on the moisture level in a room. The control mechanism allows the humidity setting to be typically adjusted from 20 to 80 percent relative humidity. Based on the pre-program or set level of humidity the humidistat can control the on/off function of the bathroom exhaust fan to regulate desired level.

#### SECTION 4.507 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.

#### 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 fan with an insulated cover.
- Use a fan with insulated duct connected to penetrations in the conditioned envelope.

**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 ACCA Manual J, ASHRAE handbooks or other equivalent design software or methods.
2. Duct systems are sized according to ACCA 29-D Manual D, ASHRAE handbooks or other equivalent design software or methods.
3. Select heating and cooling equipment according to ACCA 36-S Manual S 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](http://www.acca.org)

Background:

ASHRAE was formed by the merger of two societies, American Society of Heating and Ventilating Engineers (ASHVE), known after 1954 as American Society of Heating and Air-Conditioning Engineers (ASHAE) and the American Society of Refrigerating Engineers (ASRE). The two merged in 1959.

ASHRAE is an international organization of 51,000 persons. ASHRAE fulfills its mission of advancing heating, ventilation, air conditioning and refrigeration to serve humanity and promote a sustainable world through research, standards writing, publishing and continuing education.

**ACCA Manual J:** Produces equipment sizing loads for single-family-detached homes, small multi-unit structures, condominiums, town houses and manufactured homes.

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

**ACCA Manual S:** 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.

## Frequently Asked Questions

**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% 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% (sometimes as high as 75%) – 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% 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% 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% or less for lumber, and 15% less for wood structural panels, before use.



## CHAPTER 5. CALGREEN RESIDENTIAL TIER 1 AND TIER 2\*

CALGreen Appendix A4 is not mandatory as adopted by HCD. The voluntary measures or alternatives were developed in response to numerous stakeholder requests for a statewide, consistent, method of enhancing green construction practices beyond CALGreen's mandatory minimum levels. To meet Tier 1 or Tier 2, designers, builders, or property owners must increase the number of green building measures and further reduce percentages of water and energy use and waste to landfills in order to meet the threshold levels for each tier.

To provide a guide for implementing these "reach levels," HCD developed a tier-based Residential Occupancies Application Checklist indicating both mandatory and voluntary measures. Use of this checklist provides enforcing agencies a consistent method to identify, assess and implement tier levels.

Users should be aware that voluntary measures in Appendix A4 align with similarly numbered divisions addressing mandatory measures in CALGreen Chapter 4. For example, mandatory measures for water efficiency and conservation are discussed in Division 4.3 and voluntary measures are discussed in Appendix A4, Division A4.3.

It is extremely important to recognize that the measures in Appendix A4 are voluntary unless adopted by a city, county, or city and county through a local ordinance. (See sample Residential Model Ordinance in Appendix A4, Division A4-7.) However, if the Tier 1- and Tier 2-based systems are adopted, there are prerequisites associated with each tier. In addition, there are also a specified number of elective measures which must be selected. For this reason, 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 and Tier 2 – Mandatory, Prerequisite and Elective Measures**

Tier 1 and Tier 2 levels require compliance with all the mandatory provisions of CALGreen and incorporate higher thresholds of required prerequisite measures based upon each tier level. The measures are listed in Section A4.601.4.2 (Tier 1), Section A4.601.5.2 (Tier 2) and shown on the Residential Application Occupancies Checklist in Section A4.602. In addition to the required mandatory minimum and prerequisite measures, Tier 1 and Tier 2 buildings must incorporate at least the designated number of elective measures specified in Sections A4.601.4.2 and A4.601.5.2.

**\*Note:** This chapter is not a discussion of CALGreen Chapter 5, which addresses nonresidential mandatory measures.

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.

CALGreen Code Residential Occupancies Application Checklist in Appendix A4, Section A4.602, 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 Tier 1 and/or Tier 2, the checklist may be customized with each local adopting agency's selection of Tier 1 and/or Tier 2 and the specifically adopted elective measures. Local agencies have the discretion to include additional measures to those included in the checklist or have more restrictive requirements than shown in CALGreen; therefore, it is important to check for local amendments or requirements related to green building standards when planning a project. The complete checklist is included in CALGreen Appendix A4, Section A4.602. The sample checklist at the end of this chapter illustrates various components of the checklist.

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

**APPENDIX A4  
RESIDENTIAL VOLUNTARY MEASURES**

**DIVISION A4.6 – TIER 1 AND TIER 2**

**SECTION A4.601 GENERAL**

**A4.601.1 Scope.** The measures contained in this appendix are not mandatory unless adopted by a city, county, or city and county as specified in Section 101.7. The provisions of this section outline means of achieving enhanced construction or reach levels by incorporating additional green building measures. In order to meet one of the tier levels designers, builders, or property owners are required to incorporate additional green building measures necessary to meet the threshold of each level.

**A4.601.2 Prerequisite measures.** Tier 1 and Tier 2 thresholds require compliance with the mandatory provisions of this code and incorporation of the required prerequisite measures listed in Section A4.601.4.2 for Tier 1 and A4.601.5.2 for Tier 2. Prerequisite measures are also identified in the Residential 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's 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.*

### **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:

**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% 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.
  - 1.1 Exceed the California Energy Code requirements, based on the 2008 Energy Efficiency Standards by 15%.
  - 1.2 Comply with at least four elective measures selected from Division A4.2.
3. From Division A4.3, Water Efficiency and Conservation.
  - 1.1 Comply with the reduced flow rate for kitchen sink faucets in Section A4.303.1
  - 1.2 Comply with the Tier 1 potable water use reduction for landscape irrigation design in Section A4.304.4.
  - 1.3 Comply with at least one elective measure selected from Division A4.3.
4. From Division A4.4, Material Conservation and Resource Efficiency.
  - 1.1 Comply with the 20% cement reduction requirements in Section A4.403.2.
  - 1.2 Comply with the 10% recycled content requirements in Section A4.405.3.
  - 1.3 Comply with the 65% reduction in construction waste in Section A4.408.1.
  - 1.4 Comply with at least two elective measures selected from Division A4.4.
5. From Division A4.5, Environmental Quality.
  - 1.1 Comply with the 80% resilient flooring systems requirements in Section A4.504.2.
  - 1.2 Comply with the thermal insulation requirements for Tier 1 in Section A4.504.3.
  - 1.3 Comply with at least one elective measure selected from Division A4.3.

**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.

**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% 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.
  - 1.1 Exceed the California Energy Code requirements, based on the 2008 Energy Efficiency Standards by 30%.
  - 1.2 Comply with at least six elective measures selected from Division A4.2.
3. From Division A4.3, Water Efficiency and Conservation.
  - 1.1 Comply with the Tier 1 reduced flow rate for kitchen sink faucets in Section A4.303.1.
  - 1.2 Comply with the Tier 2 dishwasher requirements in Section A4.303.1.
  - 1.3 Comply with the Tier 2 potable water use reduction for landscape irrigation design in Section A4.304.4.
  - 1.4 Comply with at least two elective measures selected from Division A4.3.
4. From Division A4.4, Material Conservation and Resource Efficiency.
  - 1.1 Comply with the 25% cement reduction requirements in Section A4.403.2.
  - 1.2 Comply with the 15% recycled content requirements in Section A4.405.3.
  - 1.3 Comply with the 75% reduction in construction waste in Section A4.408.1.
  - 1.4 Comply with at least four elective measures selected from Division A4.4.
5. From Division A4.5, Environmental Quality.
  - 1.1 Comply with the 90% resilient flooring systems requirements in Section A4.504.2.
  - 1.2 Comply with the thermal insulation requirements for Tier 1 and Tier 2 in Section A4.504.3.
  - 1.3 Comply with at least one elective measure selected from Division A4.3.

**Note:** The Residential Occupancies Application Checklist contained in Section A4.602 may be used to show which elective measures are selected

**SAMPLE COMPLETED CHECKLIST FOR PORTIONS OF DIVISIONS 4.4 AND A4.4.**  
 [DELETED SECTIONS ARE SHOWN BY ELLIPSES (...)]

**CITY OF X  
 RESIDENTIAL OCCUPANCIES APPLICATION CHECKLIST**

FEATURE OR MEASURE	LEVELS APPLICANT TO SELECT ELECTIVE MEASURES			VERIFICATIONS ENFORCING AGENCY TO SPECIFY VERIFICATION METHOD		
	Mandatory	Prerequisites and electives <sup>1</sup>		Enforcing Agency <input type="checkbox"/> All	Installer or Designer <input type="checkbox"/> All	Third party <input type="checkbox"/> All
		Tier 1	Tier 2			
<b>MATERIAL CONSERVATION AND RESOURCE EFFICIENCY</b>						
<b>Water Resistance and Moisture Management</b>						
<b>A4.407.6</b> Exterior doors to the dwelling are protected to prevent water intrusion.		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>A4.407.7</b> A permanent overhang or awning at least 2 feet in depth is provided.		<input type="checkbox"/>	<input checked="" type="checkbox"/>			
<b>Construction Waste Reduction, Disposal and Recycling</b>						
<b>4.408.1</b> A minimum of 50 percent of the construction waste generated at the site is diverted to recycle or salvage.	<input checked="" type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>4.408.2</b> Where a local jurisdiction does not have a construction and demolition waste management ordinance, a construction waste management plan shall be submitted for approval to the enforcing agency.	<input checked="" type="checkbox"/>					
<b>A4.408.1</b> Construction waste generated at the site is diverted to recycle or salvage in compliance with one of the following: 1. Tier 1 at least a 65 percent reduction 2. Tier 2 at least a 75 percent reduction <b>Exception:</b> Equivalent waste reduction methods are developed by working with local agencies.		<input checked="" type="checkbox"/> <sup>2</sup>	<input checked="" type="checkbox"/> <sup>2</sup>			
<b>Innovative Concepts and Local Environmental Conditions</b>						
<b>A4.411.1</b> Items in this section are necessary to address innovative concepts or local environmental conditions. Item 1.	<input type="checkbox"/>	<input type="checkbox"/>				

*City X is requiring CALGreen elective measure A4.407.6 for Tier 1.*

*City X is requiring both CALGreen elective measures A4.4.07.6 and A4.407.7 for Tier 2.*

*Project needs to comply with mandatory measures 4.408.1 and 4.408.2 for all new low-rise residential construction*

*Project will need to comply with a mandatory 65% reduction if a Tier 1 Project.*

*Project will need to comply with a mandatory 75% reduction if a Tier2 project.*

*City X may allow equivalent reduction methods provided.*

*CALGreen allows alternate materials, appliances, installation, devices, arrangements, methods, or designs of construction. These are acceptable as "elective measures." Division A4.4 Tier 1 requires at least 2 elective measures; Tier 2 requires at least 4 elective measures.*

1. Green building measures listed in this table may be mandatory if adopted by a city, county, or city and county as specified in Sec. 101.7.  
 2. 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 carbon dioxide 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 Photo Voltaic (PV) system in an NSHP home.



## **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 to the CALGreen section 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

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

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

#### 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 installation 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*

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.