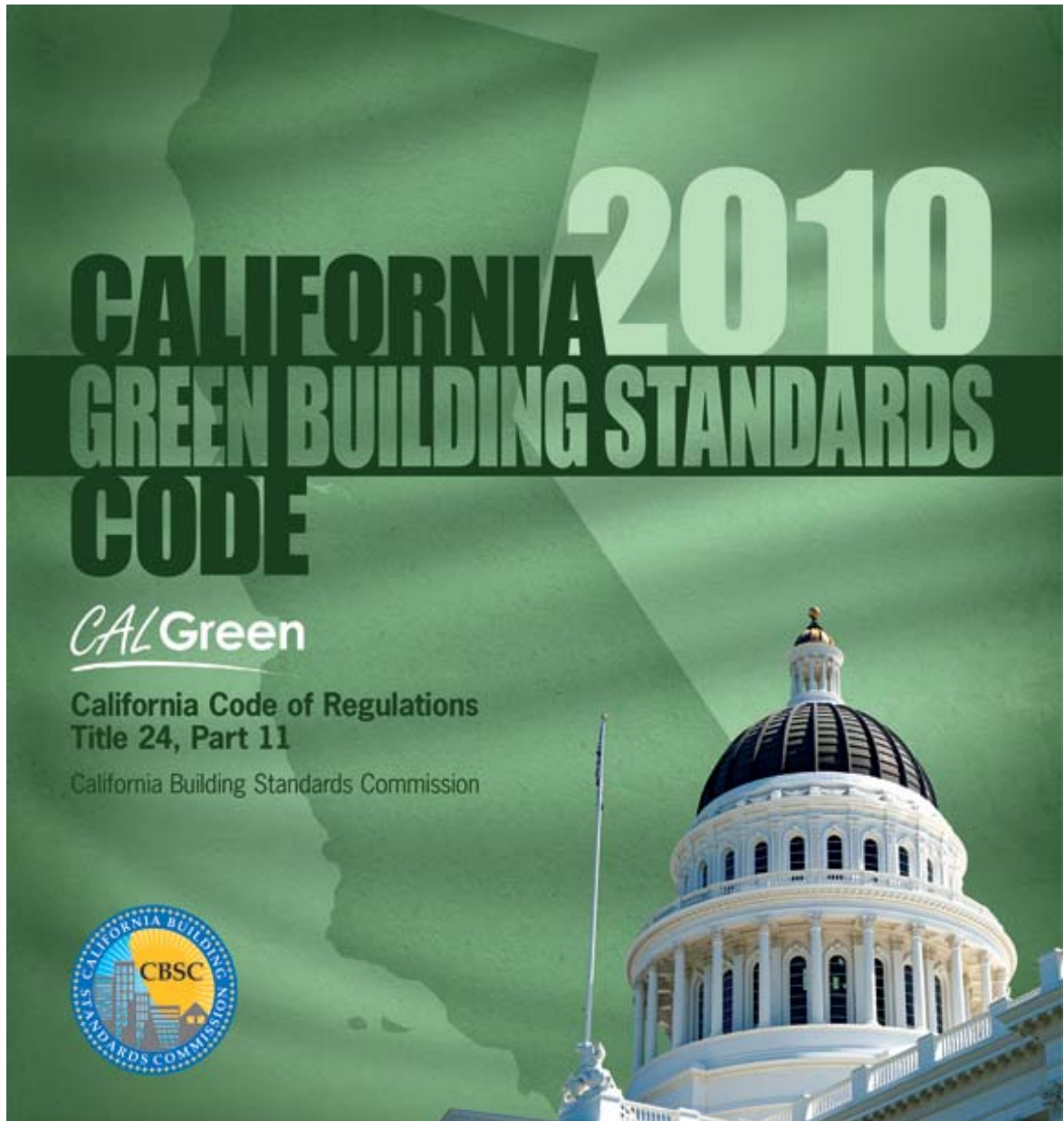


# Guide to the (Non-Residential) California Green Building Standards Code



*An educational publication by the  
California Building Standards Commission  
Second Edition, Issued November 2010*

BLANK PAGE

## **Preface**

This guide was developed and is distributed by the California Building Standards Commission as a means of introducing the 2010 California Green Building Standards Code, which is Part 11 of the California Building Standards Code in Title 24 of the California Code of Regulations. Part 11 is also known as the CALGreen Code. The contents of this guide will provide information as to the application of the California Green Building Standards Code and how to use it. It is critical to understand that this code will be effective throughout California and apply to most all new building design and construction beginning on January 1, 2011. Even prior to the development of this guide the Commission staff has been conducting introductory training throughout California in recognition of the critical importance of the new requirements meant to encourage green building design and green construction practices.

This guide should be helpful, but it is not a substitute for studying the code itself. An online version of the CALGreen Code is available through the California Building Standards Commission website <http://www.bsc.ca.gov/default.htm/>. See page 4 of this guide for information on how to purchase the CALGreen Code, other individual parts of Title 24 or the entire twelve-part set.

The California Building Standards Commission plans to issue updated editions of this guide. To be certain you have the most recent edition, check the date shown on the cover against the edition date to be shown on the website of the California Building Standards Commission <http://www.bsc.ca.gov/>.

Written comments and suggestions regarding this guide are welcomed in order to make future editions more effective. Address written comments and suggestions to:

E. David Walls, Executive Director  
California Building Standards Commission  
2525 Natomas Park Drive, Suite 130  
Sacramento, CA 95833

## **Table of Contents**

Executive Summary .....	1
Part 1- Introduction and Application .....	3
Introduction to the CALGreen Code.....	3
Identifying Requirements for Specific Buildings.....	9
Introduction of the Chapters within the CALGreen Code .....	12
Part 2 - Technical Application to Nonresidential Buildings.....	18
CAL Green Code Chapter 5, Division 5.1, General .....	20
CAL Green Code Chapter 5, Division 5.2, Energy Efficiency .....	28
CAL Green Code Chapter 5, Division 5.3, Water (reserved for future).....	29
CAL Green Code Chapter 5, Division 5.4, Material Conservation and Resource Efficiency .....	39
CAL Green Code Chapter 5, Division 5.5, Environmental Quality .....	66
Part 3 - Nonresidential Voluntary Measures .....	77
Part 4 – Suggested Forms and Templates.....	139

## **Executive Summary**

The 2010 California Green Building Standards Code is a code with mandatory requirements for new residential and nonresidential buildings (including buildings for retail, office, public schools and hospitals) throughout California beginning on January 1, 2011. The code is Part 11 of the California Building Standards Code in Title 24 of the California Code of Regulations and is also known as the CALGreen Code. In short, the code is established to reduce construction waste, make buildings more efficient in the use of materials and energy, and reduce environmental impact during and after construction.

It is essential that local government recognize this new code and take steps to ensure that building department personnel are properly trained to carry out enforcement activities beginning on January 1, 2011. In particular, building department personnel performing plan examinations and building inspections are those who will be primarily responsible for enforcing the code. Chapter 7 of the CALGreen Code provides a guideline for minimum inspector qualification criteria. Builders and design professionals will be required to incorporate features within the design of buildings and site preparation in order to meet the new requirements. Plans and specifications will need to be supplemented by documentation of conformance with the CALGreen Code. The CALGreen Code contains requirements for construction site selection, storm water control during construction, construction waste reduction, indoor water use reduction, material selection, natural resource conservation, site irrigation conservation and more.

The code provides for design options allowing the designer to determine how best to achieve compliance for a given site or building condition. The code also requires building commissioning which is a process for the verification that all building systems, like heating and cooling equipment and lighting systems are functioning at their maximum efficiency.

State law in Health and Safety Code Sections 17958.5 and 18941.5(b) allows a city, county, or city and county, to adopt more restrictive green building standards than those provided in the CALGreen Code. Such local standards along with a finding of need based on local climatic, geological, or topographical conditions must be filed with the California Building Standards Commission to become effective. Requirements for filing local ordinances establishing more restrictive green building requirements are explained in Section 101.7 of the CALGreen Code. Otherwise, the CALGreen Code is effective January 1, 2011 throughout the state.

This guide was developed as a means for providing an introduction to the CALGreen Code. The technical information in Parts 2, 3 and 4 pertain to buildings that are subject to adoptions by the California Building Standards Commission as explained on page 20 of this guide. In depth study of the CALGreen Code is recommended in order for design professionals, builders, and code enforcement personnel to become proficient. Other sources of information and training may include the following organizations:

- Department of Housing and Community Development (<http://www.hcd.ca.gov/codes/> )
- Division of the State Architect (<http://www.dsa.dgs.ca.gov/default.htm> )
- Office of Statewide Health Planning and Development (<http://www.oshpd.ca.gov/> )
- CALBO- California Building Officials (<http://www.calbo.org> )
- International Code Council, local chapters (<http://www.iccsafe.org> )
- Green Technology (<http://www.green-technology.org/> )
- California Building Industry Association (<http://www.cbia.org/go/cbia/> )
- American Institute of Architects (<http://www.aia.org/index.htm> )

## **Part 1- Introduction and Application**

### **Introduction to the CALGreen Code**

#### **The location of the CALGreen Code**

The CALGreen Code is Part 11 of the California Building Standards Code in Title 24 of the California Code of Regulations. The full name of Part 11 is the California Green Building Standards Code, but in short it is known as the CALGreen Code, or just CALGreen.

On January 1, 2011, the 2010 edition of the CALGreen Code will become effective throughout California. The 2008 edition, the first edition of the CALGreen Code, contained only voluntary standards. The 2010 edition contains both mandatory and voluntary standards applying to the design and construction of buildings and construction site management. The organization of 2010 edition of the California Building Standards Code in Title 24 is:

- Part 1, California Building Standards Administrative Code;
- Part 2, Volume 1 and 2, which is named the California Building Code and is based on the 2009 International Building Code;
- Part 2.5, which is named the California Residential Code and is based on the 2009 International Residential Code;
- Part 3, which is named the California Electrical Code and is based on the 2008 National Electrical Code;
- Part 4, which is named the California Mechanical Code and is based on the 2009 Uniform Mechanical Code;
- Part 5, which is named the California Plumbing Code and is based on the 2009 Uniform Plumbing Code;
- Part 6, which is named the California Energy Code;
- Part 7, currently vacant;
- Part 8, which is named the California Historical Building Code;
- Part 9, which is named the California Fire Code and is based on the 2009 International Fire Code;
- Part 10, which is named the California Existing Building Code and is based on provisions from the 2009 International Existing Building Code;

- Part 11, which is named the **California Green Building Standards Code**;
- Part 12, which is named the California Referenced Standards Code.

The California Code of Regulations contains regulations adopted by various state departments, boards, and commissions, under the authority provided in state law. The California Code of Regulations is divided into 28 separate titles, i.e. Title 1 through Title 28. State law requires that buildings throughout California are designed, constructed and maintained in compliance with state regulations, known as building standards, published in Title 24 of the California Code of Regulations by the California Building Standards Commission.

Much of Title 24 is available through the website of the California Building Standards Commission at [www. http://www.bsc.ca.gov/](http://www.bsc.ca.gov/) . To learn more about the California Building Standards Code in Title 24 including its organization, application and proper use, visit the website of the California Building Standards Commission and look for the link "Title 24", then click on "About Title 24". You may print this training document for study or staff training purposes. You may read more about the history of Title 24 by selecting the "About BSC" tab and the history link.

To purchase any Part of Title 24, or the entire set of the twelve Parts, there are several vendors including but not limited to:

- ICC (<http://www.iccsafe.org/Store> )
- IAPMO (<http://www.iapmostore.org/>
- California Book Express (<http://www.constructionbook.com> )
- Bookmark Inc. (<http://www.bookmarki.com>)
- BNI Books (<http://www.bnibooks.com>)
- NFPA (<http://www.nfpa.org> )



## **The purpose of the CALGreen Code**

The development of the CALGreen Code is intended to (1) cause a reduction in greenhouse gas emissions from buildings; (2) promote environmentally responsible, cost-effective, healthier places to live and work; (3) reduce energy and water consumption; and (4) respond to the directives by the Governor. The reduction in greenhouse gases has been mandated in recent years by the Governor through executive orders and the passage of the California Global Warming Solutions Act of 2006 (Assembly Bill 32, Chapter 488 of the 2006 Statutes) adding Division 25.5 to the California Health and Safety Code. The provisions of AB 32 require a cap on greenhouse gas emissions by 2020, mandatory emissions reporting, and an ongoing market-based compliance program. Establishing the CALGreen Code is an important step towards more efficient and responsible building designs. The California Air Resources Board estimates that the mandatory provisions in this new code will reduce green house gases by 3 million metric tons by the year 2020.

Green building legislation proposed in the 2007-2008 legislative session (AB 35 concerning state-owned buildings, AB 888 concerning commercial B-occupancy buildings and AB 1035 concerning residential construction) was vetoed by the Governor. In his veto messages, the Governor expressed his support for development of green building standards, but that they should not be statutory, conflict with current safety standards, and rely on private entities to set standards. He directed the California Building Standards Commission to work with state agencies to develop standards for the 2010 codes, gleaned from nationally recognized programs and the input of other state agencies, ensuring an open public adoption process.

The specific authority in law for each of the state agencies taking part in the development of the CALGreen Code, including the California Building Standards Commission, is provided within Chapter 1 of the CALGreen Code.

### **CALGreen Code effective date**

The 2010 California Building Standards Code, including the California Green Building Standards Code (CALGreen Code) in Part 11, will become effective on January 1, 2011.

### **The state agencies that developed the CALGreen Code**

The provisions of the CALGreen Code were developed by the California Building Standards Commission, Department of Housing and Community Development, Division of the State Architect and the Office of Statewide Health Planning and Development.

### **Use of local ordinances to amend the Standards**

The 2010 edition of the CALGreen Code becomes effective throughout the state on January 1, 2011. However, as explained herein, a city, county, or city and county, may enact local ordinances with more restrictive green building standards because of local conditions. Read the requirements for filing of more restrictive building standards provided on page 7 of this guide.

### **Types of buildings subject to the CALGreen Code**

Residential type buildings of three stories and less are subject to the 2010 CALGreen Code when constructed new, under a permit issued on or after January 1, 2011. The specific types of residential buildings identified in the CALGreen Code include motels, hotels, apartments, one and two family dwellings and several others listed in Section 104 of the CALGreen Code. Nonresidential buildings subject to the mandatory provisions of the CALGreen Code when constructed new include state owned buildings and state university and community college buildings, privately owned buildings used for retail, office, and medical services, and others listed in Section 103. The Office of Statewide Health Planning and Development has adopted voluntary provisions that may be applied to hospitals and medical care buildings as explained in Section 106 of the CALGreen Code. The Division of the State Architect has adopted mandatory and

voluntary provisions of the CALGreen Code that apply to public schools. Read more about the application of the CALGreen Code beginning on page 11.

### **Enforcement of the CALGreen Code**

The responsibility for enforcing the CALGreen Code is the same as for the balance of Title 24. New buildings subject to plan review, permits and inspections by the local building department will be subject to the CALGreen Code requirements and enforcement on and after January 1, 2011. State owned buildings will continue to be subject to enforcement by the state.

### **More restrictive local green building standards**

The mandatory provisions of the CALGreen Code set the minimum standard throughout California effective on and after January 1, 2011. However, a city, county, or city and county may enact local ordinances establishing more restrictive green standards as reasonably necessary because of local climatic, geological, topographical or environmental conditions. Reference Section 101.7 of the CALGreen Code for the legal references and the means to establish a local ordinance and make required filings with the California Building Standard Commission.

### **CALGreen Code training availability**

At the time this guide was being published, there are already numerous CALGreen Code training opportunities. Look to private organizations listed on page 3 for training offerings. In addition to this guide, the California Building Standards Commission is offering training in the form of seminars.

### **The meaning of Tier 1 and Tier 2 requirements**

Tier 1 and Tier 2 relates to green measures that are voluntary and not mandatory. A building said to contain Tier 2 measures will have achieved green efficiencies greater than a Tier 1 complying building. Buildings having achieved either Tier 1 or Tier 2 will have achieved more green efficiencies than a building complying solely with the mandatory green measures.

### **Special Inspection for CALGreen Code requirements**

Special inspection and special inspectors may be required by the local building department. Refer to Chapter 7 of the CALGreen Code for details. Additionally, Chapter 7 contains requirements for installers of heating, ventilation, and air conditioning systems and equipment in new residential construction.

### **Use of compliance worksheets**

CALGreen Code Section 102 establishes requirements for documenting conformance. Chapter 8 offers sample compliance forms and worksheets that may be used to document conformance with water use reduction and waste management planning. The local building department may require these worksheets, or may establish other forms to be completed and accompany plans and submittal at project completion. Applicants for building permits should check with the local building department to determine the requirement. The California Building Standards Commission also plans to develop more sample compliance forms to be included in future additions of this guide.

## **Identifying Requirements for Specific Buildings**

### **Residential Buildings**

Section 104 of the CALGreen Code explains that the Department of Housing and Community Development has adopted provisions of the CALGreen Code for residential structures. Section 101.3.1 (3) and 104 lists the types of residential structures subject to the HCD adoptions. That includes hotels, motels, apartments, condominiums, one and two family dwellings and more, up to three stories.

Note: "Low-rise residential buildings" used in Section 101.3.1 (3) is defined in Section 202 as being three stories or less.

A Matrix Adoption Table is provided at the beginning of each chapter or division of the CALGreen Code to identify adoptions by the state agencies. The abbreviation "HCD 1" is used within the Matrix Adoption Tables to identify HCD's adoptions. In the 2010 CALGreen Code, HCD adopts the mandatory provisions of Chapter 4 and the voluntary measures in Appendix A4. Other HCD adoptions are identified in the Matrix Adoption Tables for the various chapters of the CALGreen Code.

Note: If training is needed on the use of the Matrix Adoption Tables, open and print the training document available at the website of the California Building Standards Commission at [www. http://www.bsc.ca.gov/](http://www.bsc.ca.gov/) . Click on the link "Title 24", then click on "About Title 24". You may print this training document for study or staff training purposes.

### **Privately Owned Nonresidential Buildings**

Section 101.3.1 and 103 of the CALGreen Code explains that the California Building Standards Commission has adopted provisions of the CALGreen Code for state owned buildings and for privately owned nonresidential structures. A Matrix Adoption Table is provided at the beginning of each chapter or division of

the CALGreen Code to identify adoptions by the state agencies. The abbreviation "BSC" is used within the Matrix Adoption Tables to identify adoptions by the California Building Standards Commission. Accordingly, when an "X" appears in the column under the heading "BSC", and it means the section number or numbers listed on the left side of the table is adopted for application to nonresidential structures. Privately owned nonresidential buildings is meant to include common buildings of Group A Occupancy (assembly), Group B Occupancy (offices), Group M Occupancy (retail) and other common occupancies.

A good question at this point is: *Why is the California Building Standards Commission adopting green building standards for privately owned nonresidential buildings?* The answer lies in state law. Health and Safety Code Section 18930.5 provides authority to the California Building Standards Commission to adopt green building standards if no other state agency has specific authority to do so. The Department of Housing and Community Development, Division of the State Architect, and Office of Statewide Health Planning and Development, have authority to develop green building standards for specific building types or uses. None of these state agencies has the authority to adopt green building standards for privately owned buildings of Group A, B or M Occupancy that is not a public school, state building or medical facility. Therefore the California Building Standards Commission has exercised the authority provided in Health and Safety Code Section 18930.5 to adopt green building standards with application to privately owned nonresidential buildings not already subject to the authority of another state agency.

Mandatory adoptions for nonresidential buildings are located within Chapter 5 of the CALGreen Code. Voluntary measures in Appendix A5 adopted by the California Building Standards Commission are identified in the Matrix Adoption Table at the beginning of the appendix.

## **Public Schools**

Section 105 of the CALGreen Code explains that the Division of the State Architect has adopted provisions within the CALGreen Code for application to public elementary, secondary and community college buildings. The adoptions are identified by an "X" in the column under the abbreviation "DSA-SS" within the Matrix Adoption Tables located before each chapter of the code. Read Section 105 for more detail.

Mandatory DSA-SS adoptions for public schools are within Chapter 5 of the CALGreen Code. DSA-SS adopted voluntary measures in Appendix A5.

## **Medical Buildings**

Section 106 of the CALGreen Code explains that the Office of Statewide Health Planning and Development has adopted provisions within the CALGreen Code for application to specific types of buildings providing medical services. Examples include general acute care hospitals, skilled nursing facilities, intermediate care facilities, and correctional treatment centers.

At this time, OSHPD adoptions for medical facilities are found within Appendix A5 of the CALGreen Code, which are voluntary standards and not mandatory. The adoptions are identified by an "X" in the column under the abbreviation "OSHPD 1, 2 or 4" within the Matrix Adoption Table located at the beginning of the appendix. Read Section 106 for more detail.

## **Introduction of the Chapters within the CALGreen Code**

### **Chapter 1**

Chapter 1 provides important administrative requirements and clarifications that apply throughout the CALGreen Code. Most importantly are Sections 103, 104, 105 and 106 that identify the application of the adoptions by the state agencies as discussed previously, as well as sections that address local authority. Study Chapter 1 carefully to gain an understanding of the application of the CALGreen Code requirements.

### **Chapter 2**

Chapter 2 provides definitions for terms used within the CALGreen Code. Definitions are important for correct application of requirements.

### **Chapter 3**

Chapter 3 provides clarifications that are general in nature and apply throughout the CALGreen Code. An example is how to apply requirements to a building with mixed uses or to a project that is constructed in phases. Voluntary measures are addressed including those in tiers adopted by the Department of Housing and Community Development, the California Building Standards Commission, and the Office of Statewide Health Planning and Development.

### **Chapter 4**

Chapter 4 is divided into five separate Divisions and contains adoptions by the California Department of Housing and Community Development with application to residential structures as explained in Section 104 of the CALGreen Code. The Matrix Adoption Table for Chapter 4 is shown below.



**CALIFORNIA GREEN BUILDING STANDARDS CODE – MATRIX ADOPTION TABLE  
CHAPTER 4 – RESIDENTIAL MANDATORY MEASURES**

Adopting agency	BSC	SFM	HCD			DSA		OSHDP				CSA	DPH	AGR	DWR	CEC	CA	SL	SLC
			1	2	1-AC	AC	SS	1	2	3	4								
Adopt entire CA chapter			X																
Adopt entire chapter as amended (amended sections listed below)																			
Adopt only those sections that are listed below																			
Chapter/Section																			

The "X" under the column heading HCD 1 is located opposite "Adopt Entire CA chapter". Thus, HCD has adopted the entire Chapter 4. The abbreviation CA means California Amendment. There are no other "X" symbols in this table, thus no other state agency adopts this Chapter. Accordingly, the provisions will apply to only residential structures subject to HCD 1 as explained in Section 104 of the CALGreen Code.

Chapter 4 regulatory subjects for residential buildings are:

- Site development
- Energy efficiency
- Water Efficiency and Conservation
- Material conservation and resource efficiency
- Environmental quality'

**Chapter 5**

Chapter 5 is divided into five Divisions and contains adoptions by the California Building Standards Commission and the Division of the State Architect. The adopted sections of this chapter by these agencies are identified in the Matrix Adoption Table at the beginning of each division of the chapter. There are five Matrix Adoption Tables; one for each Division of the Chapter. This is necessary because of the differing adoptions by the state agencies and thus differing applications to buildings. The application of the adoptions by these agencies was discussed previously and is identified in Sections 103 and 105 of Chapter 1 of the CALGreen Code. Below is the Matrix Adoption Table for Division 1 of Chapter 5.

**CALIFORNIA GREEN BUILDING STANDARDS CODE – MATRIX ADOPTION TABLE  
CHAPTER 5 – NONRESIDENTIAL MANDATORY MEASURES  
DIVISION 1 – PLANNING AND DESIGN**

Adopting agency	BSC	SFM	HCD			DSA		OSHPD				CSA	DPH	AGR	DWR	CEC	CA	SL	SLC
			1	2	1-AC	AC	SS	1	2	3	4								
Adopt entire CA chapter	X																		
Adopt entire chapter as amended (amended sections listed below)																			
Adopt only those sections that are listed below							X												
Chapter/Section																			
5.101							X												
5.102 Definitions							X												
5.106.8							X												
5.106.10							X												

This "X" symbol under in the column heading BSC is opposite "Adopt Entire CA Chapter. That means the Building Standards Commission has adopted the entire chapter. Accordingly, the chapter will apply to buildings subject to the BSC jurisdiction as explained in Section 103 of the CALGreen Code.

The other "X" symbols in this table appear in the DSA-SS column. However, as shown above, the DSA-SS only adopts those section numbers to the left of the "X" symbols. DSA-SS does not adopt the entire Division. Section 105 of the CALGreen Code explains that DSA-SS adoptions apply to public schools.

The Matrix Adoption Table for Division 5.4 of Chapter 5 is shown below.

**CALIFORNIA GREEN BUILDING STANDARDS CODE – MATRIX ADOPTION TABLE  
CHAPTER 5 – NONRESIDENTIAL MANDATORY MEASURES  
DIVISION 5.4 – MATERIAL CONSERVATION AND RESOURCE EFFICIENCY**

Adopting agency	BSC	SFM	HCD			DSA		OSHPD				CSA	DPH	AGR	DWR	CEC	CA	SL	SLC	
			1	2	1-AC	AC	SS	1	2	3	4									
Adopt entire CA chapter	X																			
Adopt entire chapter as amended (amended sections listed below)																				
Adopt only those sections that are listed below							X													
Chapter/Section																				
5.401.1							X													
5.402.1 Definitions							X													
5.402.1 ADJUST							X													
5.402.1 BALANCE							X													
5.402.1 TEST							X													
5.407							X													
5.408.1–5.408.3							X													
5.410.1							X													
5.410.1.1							X													

This table shows that BSC adopts the entire Division 5.4 of Chapter 5. It shows that DSA-SS adopts selected sections of Division 5.4 and not the entire Division.

The two Matrix Adoption Tables for Chapter 5 shown above identify adoptions by only BSC and DSA-SS. Accordingly, the chapter has no application to residential buildings subject to HCD 1, or to medical buildings subject to OSHPD 1, 2 or 4.

Chapter 5 regulatory subjects for nonresidential buildings are:

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

**Chapter 6**

Chapter 6 provides a listing of standards adopted by reference and applicable to any building subject to the CALGreen Code.

## Chapter 7

Chapter 7 provides minimum qualifications for installers of HVAC equipment in residential buildings. Also, it provides clarification on the need for special inspections and requirements for documenting compliance with the CALGreen Code.

Requirements may vary for different types of buildings so take notice of the state agency adopting the requirements. Not all code provisions apply to all building types. So, watch for the state agency abbreviation (HCD 1, BSC, DSA-SS, OSHPD 1, 2, and 4) in order to identify the application of the code requirement.

## Chapter 8

Chapter 8 provides sample forms that may be used to document compliance with the CALGreen Code. Again, these forms are samples. The local enforcement agency may require these forms or require some other form or method of documenting compliance.

## Appendix A4

Appendix A4 provides voluntary measures for residential buildings. Adoptions are by HCD 1 as shown in the Matrix Adoption Table for this appendix. By its adoption, the Department of Housing and Community Development makes available voluntary measures, including the tiers, for local jurisdictions to adopt and for designers to employ voluntarily.

## Appendix A5

Appendix A5 is divided into seven Divisions and provides voluntary measures for nonresidential buildings with adoptions by BSC, DSA-SS and OSHPD 1, 2 and 4 as shown in the Matrix Adoption Tables for each of the Divisions of Appendix A5. Still, the provisions are voluntary and not mandatory. Local adoption and voluntary use of these provisions is the same as for Appendix A4, except that local adoption is not available for public schools and medical facilities under the authority of the Division of the State Architect (DSA-SS) and the Office of Statewide Health Planning and Development.

Blank Page

## **Part 2- Technical Application to Nonresidential Buildings**

*Note:*

- 1. This part is designed to explain provisions of the CALGreen Code that apply to common occupancies (Group A, B, M) subject to building code enforcement by the local building department. The other adopting agencies (HCD, DSA, and OSHPD) may provide specific training on housing, public schools, and medical buildings separately.*
- 2. This part provides a reprint of only those CALGreen Code Sections needing explanation.*
- 3. The Matrix Adoption Tables for Chapter 5 are not reprinted here. To identify the adoption and application of the code provisions, refer to the Matrix Adoption Tables in the CALGreen Code.*
- 4. Calculations to determine numbers of items shall be rounded up to the nearest whole number.*
- 5. Products or materials substituted after permit issuance shall be self-certified or verified for equivalency to those specified.*
- 6. Implementation of local ordinances relative to this code may require alternate means of compliance.*

### **CALGreen Chapter 1, Administration**

***CALGreen Sections: 101.3.1 State-regulated buildings, structures and applications, and 103 Building Standards Commission***

This guideline intends to assist the user in applying green building standards to all occupancies, including newly constructed privately owned nonresidential structures, newly constructed state owned buildings, state universities, and all other occupancies where no state agency has authority; and where applicable, occupancies regulated by Division of the State Architect (DSA) including public schools and community colleges.

Examples of privately owned nonresidential structures include, but are not limited to, new buildings or portions of new buildings classified by occupancy as:

***Assembly Group A*** – Motion picture theaters, concert halls, banquet halls, night clubs, restaurants, bowling allies, community halls, courtrooms, libraries, museums, arenas, amusement parks, and stadiums.

***Business Group B*** – Banks, barber and beauty shops, civic administration, motor vehicle showrooms, post offices, print shops, professional services offices, radio and television stations.

**Educational Group E** – Privately-funded educational purpose buildings for more than six students at one time through the 12<sup>th</sup> grade and daycare for more than six children 2 years and older.

**Factory Group F** – Building or structure used for factory industrial uses, moderate hazard occupancy, like food processing and dry cleaning; and low hazard manufacturing, such as of brick and ice.

**High-Hazard Group H** – Building or structure used for manufacturing and storing high hazard materials.

**Institutional Group I** – Building or structure used for caring of children, of physically disabled and include assisted living facilities, child care facilities, and adult care facilities.

**Laboratory Group L** – Laboratories with limited storage of hazardous materials as defined in the California Building Code (CBC).

**Mercantile Group M** – Department stores, drug stores, markets, motor fuel-dispensing stations, retail and wholesale stores, and sales rooms.

**Storage Group S** – Storage of moderate-hazard materials like furnishings and building materials and storage of low-hazard noncombustible materials such as food and, bottles and cans, and cement.

**Utility and Miscellaneous Group U** – Accessory or miscellaneous buildings as applicable.

*Refer to 2010 CBC Chapter 3 “Use and Occupancy Classification” for complete lists of uses for these occupancy groups.*

## CALGreen Code Chapter 5

### **DIVISION 5.1 PLANNING AND DESIGN**

**5.106.1 Storm water-soil loss prevention plan.** For newly constructed projects of less than one acre, develop a Storm Water soil loss prevention plan that has been designed, specific to its site, conforming to the State Storm water NPDES Construction Permit 99-08-DWQ or local ordinance, whichever is stricter, as is required for projects one acre or more. The plan should cover prevention of soil loss by storm water run-off and/or wind erosion, of sedimentation, and/or of dust/particulate matter air pollution.

**Note:** No state permit is required, but construction best management practices (BMPs) shall be followed. BMPs include but are not limited to the following:

1. Erosion and sediment control BMPs
  - a. Scheduling construction activity
  - b. Preservation of natural features, vegetation and soil
  - c. Drainage swales or lined ditches to control stormwater flow
  - d. Mulching or hydroseeding to stabilize disturbed soils
  - e. Erosion control to protect slopes
  - f. Protection of storm drain inlets (gravel bags or catch basin inserts)
  - g. Perimeter sediment control (perimeter silt fence, fiber rolls)
  - h. Sediment trap or sediment basin to retain sediment on site
  - i. Stabilized construction exits
  - j. Wind erosion control
2. Housekeeping BMPs:
  - a. Material handling and waste management
  - b. Building materials stockpile management
  - c. Management of washout areas (concrete, paints, stucco, etc.)
  - d. Control of vehicle/equipment fueling to contractor's staging area
  - e. Vehicle and equipment cleaning performed off site
  - f. Spill prevention and control

**Intent:**

The intent of this code provision is to ensure that newly constructed projects of less than one acre when soil is disturbed meet the same or similar (State Storm water NPDES [National Pollutant Discharge Elimination System] Construction Permit 99-08-DWQ or local ordinance) requirements currently required for projects one acre or more, though no notice of intent and fees to the state are required.

Although the state board has issued new regulations since permit 99-08-DWQ, this provision was intended to align with the requirements of the historical one. The intent of NPDES is to prevent the discharge of surface water pollutants, dust and sediment from the project site into receiving waters in an attempt to maintain water and air quality using recognized best management practices (BMPs).

**Existing Law or Regulation:**

**For projects that are one acre or larger in size, please refer to the** California Water Code and Federal Water Pollution Control Act.

**Compliance Method:**

**Design Team:** Provide a storm water soil loss prevention plan that has been prepared specific to the site and meets the State Storm Water NPDES Construction Permit 99-08-DWQ or local ordinance requirements, whichever is stricter. The plan should include BMPs and may be shown



in the construction documents or can be separately submitted. It can be prepared by an individual acceptable to the design professional in charge.

**Note:** To learn what is in the referenced permit 99-08-DWQ, you may visit the State Water Resources Control Board web site at [http://www.swrcb.ca.gov/water\\_issues/programs/stormwater/historical.shtml](http://www.swrcb.ca.gov/water_issues/programs/stormwater/historical.shtml) .

**Contractor:** No grading should be done until the storm water soil loss prevention plan has been approved by the enforcement agency. The contractor should employ the site-specific BMPs in the plan and as needed as conditions arise. He or she should conduct site inspections before, during extended storm events, and after each storm event to identify areas that may contribute to erosion and sediment problems or any other pollutant discharges. If additional control measures are needed, he or she should implement them immediately.

**Note:** A sample checklist of BMPs and self-certification form may be found in Part 4 of this Guide.

**Enforcement:**

**Plan intake:** The reviewer and/or plan checker should make sure the storm water soil loss prevention plan is either included with the construction documents or submitted separately and shows site-specific BMPs, or conformance with the NPDES 99-08-DWQ, or local requirements.

**On-Site enforcement:** The inspector should check the erosion and sediment controls for conformance with the plan and BMPs during the normal inspection process, or a separate inspection may be deemed appropriate by the enforcing agency. Additional site inspections may be required during extended storm events to verify mitigation measures.

**CALGreen Section: 5.106.4 Bicycle parking.** Comply with Sections 5.106.4.1 and 5.106.4.2; or meet local ordinance or the University of California Policy on Sustainable Practices, whichever is stricter.

**5.106.4.1 Short-term bicycle parking.** If the project is anticipated to generate visitor traffic, provide permanently anchored bicycle racks within 200 feet of the visitors' entrance, readily visible to passers-by, for 5 percent of visitor motorized vehicle parking capacity, with a minimum of one two-bike capacity rack.

**5.106.4.2 Long-term bicycle parking.** For buildings with over 10 tenant-occupants, provide secure bicycle parking for 5 percent of motorized vehicle parking capacity, with a minimum of one space. Acceptable parking facilities shall be convenient from the street and may include:

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

**Note:** Additional information on recommended bicycle accommodations may be obtained from Sacramento Area Bicycle Advocates.

**Intent:**

The intent of this code provision is to ensure that newly constructed projects provide short term and/or long term bicycle parking accommodations to promote the use of bicycles as an alternate means of transportation in an attempt to reduce green house gas emissions.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision. However, there are some jurisdictions that have adopted local ordinances.

**Compliance Method:**

**Short-Term Bicycle Parking:**

Construction documents (plans & specifications and/or site plan) should reflect the location of the required number of short-term permanently anchored bicycle parking racks for 5 percent of visitor motorized vehicle parking capacity, with a minimum of one two-bike capacity rack.

**Long-Term Bicycle Parking:**

1. Determine which of the three options will be used to comply or identify an alternate method(s).
2. Construction documents (plans & specifications and/or site plan) should reflect the method and location of the required number of long-term secured bicycle parking facilities based on 5 percent of motorized vehicle parking capacity, with a minimum of one space.

**Note:** *If the applicant is seeking a parking capacity reduction under §A5.106.6, or the local jurisdiction has a zoning ordinance for reduced parking, use the parking requirements that apply before the reduction is taken or outside any special zone in the calculations. This is to recognize that, with reduced parking capacity, more people are likely to ride bicycles.*

**Suggestion:** *Provide a calculation table or a note on the plans showing the total number of required short-term spaces by multiplying the anticipated visitor parking spaces by 5 percent and for long-term spaces by multiplying the total vehicular parking required spaces by 5 percent.*

**Examples:**

*Short-term: Visitor parking capacity at 42 x 5 percent =2.1 – Provide racks for 3 bicycles.*

*Long-term: Total Vehicular parking capacity at 216 x 5 percent =10.8 –Provide 11 spaces.  
If specifying lockers, consider using six two-bicycle lockers.*

**Enforcement:**

**Plan intake:** The reviewer and/or plan checker should review the plans and confirm that the correct number of bicycle parking racks and/or secured areas are included with the drawings and meet the requirements.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that all required bicycle parking requirements as shown on the plans have been provided and installed.

**CALGreen Section: 5.106.5.2 Designated parking.** Provide designated parking for any combination of low-emitting, fuel efficient, and carpool/van pool vehicles as follows:

**Table 5.106.5.2 not shown refer to Code**

**5.106.5.2.1 Parking stall marking.** Paint, in the paint used for stall striping, the following characters such that the lower edge of the last word aligns with the end of the stall striping and is visible beneath a parked vehicle:

**CLEAN AIR VEHICLE**

**Intent:**

This code provision is to ensure that newly constructed projects provide designated parking for clean air vehicles (low-emitting, fuel efficient, and carpool/van pool vehicles) which gives reserved parking to those who drive clean air vehicles. The intent is to promote the use of clean air vehicles in an attempt to conserve natural resources and reduce green house gas emissions.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision. However, there are some jurisdictions that have adopted ordinances.

**Compliance Method:**

**Design Team:** Construction documents (site plan) should reflect the location of the required number of designated parking stalls with the marking “CLEAN AIR VEHICLE” toward the back of the stall, similar to an accessible symbol, so that the writing can be seen when a clean air vehicle is parked. Lettering should be at least 8 inches high. The parking stalls can be located anywhere on the site without preferential location.

**Suggestion:** *The plans should reflect the total number of required vehicular spaces and refer to TABLE 5.106.5.2 to ensure that the correct number of designated parking stalls is being provided. Include all parking spaces in the calculation. As approved by the enforcing agency, some compact stalls may also be marked for clean air vehicles.*

**Examples:**

1. **55 total parking spaces:** based on TABLE 5.106.5.2 – Provide 6 Clean Air Vehicle spaces which fall within the range.
2. **240 total parking spaces:** based on TABLE 5.106.5.2, calculate  $240 \times 8 \text{ percent} = 19.2$  – Provide 20 Clean Air Vehicle spaces.

*Diagram in development.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and confirm that the correct number and configuration of “CLEAN AIR VEHICLE” parking stalls are included on the drawings.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that the correct number of clear air vehicle parking stalls have been provided and marked.

**CALGreen Section: 5.106.8 Light pollution reduction.** Meet lighting power requirements in the California Energy Code, CCR, Title 24, Part 6, and design interior and exterior lighting such that zero direct-beam illumination leaves the building site. Comply with lighting zones 1-4 and lighting zone characteristics as defined in Chapter 10 of the California Administrative Code, CCR, Title 24, Part 1, using the following strategies:

1. Shield all exterior luminaires or provide cutoff luminaires per Section 132 (b) of the California Energy Code.
2. Contain interior lighting within each source.
3. Allow no more than .01 horizontal foot candles to escape 15 feet beyond the site boundary.
4. Automatically control exterior lighting dusk to dawn to turn off or lower light levels during inactive periods.

**Exceptions:**

1. Part 2, Chapter 12, Section 1205.6 for campus lighting requirements for parking facilities and walkways.
2. Emergency lighting and lighting required for nighttime security.

**Intent:**

The intent of this code provision is to ensure that newly constructed projects reduce the amount of light and glare from both interior and exterior light sources leaving the site. This is to minimize light pollution in order to maintain our dark skies.

**Existing Law or Regulation:**

There are several existing codes that are being referenced in this provision as follows:

1. Lighting power requirements in the California Energy Code, CCR, Title 24, Part 6.
2. Lighting zone characteristics and lighting zones 1-4 as defined in Chapter 10 of the California Administrative Code, CCR Title 24, Part 1.
3. Requirements for cutoff luminaires per Section 132 (b) of the California Energy Code.
4. California Building Code, CCR title 24, Part 2 Section 1205.6 exception regarding campus lighting for parking and walkways.

**Compliance Method:**

**FIRST:**

Comply with California Energy Commission regulations in Part 1 and Part 6 cited above. Those standards form a basis upon which to build for the purpose of light pollution reduction in addition to energy efficiency. The provisions in Part 1 provide a weighted approach to the project site location, with a project located in the middle of a big city allowed more light to escape than a project at a rural or urban location. Part 6 addresses power and energy efficiency of outdoor lighting. There are exceptions for certain occupancies for lighting power requirements, and generally, they would apply to this provision, but voluntary compliance with any or all of the items is encouraged.

**THEN:**

To comply with Item 1, you can:

1. If custom lighting is needed, have it shielded to prevent uplight equivalent to cutoff fixtures. This could be an expensive option that may require photometric measurement.
2. Select cutoff exterior lighting fixtures that meet the definition in Section 5.102 of CALGreen, for installation at the building and the site.

Means to comply with Item 2 (where the word “source” is intended to mean building or structure):

1. Lay out lighting to prevent light from shining through windows or screen walls.
2. Design exterior shading features that also serve as screens at night.
3. Design indirect interior lighting, e.g. coved, at the perimeter or locate fixtures inside the exterior walls to shine into the space.
4. Specify shielded fixtures, e.g. sconces, in corridors and on building exterior, fixtures that prevent uplight.

5. Specify interior task lighting, e.g. under-cabinet.
6. Specify perimeter window coverings, e.g. blinds, as part of the construction contract.
7. Include instructions in the Operations and Maintenance Manual for extinguishing lights or drawing blinds when it gets dark, and recommend daylight janitorial services.

Means to comply with Item 3:

1. Avoid locating parking or site lighting fixtures adjacent to the property line, or choose perimeter fixtures whose photometrics are asymmetrical, focusing light on the site's interior.
2. Provide trees or man-made screens around perimeter of site.
3. As approved by the enforcing agency, multiple sites in a development or sites sharing common functions may be included within an overall site boundary for the purposes of this section.

Means to comply with Item 4:

1. For occupancies that operate principally only during daylight hours, specify photo sensors that can be programmed to turn off exterior lighting between sunset and sunrise.
2. Employ new dimming technologies that sense motion and activate lighting only as needed.

**Suggestion:** *Pay particular attention to the lighting design at the building and site perimeter, keeping in mind that this provision is limited to the effects of nighttime lighting only. Lighting layout, in and on the building and on the site, and selection of fixtures are key. Lighting manufacturers generally publish photometric data that can assist in selection of fixtures.*

*Diagrams in development.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents, including exterior light sources, to confirm compliance with Part 1, Part 2 and Part 6; review the electrical plans and specifications for complying building and exterior lighting, including photometric data for perimeter site lighting fixtures; and review specifications for any controls to be installed on the project.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that all lighting and power calculations and specified products are installed as specified on the approved plans and specifications. The inspector may make a site visit after dark when all fixtures and amenities are installed to make visual assessments and take light measurements within 15 feet of the property line.

**CALGreen Section: 5.106.10 Grading and Paving.** The site shall be planned and developed to keep surface water from entering buildings. Construction plans shall indicate how site grading or a drainage system will manage all surface water flows.

**Intent:**

The intent of this code provision is to ensure that newly constructed project sites are planned and developed to keep surface water from entering the building, to extend the longevity of the exterior building walls, and keep moisture from entering the exterior wall and perimeter slabs.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision. However, there are some code sections in the California Building Code (for example Section 1805.3.4 Foundation elevation) that address sloping grades away from buildings but does not address how all surface water flows will be managed on site.

**Compliance Method:**

Show on the construction documents (site plan or grading plan) how site grading and/or a drainage system will manage all surface water flows to keep water from entering the building. This is particularly critical on sloped sites.

***Suggestion:*** Show on the grading plan, in addition to draining the water away from the exterior walls, how surface water will be managed on site. Methods include but are not limited to:

1. Swales.
2. Water collection and dispersal systems.
3. French drains.
4. Water retention gardens.
5. Other measures appropriate to the site which keep surface water away from building and aid in groundwater recharge.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the grading plan and confirm that there are slopes away from the building and adequate measures to manage surface water flows. In addition, the reviewer should ensure that the plans indicate protection from water intrusion for buildings located on sloped sites or having flood plain requirements.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that all grading and/or drainage systems have been installed as specified on the approved plans and specifications.

*Diagram in development.*

BLANK PAGE



## **DIVISION 5.2 ENERGY EFFICIENCY**

### **GENERAL**

**CALGreen Section: 5.201.1 Scope.** 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.

### **Intent:**

The intent of this code provision is to recognize that the California Energy Commission retains its authority for energy efficiency standards. While not required by this code, a 15 percent reduction in building energy usage compared to current mandatory energy efficiency standards is recommended by the Energy Commission.

### **Existing Law or Regulation:**

For the purposes of mandatory energy efficiency standards in this code, the California Energy Commission will continue to adopt mandatory building standards. Local amendments increasing energy efficiency standards beyond those required in the California Energy Code may apply,

### **Compliance Method:**

Meet the minimum mandatory energy efficiency standards as currently required by California Energy Code, CCR Title 24, Part 6.

### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans, Title 24 Energy Compliance Forms and specifications as currently done for other portions of the code.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that all energy efficiency standards as specified on the approved plans and specifications are installed.

## **DIVISION 5.3 EFFICIENCY AND CONSERVATION**

**CALGreen Section: 5.303.1 Meters.** Separate meters or metering devices shall be installed for the uses described in Sections 5.303.1.1 and 5.303.1.2.

**5.303.1.1 Buildings in excess of 50,000 square feet.** Separate submeters shall be installed as follows:

1. For each individual leased, rented, or other tenant space within the building projected to consume more than 100 gal/day.
2. For spaces used for laundry or cleaners, restaurant or food service, medical or dental office, laboratory, or beauty salon or barber shop projected to consume more than 100 gal/day.

**5.303.1.2 Excess consumption.** Any building within a project or space within a building that is projected to consume more than 1,000 gal/day.

### **Intent:**

The intent of this code provision is to reduce potable water use in new buildings over 50,000 square feet or consumption in excess of 1,000 gal/day by making building owners and/or tenants aware of their daily potable water consumption to encourage voluntary reduction of potable water use. Note: Owner billing of tenants based on actual use is not intended but is not prohibited.

### **Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

### **Compliance Method:**

First determine if the new project will require separate meters based on the 50,000 square foot or excess consumption regulation. If so then:

1. Determine if your leased, rented, or other tenant space within the 50,000 square foot building (including spaces used for laundry or cleaners, restaurant or food service, medical or dental office, laboratory, or beauty salon or barber shop) is projected to consume more than 100 gal/day. If so, then provide separate submeters to be installed by the owner or contractor after the main meter supplied by the utility.
2. If any building within a project or space within a building is projected to consume more than 1,000 gal/day then provide a separate submeter or metering devices. Examples are car washes and aquariums.

***Suggestion:*** Show separate meters on the plans (Site Utility Plan) and provide specifications for the submeters and/or metering devices.

### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that separate meters and/or metering devices are specified on the plans when required.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that all separate submeters and/or metering devices are installed as specified on the approved plans and specifications.

**CALGreen Section: 5.303.2 Twenty percent savings.** A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by 20 percent shall be provided. The reduction shall be based on the maximum allowable water use per plumbing fixture and fittings as required by the California Building Standards Code. The 20 percent reduction in potable water use shall be demonstrated by one of the following methods.

1. Each plumbing fixture and fitting shall meet the 20 percent reduced flow rate specified in Table 5.303.2.3, or
2. A calculation demonstrating a 20 percent reduction in the building “water use baseline” as established in Table 5.303.2.2 shall be provided.

**Intent:**

The intent of this code provision is to reduce the overall use of potable water within the building by 20 percent. The Governor issued a proclamation in 2009 making 20 percent water use reduction a statewide goal.

**Existing Law or Regulation:**

AB 715 (Stats 2007, c. 499) modified the Health and Safety Code to allow only high-efficiency toilets and urinals to be sold or installed after January 1, 2014.

**Compliance Method:**

Demonstrate a 20 percent reduction in potable water use by using one of the following methods:

1. Prescriptive Method: Refer to Table 5.303.2.3 and select the plumbing fixtures and fittings with the reduced flow rates.

OR

2. Performance Method: Refer to Table 5.303.2.2 and provide a calculation demonstrating a 20 percent reduction in the building “water use baseline” as established in the table.

***Suggestion:*** *For the Prescriptive Method, provide a note on the plans and specify the fixtures and fittings that meet the requirement.*

*For the Performance Method, provide a plumbing calculation on the plans demonstrating an overall 20 percent water use reduction.*

*Sample worksheets are included in Part 4 of this Guide.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that either the prescriptive or performance method has been submitted and check for the 20 percent water reduction compliance. If the performance method is used, review the water calculations showing the 20 percent reduction.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that the specified water efficient plumbing fixtures and fixture fittings are installed. If the performance method was used, the inspector will verify that fixtures or systems used to reduce overall water use by 20 percent have been installed. The inspector may review the fixture specifications to verify compliance or accept self-certification form.

**CALGreen Section: 5.303.2.1 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 5.303.2.3 or the shower shall be designed to only allow one showerhead to be in operation at a time.

**Exception:** The maximum flow rate for shower heads when using the calculation method specified in Section 5.303.2, Item 2 is 2.5 gpm @ 80 psi.

**Intent:**

The intent of this code provision is to establish that the maximum flow rate in the 20 percent reduction table covers all applications where water sprays from multiple sources at one time. It is not the intent to permit multiple independent water supply lines to a single shower enclosure. This is intended to cover a single shower enclosure or space. In multiple shower spaces or gang showers, the requirement shall apply to each shower.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

**Compliance Method:**

Specify the shower fixture and fittings to either:

1. Restrict the flow at the valve that serves all the showerheads to provide no more than 2 gpm @ 80 psi as specified in the 20 percent reduction column contained in Table 5.303.2.3.
2. Specify the flow rate of the showerheads to produce a combined flow rate of no more than 2 gpm @ 80 psi as specified in the 20 percent reduction column contained in Table 5.303.2.3.
3. Specify a valve that is designed to allow only one showerhead to be in operation at a time with a maximum flow rate of 2 gpm @ 80 psi.
4. Performance Method: Refer to Table 5.303.2.2 and provide a calculation demonstrating a 20 percent reduction in the building "water use baseline" with a maximum combined flow rate of 2.5 gpm@80 psi for multiple showerheads.

**Contractor:** Contractor should be able to provide documentation or self-certification form to the inspector.

**Suggestion:** *Provide a note on the plans that multiple shower heads served by a single shower fixture shall have a combined flow rate of all the showerheads not to exceed the maximum flow rates specified in the 20 percent reduction column contained in Table 5.303.2.3. Or note that shower heads are being controlled to work independently. When using the Exception, provide a plumbing calculation on the plans.*

*Sample worksheets are included in Part 4 of this Guide.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and confirm that multiple shower heads specified meet the combined flow rates on the tables or that they are plumbed to operate independently or that the performance method does not exceed the combined maximum flow rates.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that the specified showerheads and/or water reducing fittings are installed. If the performance method was used, the inspector will confirm that showerheads or systems used to reduce overall water use by 20 percent have been installed. The inspector may review fixture specifications provided by the manufacturers as verification of compliance. Testing of flow rates may be done at the inspector's discretion.

**CALGreen Section: 5.303.4 Wastewater reduction.** Each building shall reduce by 20 percent wastewater by one of the following methods:

1. [DSA-SS] The installation of water-conserving fixtures (water closets, urinals) meeting the criteria established in section 5.303.2 or
2. Utilizing nonpotable water systems [captured rainwater, graywater, and municipally treated wastewater (recycled water) complying with the current edition of the California Plumbing Code or other methods described in Section A5.304].

**Intent:**

The intent of this code provision is to reduce wastewater discharge potable and non-potable, into the municipal sewer system, thereby reducing energy used in sewage treatment.

**Existing Law or Regulation:**

Chapter 16A of the California Plumbing Code (CPC) regulates residential graywater and dual plumbing for residential and nonresidential recycled water systems. Appendix G contains provisions for nonresidential graywater.

**Compliance Method:**

Demonstrate a 20 percent waste water reduction by using one of the following methods:

1. Comply with the 20% water use reduction provision of section 5.303.2 discussed above.
2. Where available and/or permitted by the local jurisdiction, utilize non-potable water systems (captured rainwater, graywater, and municipally treated wastewater [recycled water]).
3. Use waterless urinals.
4. Irrigate landscape with graywater from fixtures or appliances per CPC Appendix G

***Suggestion:*** Provide a note on the plans stating the method of compliance to be used. Specify appropriate fixtures and/or show plumbing calculations. If using non-potable water systems, detail on the plans.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and confirm that either the water-conserving fixtures (prescriptive or performance) method has been submitted and check for the 20 percent waste water reduction compliance. If the non-potable water systems method will be used, confirm availability and compliance with local ordinance.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that the specified water efficient plumbing fixtures and fixture fittings are installed. If the performance method was used, the inspector will verify that the 20 percent waste water reduction as approved has been followed. If a non-potable water systems is installed, the inspector will confirm that it meets local ordinances and operates properly.

**CALGreen Section: 5.303.6 Plumbing fixtures and fittings.** Plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall meet the standards referenced in Table 5.503.6.

**Intent:**

The intent of this code provision is to provide specifications for plumbing fixtures and fittings by referencing US EPA WaterSense labels and ASME standards for fixtures that can be used to meet the 20 percent water use reduction.

**Existing Law or Regulation:**

AB 715 (Stats. 2007, c. 499) modified the Health and Safety Code to specify standards for high efficiency toilets and urinals. AB 1953 (Stats. 2006, c. 853) changed the code to redefine “lead free plumbing” to reduce the amount of lead allowed in potable water fittings and fixtures effective January 1, 2010. (AB 1953 is referenced in Section 604.10 of the California Plumbing Code) Subsequent legislation in SB 1334 (Stats. 2008, c. 580) and SB 1395 (Stats. 2008, c. 581) required that products be certified as to lead levels by an ANSI-accredited third party.

**Compliance Method:**

Specify plumbing fixtures and fittings to meet the reference standards on Table 5.303.6.

*Note: If the performance method of compliance is used and a trade off is included in the calculation, not all fixtures need to meet these standards.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that plumbing fixtures and fittings specified meet the reference standards on Table 5.303.6. If the performance method is used and the water calculations produce a 20 percent reduction, it is possible that not all water closets and flush urinals will meet the standards on Table 5.303.6.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that the specified fixtures and fittings that meet the reference standards on Table 5.303.6 have been installed. If the performance method was used, the inspector will verify that fixtures or systems used to reduce overall water use by 20 percent have been installed, including any water closets and flush urinals which do not meet the standards on Table 5.303.6.

**CALGreen Section: 5.304.1 Water budget.** A water budget shall be developed for landscape irrigation use that conforms to the local water efficient landscape ordinance or to the California Department of Water Resources Model Water Efficient Landscape Ordinance where no local ordinance is applicable.

**Note:** Prescriptive measures to assist in compliance with the water budget are listed in Sections 492.5 through 492.8, 492.10 and 492.11 of the ordinance, which may be found at: <http://www.owue.water.ca.gov/landscape/ord/ord.cfm>

**Intent:**

The intent of this code provision is to reduce the overall outdoor potable water use by requiring that a water budget be developed for landscape irrigation.

**Existing Law or Regulation:**

The California Department of Water Resources has adopted a Model Water Efficient Landscape Ordinance (MLO) which requires that a water budget be developed that is currently in effect. There are some local jurisdictions that have adopted water efficient landscape ordinances that may be more restrictive.

**Compliance Method:**

Develop a water budget using one of the following methods:

1. Check with your local jurisdiction to confirm whether a local water efficient landscape ordinance is in place and if so develop a water budget for landscape irrigation that conforms to the local ordinance.

Or

2. Develop a water budget for landscape irrigation use that conforms to the California Department of Water Resources Model Water Efficient Landscape Ordinance for landscaped areas 2,500 square feet or more.

**Note:** *Prescriptive measures and compliance forms to assist in compliance with the water budget are listed in Sections 492.5 through 492.8, 492.10 and 492.11 of the ordinance, which may be found at: <http://www.owue.water.ca.gov/landscape/ord/ord.cfm>*

*An example of a water budget calculation is shown below.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for calculations to confirm that a water budget is developed by either using the local ordinance and/or the California Department of Water Resources Model Water Efficient Landscape Ordinance.

**On-Site Enforcement:** The inspector should review the permit set of plans and calculations to verify that the approved water budget as specified is followed during construction. The MLO or local ordinance compliance forms may serve this purpose.

### **Example of water budget calculation**

1 The water budget is first calculated by determining the **Maximum Applied Water Allowance (MAWA)** which is in turn established in part by the project's location. The rate of Evapotranspiration from the soil and plant tissues increases with higher temperature and lower humidity.

The project's Maximum Applied Water Allowance shall be calculated using this equation:

$$MAWA = (ET_o) (0.62) [(0.7 \times LA) + (0.3 \times SLA)]$$

where:

- MAWA = Maximum Applied Water Allowance (gallons per year)
- ET<sub>o</sub> = Reference Evapotranspiration from Appendix A (inches per year)
- 0.7 = ET Adjustment Factor (ETAF) <sup>1</sup>
- LA = Landscaped Area includes Special Landscape Area (square feet)
- 0.62 = Conversion factor (to gallons per square foot)
- SLA = Portion of the landscape area identified as Special Landscape Area (square feet)<sup>2</sup>
- 0.3 = the additional ET Adjustment Factor for Special Landscape Area (1.0 - 0.7 = 0.3)

Maximum Applied Water Allowance is expressed in gallons per year.

*Example calculation for a Sacramento landscape project with 10, 000 square feet of landscape area including a 1000 square foot demonstration vegetable garden:*

**MAWA = (51.9 inches) (0.62) [(0.7 x 10,000 square feet) + (0.3 x 1000 square feet)] = 234,899 gallons per year.**

<sup>1</sup> ETAF is based on a mixed landscape of plants with different water needs modified by the efficiency of the irrigation system (IE). This plant factor (PF) in MAWA is assumed to be 50% of ET<sub>o</sub>. ETAF is .5 PF x .71 IE, or 70% of ET<sub>o</sub>.

<sup>2</sup> SLA is defined in the Model Water Efficient Landscape Ordinance (MLO) as an area devoted to edible plants, recreational areas, or areas served by recycled water.



2. The water budget for the project is then established by calculating the **Estimated Total Water Use (ETWU)** and comparing that with the MAWA. ETWU for all hydrozones shall not exceed MAWA.

The project's Estimated Total Water Use is calculated using the following formula:

$$ETWU = (ETo)(0.62) \left( \frac{PF \times HA}{IE} + SLA \right)$$

where:

- ETWU = Estimated total water use per year (gallons per year)
- ETo = Reference Evapotranspiration (inches per year)
- PF = Plant Factor from WUCOLS<sup>3</sup>
- HA = Hydrozone Area [high, medium, and low water use areas] (square feet)
- SLA = Special Landscape Area (square feet)
- 0.62 = Conversion Factor (to gallons per square foot)
- IE = Irrigation Efficiency (minimum 0.71)

*Sample hydrozone Table for Calculating ETWU for the Sacramento project:*

Hydrozone	Plant Water Use Type(s)	Plant Factor (PF)	Area (HA) (square feet)	PF x HA (square feet)
1	High	0.7	1000	700
2	Medium	0.5	4000	2000
3	Low	0.3	4000	1200
			Sum	3900
4	SLA	1.0	1000	1000

**ETWU = (51.9) (0.62) (3900/0.71 + 1000) = 208,930 gallons per year, within the MAWA of 234,899 gallons per year.**

<sup>3</sup> WUCOLS is the Water Use Classification of Landscape Species published by the UC Cooperative Extension, DWR, and the Bureau of Reclamation, 2000, and uses the range of water use values shown in this table:

Plant Water Use Type	Plant Factor
Low	0 - 0.3
Medium	0.4 - 0.6
High	0.7 - 1.0
SLA	1.00

**Notes:**

WUCOLS may be accessed from DWR's website at:  
<http://www.water.ca.gov/wateruseefficiency/docs/wucols00.pdf>

A MAWA and ETWU calculator in Excel format is also available on DWR's website at:  
<http://www.water.ca.gov/wateruseefficiency/docs/WaterBudget101.xls>

**CALGreen Section: 5.304.2 Outdoor potable water use.** For new water service for landscaped areas between 1,000 square feet and 5,000 square feet (the level at which Water Code §535 applies), separate meters or submeters shall be installed for indoor and outdoor potable water use.

**Intent:**

The intent of this code provision is to reduce outdoor potable water use for new water service for landscaped areas between 1,000 square feet and 5,000 square feet by making building owners and/or tenants aware of their daily outdoor potable water consumption for landscaping. Additionally, it allows the consumer to monitor water use to identify spikes that may occur due to leaks in irrigation systems. Water loss attributed to leaks can be substantial.

**Existing Law or Regulation:**

AB 1881 (Stats. 2006, c. 559) currently requires that a separate water meter be installed by the water purveyor for new water service serving more than 5,000 square feet of irrigated landscape. There might be some local jurisdictions that have adopted ordinances that may be more restrictive.

**Compliance Method:**

**How to comply:**

First determine if the new project will require separate meters based on the 1,000-5,000 square foot landscape area. If so then:

1. Owner or contractor shall install a submeter after the main meter for outdoor potable water use.

***Suggestion:*** Show separate meters and submeters on the plans (Site Utility Plan) and specifications.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents to confirm that a separate submeter for landscape irrigation was provided.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that separate meters as specified on the approved construction documents are installed.

**CALGreen Section: 5.304.3 Irrigation design.** In new nonresidential construction with between 1,000 and 2,500 square feet of landscaped area (the level at which the MLO applies), install irrigation controllers and sensors which include the following criteria, and meet manufacturer's recommendations.

**5.304.3.1 Irrigation controllers.** Automatic irrigation system controllers 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.

**Intent:**

The intent of this code provision is to reduce outdoor potable water use for new construction landscaped areas between 1,000 square feet and 2,500 square feet by requiring the installation of irrigation controllers and sensors that are weather-or soil moisture-based.

**Existing Law or Regulation:**

The California Department of Water Resources has adopted a Model Water Efficient Landscape Ordinance (MLO) which requires that irrigation controllers utilizing either evapotranspiration or soil moisture sensor data for landscape areas 2,500 square feet or more. There might be some local jurisdictions that have adopted ordinances.

**Compliance Method:**

First determine if the new project landscape area is between 1,000-2,500 square feet.

If so then:

Determine which type of controller is going to be installed (weather based versus soil-moisture based).

If specifying a weather-based controller, make sure that it either has an integral rain sensor, or provide a separate sensor.

Install all components of the irrigation control system per the manufacturer's instructions.

**Note:** More information regarding irrigation controller function and specifications is available from the Irrigation Association at <http://www.irrigation.org/SWAT/Industry/ia-tested.aspx>

**Suggestion:** Show on the plans (Landscaping Plan) and specifications the irrigation controllers and sensors and design criteria outlined in section 492.7 of the MLO.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents to confirm that irrigation controllers and sensors are weather-or soil moisture-based.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that irrigation controllers and sensors as specified on the approved construction documents are installed according to the manufacturer's instructions and as shown on the irrigation design plan. The inspector may accept a certification form as a method of compliance, including any forms used for compliance with MLO or local ordinance.

## **DIVISION 5.4 MATERIAL CONSERVATION AND RESOURCE EFFICIENCY**

**CALGreen Section: 5.407.1 Weather protection.** Provide a weather-resistant exterior wall and foundation envelope as required by California Building Code Section 1403.2 (Weather Protection) and California Energy Code Section 150, (Mandatory Features and Devices), manufacturer's installation instructions, or local ordinance, whichever is more stringent.

### **Intent:**

The intent of this code provision is to provide a weather-resistant exterior wall and foundation envelope as currently required by California Building Codes. This measure is to spotlight those existing code provisions and increase the integrity and longevity of the structure.

### **Existing Law or Regulation:**

Currently this code provision is regulated by California Building Code Section 1403.2 (Weather Protection) and California Energy Code Section 150, (Mandatory Features and Devices for low-rise residential) and some local ordinances.

### **Compliance Method:**

**Design Team:** Determine local conditions that may affect the amount of moisture that might penetrate the envelope due to weather, wind-driven rain or exposure to salt spray, etc. For example, the protection measures in Section 150 of the energy code are required for Climate Zones 14 & 16, in the mountains. Design and detail exterior wall systems to reflect local findings, specifying appropriate materials and vapor retardance. Show on the plans and specifications.

**Suggestion:** *Pay particular attention to openings and changes of material in detailing exterior wall systems.*

**Contractor:** Install any exterior wall system in accordance with architectural details and manufacturer's installation instructions.

**Suggestion:** *Systems like exterior insulation and finish systems, if not installed to manufacturer's installation instructions, have the potential for moisture penetration and condensation that may lead to mold, structural failure, and increased liability.*

### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents to confirm that the exterior wall and foundation envelope meets the California Building Code Section 1403.2 (Weather Protection) and California Energy Code Section 150, (Mandatory Features and Devices for low-rise residential) and/or local ordinances are being met.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that the exterior wall and foundation envelope as specified on the approved plans and specifications are installed.

**CALGreen Section: 5.407.2 Moisture control.** Employ moisture control measures by the following methods.

**5.407.2.1 Sprinklers.** Design and maintain landscape irrigation systems to prevent spray on structures.

**5.407.2.2 Entries and openings.** Design exterior entries and/or openings subject to foot traffic or wind-driven rain to prevent water intrusion into buildings.

**Notes:**

1. Use features such as overhangs and recesses, and flashings integrated with a drainage plane.
2. Use non-absorbent floor and wall finishes within at least two feet around and perpendicular to such openings.

**Intent:**

The intent of this code provision is to minimize the amount of moisture entering the building; at the exterior entries & openings from wind-driven rain and at exterior walls from poorly designed sprinkler systems.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

**Compliance Method:**

**For Sprinklers:** Design irrigation systems to prevent spray on structures by specifying sprinkler heads which are adjacent to or near exterior walls to have a maximum degree head rotation or spray pattern that ensures protection of the building exterior.

**For entries and openings:**

1. Use design features such as overhangs and recesses, and flashings integrated with a drainage plane.
2. Specify non-absorbent flooring material at the interior landing surface a minimum of two feet in the direction of travel and at wall finishes adjacent to the door opening on the sides and at the top. If two feet is not available above the opening, wall finishes may terminate at the ceiling.

***Suggestion:*** Show on the plans (*Landscaping Plan, Site plan and Floor plans,*) and specifications the sprinkler design and design features that meet the requirements.

*Diagrams in development.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that the sprinkler design and design features at entries and openings are included in the submitted plans.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that the sprinkler design and design features at entries and openings as specified on the approved plans and specifications are installed per specifications.

**CALGreen Section: 5.408.1 Construction waste diversion.** Establish a construction waste management plan for the diverted materials, or meet local construction and demolition waste management ordinance, whichever is more stringent.

**5.408.2 Construction waste management plan.** Where a local jurisdiction does not have a construction and demolition waste management ordinance, submit a construction waste management plan for approval by the enforcement agency that:

1. Identifies the materials to be diverted from disposal by efficient usage, recycling, reuse on the project, or salvage for future use or sale.
2. Determines if materials will be sorted on-site or mixed.
3. Identifies diversion facilities where material collected will be taken.
4. Specifies that the amount of materials diverted shall be calculated by weight or volume, but not by both.

**5.408.2.1 Documentation.** Documentation shall be provided to the enforcing agency which demonstrates compliance with Section 5.408.2 items 1 thru 4. The waste management plan shall be updated as necessary and shall be accessible during construction for examination by the enforcing agency.

**Exception: [DSA-SS]** Jobsites in areas where there is no mixed construction and demolition debris (C&D) processor or recycling facilities within a feasible haul distance shall meet the requirements as follows:

1. The enforcement agency having jurisdiction shall at its discretion, enforce the waste management plan and make exceptions as deemed necessary.

**5.408.2.2 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 the California Department of Resources Recycling and Recovery (CalRecycle).

**Intent:**

The intent of this measure is to ensure that construction waste is diverted away from landfills and re-used or recycled either in conformance with the construction Waste Management Plan (WMP) or local ordinance.

**Existing Law or Regulation:**

AB 939 (Stats. 1989, c. 1095) as amended (WMA) made all California cities, counties, and approved regional solid waste management agencies responsible for enacting plans and implementing programs to divert 25 percent of their solid waste by 1995 and 50 percent by year 2000.

**Compliance Method:**

**How to comply:** If no local construction waste diversion ordinance exists then establish a construction waste management plan and identify the construction waste materials to be diverted from disposal as well as the diversion facility where the material will be taken. The requirements for the WMP are indicated in the regulation above.

**Notes:** *Sample WMP form provided in Part 4 of this Guide can be used to identify diverted materials. Mixed construction and demolition debris (C&D) processors can be located at <http://www.ciwmb.ca.gov/ConDemo/>.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the set of plans, specifications and/or forms to confirm that a WMP for diverted materials has been included with the plan

submittal, that a local ordinance is cited as the method of compliance, or that an exception should be granted for an isolated job site that lacks access to a recycling facility or markets.

**On-Site Enforcement:** The inspector should review the approved WMP or Exception (Isolated jobsite) to verify that the identified materials are being diverted as specified.

**CALGreen Section: 5.408.3 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. Calculate the amount of materials diverted by weight or volume, but not by both.

**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.

**Intent:**

Since construction waste makes up about 27% of the waste stream in California, this code provision is reducing the amount of construction waste from new construction that would be sent to the landfills, thereby extending the life of the landfills. Its purpose is also to encourage material resource efficiency through re-use and recycling of construction waste products.

**Existing Law or Regulation:**

AB 939 (Stats. 1989, c. 1095) mandated a 50% diversion of all waste by 2000, but the CALGreen regulation targets 50% of new construction waste that makes up a smaller percentage of the total waste stream. There are some local jurisdictions that have ordinances in place that have requirements for this provision.

**Compliance Method:**

1. Determine if a local construction waste management ordinance is in place in your jurisdiction and comply with the more stringent requirement
2. Determine what local hauling and recycling facilities are available in your area to establish the most economically feasible option for recycle and/or salvage of construction debris. If there is no facilities in your area, use Exception 2 and work with the local enforcing agency to establish an acceptable alternate.
3. Include for recycling the following materials: carpet, wood, aggregate, paint, shingles, wallboard or any other materials that have recyclable value. For more information on various materials visit the C&D Publications link on the CALRecycle website, the Construction Waste Management (CWM) Worksheet provided in Part 4 of this Guide, or as required by local ordinance.

**Note:** *The demolition debris provision may be applicable in the CALGreen code if an EXISTING building is going to be completely torn down and a NEW building built on the same site, where both are considered to be part of the same project. This would be determined on a case by case basis. Local market conditions may determine the level of diversion of demolition debris acceptable to the local enforcing agency.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans, specifications and/or forms to confirm that a construction waste management plan has been included with the plan submittal or that and Exception 2 has been approved by the enforcing agency.

**On-Site Enforcement:** The inspector should review the approved construction waste management plan or Exception 2 to verify that the plan is being followed or that an exception is being used. The inspector may ask for haul tags and/or reports from the contractor to verify compliance with the 50 percent waste reduction. Verification by documentation from a waste management company or recycling facility is acceptable.

**Suggestion:** *Building departments are strongly urged to work with their jurisdictions' Recycling Coordinators to determine if local conditions warrant exemptions and to identify appropriate means of alternate compliance.*



**CALGreen Section: 5.408.4 Excavated soil and land clearing debris** 100 percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled. For a phased project, such material may be stockpiled on site until the storage site is developed.

**Intent:**

The intent of this code provision is to reduce the high volume, bulky land clearing materials from filling up the landfills and to encourage the market for non-hazardous land clearing debris. It is not meant to apply to clearing of contaminated sites for purposes such as brownfield remediation.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision. However, there are some local jurisdictions that have ordinances in place that have requirements for this provision.

**Compliance Method:**

1. Determine if a local construction ordinance is in place in your jurisdiction and comply with the more stringent requirement or as accepted by the local enforcing agency.
2. Look for local markets and salvage opportunity for re-use of clearing debris.
3. For phased developments and other long term projects, the materials may be stored on site until project completion.

***Suggestion:*** *The need to salvage or recycle land clearing debris can be reduced by site planning that maintains such features as trees and rocks in the project where feasible.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and look for the appropriate note on the plans (civil plan), WMP or CWM Worksheet that describes the method of disposal of land clearing debris.

**On-Site Enforcement:** The inspector should review the permit set of plans and will verify that the excavated soil and land clearing debris is being reused or recycled as specified on the plans.

**CALGreen Section: 5.410.1 Recycling by occupants.** Provide readily accessible areas that serve the entire building and are identified for the depositing, storage, and collection of non-hazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics and metals.

**5.410.1.1 Sample ordinance.** Space allocation for recycling areas shall comply with Chapter 18, Part 3, Division 30 of the Public Resources Code. Chapter 18 is known as the California Solid Waste Reuse and Recycling Access Act of 1991 (Act).

**Note:** A sample ordinance for use by local agencies may be found in Appendix A of the document at the Cal Recycle's web site.

**Intent:**

The intent of this code provision is to direct attention to existing law to provide areas for recycling by occupants, including collection and loading of recyclable materials.

**Existing Law or Regulation:**

Currently there is a requirement for a model ordinance in Chapter 18, Part 3, Division 30 of the Public Resources Code. Chapter 18 is known as the California Solid Waste Reuse and Recycling Access Act of 1991 (Act) that can be used for statewide application.

**Compliance Method:**

1. Determine if a local recycling ordinance is in place in your jurisdiction and comply. If no ordinance; then use the model recycling ordinance.
2. Show on the plans (site and/or floor plans) readily accessible areas and signage for those areas that serve the entire building for recycling of non-hazardous materials by occupants.
3. In accordance with the model ordinance, recycling areas shall be secure; be protected from the elements, such as rain; and be adequately separated from occupied spaces for protection against impacts such as noise, odor and pests.
4. Where feasible, recycling areas should be located adjacent to solid waste collection areas.

**Note:** A sample ordinance for use by local agencies may be found in Appendix A of the document at the CalRecycle web site.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and confirm that the appropriate recycling areas and signage for those areas have been provided on the plans.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that the recycling areas and signage for those areas on the plans and specifications are installed.

**CALGreen Section: 5.410.2 Commissioning.** For new buildings 10,000 square feet and over, building commissioning shall be included in the design and construction processes of the building project to verify that the building systems and components meet the owner's or owner representative's project requirements. Commissioning shall be performed in accordance with this section by trained personnel with experience on projects of comparable size and complexity. Commissioning requirements shall include:

1. Owner's Project Requirements
2. Basis of Design
3. Commissioning measures shown in the construction documents
4. Commissioning Plan
5. Functional Performance Testing
6. Documentation & Training
7. Commissioning Report

All building systems and components covered by Title 24, Part 6, as well as process equipment and controls, and renewable energy systems shall be included in the scope of the Commissioning Requirements.

**Introduction:**

The purpose of this code is to improve public health, safety and general welfare by enhancing the design and construction of buildings through the use of concepts that reduce negative and increase positive environmental impacts. Commissioning is a vital element in this effort.

**Definitions used in the CALGreen CX Guide:**

**Acronyms**

BOD	Basis of Design
Cx	Commissioning
FPT	Functional Performance Test
HVAC	Heating Ventilating and Air-Conditioning
O&M	Operations and Maintenance
OPR	Owner's Project Requirements

**Glossary**

**Acceptance Criteria** - The conditions that must be met for systems or equipment to meet defined expected outcomes.

**Commissioning (Cx)** - Building commissioning as required in this code involves a quality assurance process that begins during design and continues to occupancy. Commissioning verifies that the new building operates as the owner intended and that building staff are prepared to operate and maintain its systems and equipment.

**Owner** - The individual or entity holding title to the property on which the building is constructed.

**Commissioning Coordinator** - The person who coordinates the commissioning process. This can be either a third-party commissioning provider or an experienced member of the design team or owner in-house staff member.

**Commissioning Team** - The key members of each party involved with the project designated to provide insight and carry out tasks necessary for a successful commissioning project. Team members may include the commissioning coordinator, owner or owner's representative, building staff, design professionals, contractors or manufacturer's representatives, and testing specialists.

**Independent Third-Party Commissioning Professional** - A commissioning consultant contracted directly by the owner who is not responsible to, or affiliated with any other member of the design and construction team.

**Operation and Maintenance (O&M) Manuals** - Documents that provide information necessary for operating and maintaining installed equipment and systems.

**Owner Representative** – An individual or entity assigned by the owner to act and sign on the owner’s behalf.

**Process Equipment** - Energy-using equipment and components that are not used for HVAC, Electrical, Plumbing and Irrigation operations. Such devices would include but are not limited to heat transfer, water purifying, air cleaning, air vacuum and air compressing.

**Sequence of Operation** – A written description of the intended performance and operation of each control element and feature of the equipment and systems.

#### **Selecting Trained Personnel for (Commissioning)**

This code requires that “Commissioning shall be performed in accordance with this section by trained personnel with experience on projects of comparable size and complexity.” The trained personnel manage and facilitate the commissioning process. The trained personnel develop and implement the commissioning tasks and documentation identified in sections 5.410.2.1 through 5.410.2.7. Trained personnel may include appropriate members of owner staff, contractor and design team as well as independent commissioning professionals.

It is essential that there is a single person designated to lead and manage the commissioning activities. In practice, this individual has been referenced by various identifiers such as commissioning authority, agent, provider, coordinator, lead, etc. In this guide the term “commissioning coordinator” is used.

The designated commissioning coordinator may be an independent third-party commissioning professional, a project design team member (e.g. engineer or architect), an owner’s engineer or facility staff, contractor or specialty sub-contractor. Methods of evaluating the designated commissioning coordinator and trained personnel include review of the following:

1. Technical knowledge
2. Relevant experience
3. Potential conflict of interest concerns
4. Professional certifications and training
5. Communication and organizational skills
6. Reference and sample work products

Selection of “trained”, qualified personnel is required by this Code. In order to meet this requirement, the commissioning provider should be evaluated via the methods discussed above. In addition, various organizations have training and certification programs that may be a source for identification of qualified commissioning providers.

*For information about enforcement and compliance of each commissioning element see sections 5.410.2.1 through 5.410.2.7.*

[See \(Part 4\) for forms and templates.](#)

## 1. Owner's Project Requirements

### **CALGreen Section: 5.410.2.1 Owner's or Owner representative's Project Requirements**

**(OPR).** The expectations and requirements of the building appropriate to its phase shall be documented before the design phase of the project begins. This documentation shall include the following:

1. Environmental and Sustainability Goals
2. Energy Efficiency Goals
3. Indoor Environmental Quality Requirements
4. Project program, including facility functions and hours of operation, and need for after hours operation
5. Equipment and Systems Expectations
6. Building Occupant and O&M Personnel Expectations

#### **Intent:**

The Owner's Project Requirements (OPR) documents the functional requirements of a project and expectations of the building use and operation as it relates to systems being commissioned. The document describes the physical and functional building characteristics desired by the owner and establishes performance and acceptance criteria. The OPR is most effective when developed during pre-design and used to develop the Basis of Design (BOD) during the design process. The level of detail and complexity of the OPR will vary according to building use, type and systems.

#### **Existing Law or Regulation:**

No existing law or regulation. Review local ordinances for any applicable commissioning OPR requirement.

#### **Compliance Method:**

Compliance is demonstrated by the owner or owner's representative developing and/or approving the Owner's Project Requirements (OPR) document and can be defined as follows:

1. *Environmental and Sustainability Goals* – Establish environmental project goals and objectives exceeding the code for the project's sustainability which may include:
  - a) CALGreen voluntary measures or Tiers sought, or other specific green building rating system or program credits and/or level of certification sought
  - b) Specific environmental or sustainability goals such as water efficiency, water reuse, CO2 monitoring, xeriscaping, etc.
2. *Energy Efficiency Goals* – Establish goals and targets affecting energy efficiency which may include:
  - a) Overall energy efficiency less than the California Energy Code performance approach energy budget by \_\_%)
  - b) Lighting system efficiency (less than the California Energy Code performance approach energy budget by \_\_%)
  - c) HVAC equipment efficiency & characteristics
  - d) Any other measures affecting energy efficiency desired by owner
    - Building orientation and siting
    - Daylighting
    - Facade, envelope and fenestration
    - Roof
    - Natural ventilation
    - Onsite renewable power generation and net-zero energy use
    - Landscaping and shading
3. *Indoor Environmental Quality Requirements* - For each program space describe indoor environmental requirements including intended use and anticipated schedule
  - a) Lighting

- b) Temperature and humidity
  - c) Acoustics
  - d) Air quality, ventilation and filtration
  - e) Desired adjustability of system controls
  - f) Accommodations for after-hours use
  - g) Other owner requirements including natural ventilation, operable windows, daylight, views, etc.
4. *Project Program, Including facility functions and hours of operation, and need for after hours operation* – Describe primary purpose, program and use of proposed project
- a) Building size, number of stories, construction type, occupancy type and number
  - b) Building program areas including intended use and anticipated occupancy schedules
  - c) Future expandability and flexibility of spaces
  - d) Quality and/or durability of materials and building lifespan desired
  - e) Budget or operational constraints
  - f) Applicable codes
5. *Equipment and Systems Expectations* – Describe the following for each system commissioned:
- a) Level of quality, reliability, equipment type, automation, flexibility, maintenance and complexity desired
  - b) Specific efficiency targets, desired technologies, or preferred manufacturers for building systems, acoustics and vibration
  - c) Degree of system integration, automation and functionality for controls; i.e., load shedding, demand response, energy management
6. *Building Occupant and O&M Personnel Expectations* – Describe the following:
- a) How building will be operated and by whom
  - b) Level of training and orientation required to understand, operate and use the building systems for building operation and maintenance staff, as well as occupants
  - c) Building operation and maintenance staff location and capabilities

[See \(Part 4\) for forms and templates.](#)

**Enforcement:**

At their discretion, the building official confirms demonstrated compliance at *Plan Intake* by:

- a) Receipt of a copy of the OPR document, or
- b) Receipt of a form signed by the owner or owner representative attesting that the OPR has been completed and approved by the owner.

[See \(Part 4\) for forms and templates.](#)

## 2. Basis of Design (BOD)

**CALGreen Section: 5.410.2.2 Basis of Design (BOD).** A written explanation of how the design of the building systems meets the OPR shall be completed at the design phase of the building project, and updated as necessary during the design and construction phases. The Basis of Design document shall cover the following systems:

1. Heating, Ventilation, Air Conditioning (HVAC) Systems and Controls
2. Indoor Lighting System and Controls
3. Water Heating System
4. Renewable Energy Systems
5. Landscape Irrigation Systems
6. Water Reuse Systems

### **Intent:**

The Basis of Design (BOD) describes the building systems to be commissioned and outlines design assumptions not indicated in the design documents. The design team develops the BOD to describe how the building systems design meets the Owner's Project Requirements (OPR), and why the systems were selected. The BOD is most effective when developed early in the project design and updated as necessary throughout the design process.

### **Existing Law or Regulation:**

No existing law or regulation. Review local ordinances for any applicable commissioning BOD requirement.

### **Compliance Method:**

Compliance requires the completion of the BOD document and should include the following where applicable:

1. *Heating, Ventilation, Air Conditioning (HVAC) Systems and Controls*
  - a) Provide narrative description of system – system type, location, control type, efficiency features, outdoor air ventilation strategy, indoor air quality features, environmental benefits, other special features.
  - b) Describe reasons for system selection – why chosen system is better than alternatives, issues such as comfort, performance, efficiency, reliability, flexibility, simplicity, cost, owner preference, site constraints, climate, maintenance, acoustics
  - c) Provide design criteria including the following:
    - Load calculation method/software
    - Summer outdoor design conditions( \_\_°F drybulb and \_\_°F wetbulb)
    - Winter outdoor design conditions ( \_\_°F drybulb and \_\_°F wetbulb)
    - Indoor design conditions ( \_\_°F drybulb cooling, \_\_%RH cooling; \_\_°F drybulb heating, \_\_%RH heating)
    - Applicable codes, guidelines, regulations and other references used
    - Load calculation assumptions
  - d) Sequence of Operations – operating schedules, setpoints, may refer to plans or specifications if sequence indicated within permit documents
  - e) Describe how system meets the OPR
2. *Indoor Lighting System and Controls*
  - a) Provide narrative description of system – type of fixtures, lamps, ballasts, controls
  - b) Describe reason for system selection – why chosen system better than alternatives, issues such as visual comfort, performance, efficiency, reliability, cost, flexibility, owner preference, color rendering, integration with daylighting, ease of control
  - c) Provide design criteria for each type of space including the following:
    - Applicable codes, guidelines, regulations and other references used
    - Illumination design targets (footcandles) and lighting calculation assumptions
  - d) Provide lighting power design targets for each type of space

- Title 24 lighting power allowance and lighting power design target (watts/ft<sup>2</sup>)
- e) Describe how system meets the OPR
- 3. *Water Heating System*
  - a) Provide narrative description of system – system type, control type, location, efficiency features, environmental benefits, other special features
  - b) Describe reason for system selection – why chosen system is better than alternatives, issues such as performance, efficiency, reliability, space constraints, cost, utility company incentives, owner preference, ease of maintenance
  - c) Water heating load calculations
  - d) Describe how system meets the OPR
- 4. *Renewable Energy Systems*
  - a) Provide narrative description of system – type, performance, control type, energy savings, payback period
  - b) Describe reason for system selection – why chosen system is better than alternatives, issues such as performance, efficiency, reliability, flexibility, simplicity, expandability, cost, payback period, utility company incentives, owner preference,
  - c) Sequence of Operation – operating schedules, setpoints, storage capacity
  - d) Describe how system meets the OPR
- 5. *Landscape Irrigation Systems*
  - a) Provide narrative description of system – type, performance, water usage
  - b) Describe reason for system selection – why chosen system is better than alternatives, issues such as performance, efficiency, reliability, flexibility, expandability, cost, owner preference, simplicity
  - c) Sequence of Operation – operating schedules, setpoints
  - d) Describe how system meets the OPR
- 6. *Water Reuse Systems*
  - a) Provide narrative description of system – type, performance, capacity, reuse purpose
  - b) Describe reason for system selection – why chosen system is better than alternatives, issues such as performance, efficiency, reliability, flexibility, expandability, cost, owner preference, simplicity
  - c) Sequence of Operation – operating schedules, setpoints
  - d) Describe how system meets the OPR

[See \(Part 4\) for forms and templates.](#)

**Enforcement:**

- At their discretion, the building official confirms demonstrated compliance at *Plan Intake* by:
- a) Receipt of a copy of the BOD document, or
  - b) Receipt of a form signed by the architect, engineer or designer of record, attesting that the BOD has been completed and meets the requirements of the OPR.

[See \(Part 4\) for forms and templates.](#)



### 3. Commissioning measures shown in the construction documents

**CALGreen Section: 5.410.2 Commissioning.** For new buildings 10,000 square feet and over, building commissioning shall be included in the design and construction processes....

Commissioning requirements shall include:

1. Owner's Project Requirements
2. Basis of Design
- 3. Commissioning measures shown in the construction documents**
4. Commissioning Plan
5. Functional Performance Testing
6. Documentation & Training
7. Commissioning Report

This section provides details for element 3: *Commissioning measures shown in the construction documents*.

**Intent:**

Include commissioning measures or requirements in the construction documents (plans and specifications). Commissioning measures or requirements should be clear, detailed and complete to clarify the commissioning process.

**Existing Law or Regulation:**

Title 24 Part 6 requires that specific functional test procedure forms be included in the construction documents. These test forms create a subset of the broader CalGreen commissioning requirements described herein. Review local ordinances for additional applicable requirements.

**Compliance Method:**

Compliance is achieved by including commissioning requirements in the project specifications. The commissioning specifications should include the following:

1. Primary (and optionally all) commissioning requirements are included in the general specification division (typically Division 1) and clear cross references of all commissioning requirements to and from the general division are included to ensure all subcontractors are held to them
2. A list of the systems and assemblies covered by the commissioning requirements.
3. Roles and responsibilities of all parties including:
  - General contractor and subcontractors, vendors, construction manager
  - Commissioning provider lead
  - Owner, facility staff
  - Architect and design engineers
  - Including the non-contractor parties in the construction specifications is for information only to provide the contractor with context for their work
  - Include who writes checklists and tests, who reviews and approves test forms, who directs tests, who executes tests, who documents test results and who approves completed tests. These roles may vary by system or assembly.
4. Meeting requirements
5. Commissioning schedule management procedures
6. Issue and non-compliance management procedures
7. Requirements for execution and documentation of installation, checkout and start up, including controls point-to-point checks and calibrations
8. Specific testing requirements by system, including:
  - Monitoring and trending
  - Opposite season or deferred testing requirements, functions and modes to be tested
  - Conditions of test
  - Acceptance criteria, and any allowed sampling

- Include details of the format and rigor of the test forms required to document test execution
  - Including example forms is recommended
9. Submittal review requirements and approval process.
  10. Content, authority and approval process of the commissioning plan.
  11. Commissioning documentation and reporting requirements.
  12. Facility staff training requirements and verification procedures.
  13. O&M manual review and approval procedures.
  14. System's manual development and approval requirements and procedures.
  15. Definitions section.

[See \(Part 4\) for forms and templates.](#)

**Enforcement:**

At their discretion, the building official confirms demonstrated compliance at *Plan Intake* by:

- a) Receipt of a copy of the commissioning specifications, or
- b) Receipt of a form signed by the owner or owner representative or designer of record attesting that the owner-approved commissioning specifications are included in the construction documents.

[See \(Part 4\) for forms and templates.](#)

**4. Commissioning plan.** Prior to permit issuance a commissioning plan shall be completed to document how the project will be commissioned and shall be started.

**CALGreen Section: 5.410.2.3 Commissioning plan.** Prior to permit issuance a commissioning plan shall be completed to document how the project will be commissioned and shall be started during the design phase of the building project. The Commissioning Plan shall include the following:

1. General project information
2. Commissioning goals
3. Systems to be commissioned. Plans to test systems and components shall include:
  - a. An explanation of the original design intent
  - b. Equipment and systems to be tested, including the extent of tests
  - c. Functions to be tested
  - d. Conditions under which the test shall be performed
  - e. Measurable criteria for acceptable performance
4. Commissioning team Information
5. Commissioning process activities, schedules and responsibilities. Plans for the completion of commissioning requirements listed in Section 5.410.4.4 through 5.410.4.6 shall be included.

**Intent:**

The Commissioning Plan (Cx Plan) establishes the commissioning process guideline for the project and commissioning team's level of effort by identifying the required Cx activities to ensure that the Owner's Project Requirements (OPR) and the Basis of Design (BOD) are met. The Cx Plan also includes a commissioning schedule from design to occupancy.

**Existing Law or Regulation:**

No previous existing State of California laws or regulations. Review local county, city or jurisdiction ordinances for any applicable commissioning planning requirements.

**Compliance Method:**

Compliance is demonstrated by preparation of a project specific Cx Plan that includes the elements listed in the code section above. The following gives guidance for developing the components of the Commissioning Plan:

1. *General project information* - Provide project identifying information including but not limited to the following:
  - Project Name, Owner, Location,
  - Building type, Building area,
  - Project Schedule
  - Contact information of individual/company providing the commissioning services
2. *Commissioning Goals* – Document the commissioning goals, including, but not limited to:
  - Meeting CALGreen code requirements for commissioning
  - Meeting OPR and BOD requirements
  - Carrying out requirements for commissioning activities as specified in plans and specifications
3. *Systems to be commissioned* – See BOD
  - a. *An explanation of the original design intent* - Document the performance objectives and design intent for each system listed to be commissioned in a written narrative
    - Refer to the OPR and BOD documents
  - b. *Equipment and systems to be tested, including the extent of tests*
    - Provide a list of equipment and systems to be tested
    - Describe the range and extent of tests to be performed for each system component, and interface between systems
  - c. *Functions to be tested* - Provide example functional test procedures to identify the level of testing detail required

- See (section 5.410.2.4) FPT guidance for more information
- d. *Conditions under which the test shall be performed* - Identify the conditions under which the major operational system functions are to be tested, including:
  - Normal operations and part-load operations
  - Seasonal testing requirements
  - Restart of equipment and systems after power loss
  - System alarm confirmations
- e. *Measurable criteria for acceptable performance* - Include measurable criteria for acceptable performance of each system to be tested
- 4. *Commissioning Team Information* - Provide a contact list for all Commissioning team members, including but not limited to:
  - Owner, owner's representative
  - Architect, Engineers
  - Designated commissioning representative
  - General contractor, sub-contractors, and construction manager
- 5. *Commissioning process activities, schedules and responsibilities*
  - Establish prescribed commissioning process steps and activities to be accomplished by the Cx team throughout the design to occupancy
  - For each phase of the work, define the roles and responsibilities for each member of the Cx team
  - List the required Cx deliverables, reports, forms and verifications expected at each stage of the commissioning effort
  - Include the confirmation process for the O&M manual, systems manual and the facility operator and maintenance staff training

[See \(Part 4\) for forms and templates.](#)

**Enforcement:**

- At their discretion, the building official confirms demonstrated compliance at *Plan Intake* by:
- a) Receipt of a copy of the Commissioning Plan, or
  - b) Receipt of a form signed by the owner or owner representative attesting that the Cx Plan has been completed.

[See \(Part 4\) for forms and templates.](#)

## 5. Functional performance testing

**CALGreen Section: 5.410.2.4 Functional performance testing.** Functional performance tests shall demonstrate the correct installation and operation of each component, system, and system-to-system interface in accordance with the approved plans and specifications. Functional performance testing reports shall contain information addressing each of the building components tested, the testing methods utilized, and include any readings and adjustments made.

### **Intent:**

Develop and implement the functional performance tests to document, as set forth in the Commissioning Plan, that all components, equipment, systems and system-to-system interfaces were installed as specified, and operate according to the Owner's Project Requirements, Basis of Design, and plans and specifications.

The following systems to be functionally tested are listed in the Basis of Design (5.410.2.2 of the Code):

1. Heating, Ventilation, Air Conditioning (HVAC) Systems and Controls
2. Indoor Lighting System and Controls
3. Water Heating System
4. Renewable Energy Systems
5. Landscape Irrigation Systems
6. Water Reuse Systems

### **Existing Law or Regulation:**

Title 24 Acceptance Testing requirements call for functional testing of some systems and equipment required to be commissioned by CALGreen. Refer to Title 24 and Nonresidential Compliance Manual For California's 2008 Energy Efficiency Standards.

[http://www.energy.ca.gov/title24/2008standards/nonresidential\\_manual.html](http://www.energy.ca.gov/title24/2008standards/nonresidential_manual.html)

*Note: CALGreen Functional Performance Tests are not intended to replace the Title 24 Section 6 Acceptance Tests. Instead, the T24 acceptance tests, which focus on energy efficiency, can be part of the broader scope of testing forms and procedures required for CALGreen compliance.*

Review local ordinances for any applicable requirements.

### **Compliance Method:**

Compliance is demonstrated by developing and implementing test procedures for each piece of commissioned equipment and interfaces between equipment and systems according to the building-specific Commissioning Plan. Tests should include verification of proper operation of all equipment features, each part of the sequence of operation, overrides, lockouts, safeties, alarms, occupied and unoccupied modes, loss of normal power, exercising a shutdown, startup, low load through full load (as much as is possible) and back, staging and standby functions, scheduling, energy efficiency strategies and loop tuning.

### **Elements of acceptable test procedures include:**

1. *Date and Party* -- Identification of the date of the test and the party conducting the test.
2. *Signature Block* -- Signature of the designated commissioning lead and the equipment installing contractor attesting that the recorded test results are accurate.
3. *Prerequisites* -- Any conditions or related equipment checkout or testing that needs to be completed before conducting this test.
4. *Precautions* -- Identification of the risks involved to the test team members and the equipment and how to mitigate them.
5. *Instrumentation* -- Listing of the instrumentation and tools necessary to complete the test.
6. *Reference* -- In each procedure item, identify the source for what is being confirmed (e.g., sequence of operation ID, operating feature, specification requirement, etc.).

7. *Test Instructions* -- Step-by-step instructions of how to complete the test, including functions to test and the conditions under which the tests should be performed.
8. *Acceptance Criteria* -- Measurable pass / fail criteria for each step of the test, as applicable.
9. *Results* -- Expected system response and space to document the actual response, readings, results and adjustments.
10. *Return to Normal* -- Instructions that all systems and equipment are to be returned to their as-found state at the conclusion of the tests.
11. *Deficiencies* -- A list of deficiencies and how they were mitigated.

[See \(Part 4\) for forms and templates.](#)

**Enforcement:**

At their discretion, the building official confirms demonstrated compliance during *Onsite Enforcement* by:

- a) Receipt of a copy of completed and signed Functional Performance Tests and corrected deficiencies, or
- b) Receipt of a form signed by the owner, owner representative or commissioning coordinator attesting that the Functional Performance Tests have been completed and any deficiencies corrected.

[See \(Part 4\) for forms and templates.](#)

## 6. Documentation and training

**CALGreen Section: 5.410.2.5 Documentation and training.** A Systems Manual and Systems Operations Training are required, including Occupational Safety and Health Act (OSHA) requirements in California Code of Regulations (CCR), Title 8, Section 5142, and other related regulations.

**See sections 5.410.2.5.1 and 5.410.2.5.2 below.**

**CALGreen Section: 5.410.2.5.1 Systems manual.** Documentation of the operational aspects of the building shall be completed within the Systems Manual and delivered to the building owner or representative and facilities operator. The Systems Manual shall include the following:

1. Site information, including facility description, history and current requirements.
2. Site contact information
3. Basic operations & maintenance, including general site operating procedures, basic troubleshooting, recommended maintenance requirements, site events log
4. Major systems
5. Site equipment inventory and maintenance notes
6. A copy of all special inspection verifications required by the enforcing agency or this code
7. Other resources and documentation.

**Intent:**

The Systems Manual documents information focusing on the operation of the building systems. This document provides information needed to understand, operate, and maintain the equipment and systems and informs those not involved in the design and construction of the building systems. This document is in addition to the record construction drawings, documents, and the Operation & Maintenance (O&M) Manuals supplied by the contractor. The Systems Manual is assembled during the construction phase and available during the contractors' training of the facility staff.

**Existing Law or Regulation:**

No existing law or regulation. Review local ordinances for any applicable Systems manual requirement.

**Compliance Method:**

Compliance is demonstrated by providing the Systems Manual. The information in the Systems Manual includes the following information:

1. *Site information, including facility description, history and current requirements*
  - a) Site Information
    - i. Location of property - Address
    - ii. Site acreage
    - iii. Local utility information
      - Water service provider
      - Natural/LPG gas service provider
      - Electrical service provider
      - Telecommunications service provider
      - Other service providers
  - b) Facility Description
    - i. Use/Function
    - ii. Square footage
    - iii. Occupancy Type
    - iv. Construction Type
    - v. Basis of design

- vi. Location of major systems & equipment
- c) Project History
  - i. Project requirements
    - Owner's Project Requirements (OPR)
    - Basis of Design (BOD)
  - ii. Project undocumented events
  - iii. Record Drawings & Documents
  - iv. Final control drawings and schematics
  - v. Final control sequences
  - vi. Construction documents - Location or delivery information
    - Mechanical & electrical drawings
    - Specifications
    - Submittals
    - Project change orders and information
- d) Current requirements
  - i. Building operating schedules
  - ii. Space temperature, humidity, & pressure, CO2 setpoints
  - iii. Summer and winter setback schedules
  - iv. Chilled & hot water temperatures
  - v. As-built control setpoints and parameters
- 2. *Site contact information*
  - a) Owner information
  - b) Emergency contacts
  - c) Design Team: Architect, Mechanical, Engineer, Electrical Engineer, etc.
  - d) Prime Contractor contact information
  - e) Subcontractor information
  - f) Equipment supplier contact information
- 3. *Basic operation & maintenance, including general site operating procedures, basic trouble shooting, recommended maintenance requirements site events log*
  - a) Basic operation
    - i. Written narratives of basic equipment operation
    - ii. Interfaces, interlocks and interaction with other equipment and systems
    - iii. Initial maintenance provide by contactor
  - b) General site operating procedures
    - i. Instructions for changes in major system operating schedules
    - ii. Instructions for changes in major system holiday & weekend schedules
  - c) Basic troubleshooting
    - i. Cite any recommended troubleshooting procedures specific to the major systems and equipment installed in the building.
    - ii. Manual operation procedures
    - iii. Standby/Backup operation procedures
    - iv. Bypass operation procedures
    - v. Major system power fail resets and restarts
    - vi. Trend log listing
  - d) Recommended maintenance events log
    - i. HVAC air filter replacement schedule & log
    - ii. Building control system sensor calibration schedule & log
  - e) Operation & Maintenance Manuals - Location or delivery information
- 4. *Major systems*
  - a) HVAC systems & controls
    - i. Air conditioning equipment (chillers, cooling towers, pumps, heat exchanges, thermal energy storage tanks, etc)
    - ii. Heating equipment (boilers, pumps, tanks, heat exchanges, etc.)
    - iii. Air distribution equipment (fans, terminal units, accessories, etc.)
    - iv. Ventilation equipment (fans, accessories, and controls)



- v. Building automation system (workstation, servers, panels, variable frequency drives, local control devices, sensors, actuators, thermostats, etc.)
- b) Indoor lighting systems & controls
  - i. Lighting control panels
  - ii. Occupancy sensors
  - iii. Daylight harvesting systems
- c) Renewable energy systems
  - i. Photovoltaic panels & inverters
  - ii. Wind powered electrical generators & inverters
- d) Landscape irrigation systems
  - i. Water distribution diagrams
  - ii. Control system
- e) Water reuse systems
  - i. Reclaimed water system for indoor use
  - ii. Reclaimed water for irrigation use
- 5. *Site equipment inventory and maintenance notes*
  - a) Spare parts inventory
  - b) Frequently required parts and supplies
  - c) Special equipment required to operate or maintain systems
  - d) Special tools required to operate or maintain systems
- 6. *A copy of all special inspection verifications required by the enforcing agency of this code*
- 7. *Other resources and documentation*

[See \(Part 4\) for forms and templates.](#)

**Enforcement:**

At their discretion, the building official confirms demonstrated compliance during *Onsite Enforcement* by:

- a. Receipt of a copy of the Systems Manual, or
- b. Receipt of a form signed by the owner or owner representative attesting that the System's Manual has been completed.

[See \(Part 4\) for forms and templates.](#)

**CALGreen Section: 5.410.2.5.2 Systems operations training.** The training of the appropriate maintenance staff for each equipment type and/or system shall be documented in the commissioning report and shall include the following:

1. System/equipment overview (what it is, what it does and with what other systems and/or equipment it interfaces)
2. Review and demonstration of servicing/preventive maintenance
3. Review of the information in the Systems Manual
4. Review of the record drawings on the system/equipment

**Intent:**

The systems operation training verifies that a training program is developed to provide training to the appropriate maintenance staff for each equipment type and/or system and that this training program is documented in the commissioning report. The systems operations training program is specified in the project specifications for the major systems listed. The System Manual, Operation and Maintenance (O&M) documentation, and record drawings are prepared and available to the maintenance staff prior to implementation of any training or the development of a written training program. The training program is to be administered when the appropriate maintenance staff is made available to receive training.

**Existing Law or Regulation:**

No existing law or regulation. Review local ordinances for any applicable Systems Operation Training requirement.

**Compliance Method:**

The written training program includes: (a) learning goals and objectives for each session, (b) training agenda, topics, and length of instruction for each session, (c) instructor information and qualifications, (d) location of training sessions (onsite, off-site, manufacturer's or vendor's facility), (e) attendance forms, (f) training materials, and (g) description on how the training will be archived for future use.

1. *Systems/equipment overview*
  - a) Review OPR and BOD related to the major systems and equipment
  - b) Describe system type and configuration
  - c) Explain operation all major systems and equipment and how it interfaces with other systems and equipment
  - d) Describe operation of critical devices, controls and accessories
  - e) Review location of the major systems and equipment
  - f) Describe operation of control system for each system, location of critical control elements, and procedures to properly operate control system
  - g) Review recommendations for implementation to reduce energy and water use
2. *Review and demonstration of servicing/preventive maintenance*
  - a) Explain location or delivery contact of the Operation & Maintenance manuals
  - b) Review of all manufacturer's recommended maintenance activities to maintain warranty
  - c) Review and demonstrate frequent maintenance activities (air filter replacement, lubrication, fan belt inspection and/or replacement, condenser water treatment, etc.), and suggested schedule.
  - d) Review and demonstrate typical servicing procedures and techniques (electrical current, pressure, and flow readings, etc; calibration procedures, point trending, power fail restart procedures, etc.)
  - e) Locate, observe and identify major equipment, systems, accessories and controls
  - f) Review emergency shut-offs and procedures
3. *Review of the information in the Systems Manual*
  - a) Describe use of System Manual
  - b) Review elements of System Manual
  - c) Explain how to update and add revisions to System Manual

4. *Review record drawings on the systems/equipment*
  - a) Explain location or delivery contact of the record drawings
  - b) Review record drawings, revisions, and changes to original design drawings.
  - c) Review equipment schedules and compare with actual installed systems

[See \(Part 4\) for forms and templates.](#)

**Enforcement:**

At their discretion, the building official confirms demonstrated compliance during *Onsite Enforcement* by:

1. In the event appropriate maintenance staff is made available to receive training for each equipment type and/or system installed in the building.
  - a. Receipt of a copy of the written training program and completed attendance forms, or
  - b. Receipt of a form signed by the owner or owner representative attesting that the training program and delivery of training has been completed
  
2. In the event appropriate maintenance staff are unavailable to receive training for each equipment type and/or system installed in the building.
  - a. Receipt of a copy of the training program provided to the owner or owner's representative, or
  - b. Receipt of a form signed by the owner or owner representative attesting that the written training program has been provided.

[See \(Part 4\) for forms and templates.](#)

## 7. Commissioning report

**CALGreen Section: 5.410.2.6 Commissioning report.** A complete report of commissioning process activities undertaken through the design, construction and reporting recommendations for post-construction phases of the building project shall be completed and provided to the owner or representative.

### **Intent:**

The Commissioning Report documents the commissioning process and test results. The report includes confirmation from the commissioning agent verifying that commissioned systems meet the conditions of the Owner's Project Requirements (OPR), Basis of Design (BOD), and Contract Documents.

### **Existing Law or Regulation:**

No existing law or regulation. Review local ordinances for any applicable Commissioning Report requirement.

### **Compliance Method:**

The Components of the Commissioning Report include the following and are defined as follows:

1. Executive summary of process and results of commissioning program – including observations, conclusions and any outstanding items.
2. History of any system deficiencies and how resolved
  - a) Include outstanding deficiencies and plans for resolution
  - b) Include plans for seasonal testing scheduled for a later date
3. System performance test results and evaluations
4. Summary of training process completed and scheduled
5. Attach commissioning process documents
  - a) Commissioning Plan
  - b) Owners Project Requirements (OPR)
  - c) Basis of Design (BOD)
  - d) Executed installation checklists
  - e) Executed Functional Performance Test (FPT) forms
  - f) Recommendations for end-of-warranty review activities

[See \(Part 4\) for forms and templates.](#)

### **Enforcement:**

At their discretion, the building official confirms demonstrated compliance during *Onsite Enforcement* by:

- a) Receipt of a copy of the Commissioning Report, or
- b) Receipt of a form signed by the owner or owner representative attesting that the Cx Report has been completed.

[See \(Part 4\) for forms and templates.](#)

**CALGreen Section: 5.410.4 Testing and adjusting.** Testing and adjusting of systems shall be required for buildings less than 10,000 square feet.

**5.410.4.1 (Reserved)**

**5.410.4.2 Systems.** Develop a written plan of procedures for testing and adjusting systems. Systems to be included for testing and adjusting shall include at a minimum, as applicable to the project:

1. HVAC systems and controls
2. Indoor and outdoor lighting and controls
3. Water heating systems
4. Renewable energy systems
5. Landscape irrigation systems
6. Water reuse systems.

**5.410.4.3 Procedures.** Perform testing and adjusting procedures in accordance with industry best practices and applicable standards on each system as determined by the building official.

**5.410.4.3.1 HVAC balancing.** In addition to testing and adjusting, before a new space-conditioning system serving a building or space is operated for normal use, the system shall be balanced in accordance with the procedures defined by the Testing Adjusting and Balancing Bureau National Standards; the National Environmental Balancing Bureau Procedural Standards; or Associated Air Balance Council National Standards or as approved by the building official.

**5.410.4.4 Reporting.** After completion of testing, adjusting and balancing, provide a final report of testing signed by the individual responsible for performing these services.

**5.410.4.5 Operation and maintenance (O & M) manual.** Provide the building owner or representative with detailed operating and maintenance instructions and copies of guaranties/warranties for each system. O & M instructions shall be consistent with OSHA requirements in CCR, Title 8, Section 5142, and other related regulations.

**5.410.4.5.1 Inspections and reports.** Include a copy of all inspection verifications and reports required by the enforcing agency.

**Intent:**

For construction projects less than 10,000 square feet testing and adjusting the building systems can ensure maximum efficiency of the equipment operation as well improve the indoor air quality for occupants. Additionally, testing and adjusting building system can prolong the life of the systems and maximize the equipment intended design parameters.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

**Compliance Method:**

**Design Team:** Specify the systems in the project to be tested and adjusted; the testing team members and their qualifications, and the procedures, including those recommended by the manufacturer, as well as the report forms to be used in testing and adjusting.

**Contractor:** Maintain evidence of the qualifications of the testing and adjusting team and install the specified building systems in accordance with the plans and specifications. Examine systems for functional deficiencies that cannot be adjusted and report deficiencies discovered before and during testing and adjusting.

Prepare a testing and adjusting plan with step by step procedures and perform testing and adjusting of systems according to those procedures. Remedy any deficiencies that are discovered during testing. For HVAC systems use the balancing procedures defined by the organizations listed in the regulations, and perform additional testing and balancing as required to verify that balanced conditions are being maintained.

Complete testing and adjusting reports as required.

Prepare the O & M manual for turning over to the owner to encourage proper maintenance and optimum performance of the systems after Certificate of Occupancy.

**Enforcement:**

**Plan Intake:** Confirm that the testing and adjusting requirements are specified for the applicable building systems.

**On-Site Enforcement:** The inspector will collect copies of the testing, adjusting and balancing reports after all functional testing has been completed.

## **DIVISION 5.5 ENVIRONMENTAL QUALITY**

### **SECTION 5.503 – FIREPLACES**

**CALGreen Section: 5.503.1 General.** Install only a direct-vent sealed-combustion gas or sealed wood-burning fireplace, or a sealed woodstove or pellet stove, and refer to residential requirements in the California Energy Code, Title 24, Part 6, Subchapter 7, Section 150. Woodstoves, pellet stoves and fireplaces shall comply with applicable local ordinances.  
**5.503.1.1 Woodstoves.** Woodstoves and pellet stoves shall comply with U.S. EPA Phase II emission limits.

**Intent:**

Although limited in non-residential applications, this code provision is intended to prevent the use of indoor air for combustion and to prevent contaminated air and any unused fuel from escaping the sealed fireplace to maintain indoor air quality and increased energy efficiency.

**Existing Law or Regulation:**

Currently the California Energy Code, CCR, Title 24, Part 6, Subchapter 7, Section 150 regulates residential fireplaces. There may be a local or regional ordinance in place.

**Compliance Method:**

1. Specify and install a direct-vent gas fireplace
2. Specify and install a pellet or wood stove which meets the US EPA Phase II emission standards.
3. Comply with local or regional ordinance.

**Suggestion:**

**Contractor:** Retain product data sheets for onsite verification by the enforcing agency and for the operation and maintenance manual.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that the fireplaces and/or woodstoves meet the direct-vent sealed-combustion and/or US EPA Phase II emission limits.

**On-Site Enforcement:** The inspector should review the permit set of plans and product data sheets to verify that the fireplaces and/or woodstoves as specified on the approved plans and specifications are installed, or are stored on site with the ability to be verified.

## SECTION 5.504 POLLUTANT CONTROL

**CALGreen Section: 5.504.3 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.

**Intent:**

To enhance HVAC equipment efficiency and indoor air quality at building occupancy by preventing construction debris from building up in the air ducts during construction.

**Existing Law or Regulation:**

Section 604.4 of the California Mechanical Code, CCR, Title 24, Part 4, addresses Protection of Ducts to control “damage”. However, the CALGreen regulation is designed also to reduce indoor environmental pollution in an attempt to comply with the spirit of AB 1807 (Stats. 1983, c. 1047), the public policy that emissions of toxic air contaminants should be controlled to levels which prevent harm to the public health.

**Compliance Method:**

Either when stored or moved into rough frame, HVAC equipment openings and ducts should be protected and protection maintained until final startup of the system.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents to confirm that protection measures are required of the contractor.

**On-Site Enforcement:** During site visits that occur after equipment is delivered and prior to final HVAC startup, the inspector will verify that protection is in place.



**CALGreen Section: 5.504.4 Finish material pollutant control.** Finish materials shall comply with Sections 5.504.4.1 through 5.504.4.4.

**5.504.4.1 Adhesives, sealants, and caulks.** Adhesives, sealants, and caulks used on the project shall meet the requirements of the following standards:

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 5.504.4.1 and 5.504.4.2. 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.

**Tables not shown – refer to Code**

**5.504.4.3 Paints and coatings.** Architectural paints and coatings shall comply with VOC limits in Table 1 of the ARB Architectural Coatings Suggested Control Measure, as shown in Table 5.504.4.3, 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 5.504.4.3, 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 5.504.4.3 shall apply.

**5.504.4.3.1 Aerosol Paints and Coatings.** Aerosol paints and coatings shall meet the PWMIR 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.

**Table not shown – refer to Code**

**5.504.4.3.2 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

**5.504.4.4 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 Sustainable Choice.

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

**5.504.4.4.2 Carpet adhesive.** All carpet adhesive shall meet the requirements of Table 5.504.4.1.

**5.504.4.5 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 5.504.4.5

**Table not shown – refer to Code**

**5.504.4.5.1 Early compliance. Reserved.**

**5.504.4.5.2 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

**5.504.5. Resilient flooring systems.** For 50 percent of floor area receiving resilient flooring, install resilient flooring complying with the VOC-emission limits defined in the 2009 Collaborative for High Performance Schools (CHPS) criteria and listed on its Low-emitting Materials List (or Product Registry) or certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.

**[DSA-SS]** Documentation shall be provided that verifies that finish materials are certified to meet the pollutant emission limits.

**5.504.4.6.1 Verification of compliance.** Documentation shall be provided verifying that resilient flooring materials meet the pollutant emission limits.

**Note:** Products compliant with CHPS criteria and certified under the Greenguard Children & Schools program may also be used.

**Intent:**

The purpose of these measures is to reduce the volatile organic compounds (VOC) of finish materials commonly installed on a project, which will help improve air quality for the building occupants.

**Existing Law or Regulation:**

The low-VOC provisions are based on the recommendations, guidelines and regulations of the Air Resources Board cited in each section. Regulations for aerosol adhesives and paints and for composite wood products are found in California Code of Regulations, Title 17 as noted above.

**Compliance Method:**

Specify finish materials that meet the limits of VOC shown in the tables for adhesives and sealants, paints and coatings, and composite wood products (particle board and hardboard casework). Flooring products (carpet systems and resilient flooring) shall be specified to meet VOC limit criteria as tested by the listed organizations. Substitutes may be approved by the local enforcing authority if it deems equivalency.

**Suggestion:**

**Contractor:** Retain product data sheets for onsite verification by the enforcing agency and for the operation and maintenance manual. Sample compliance forms can be found in Part 4 of this Guide.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that the finishes are specified to meet VOC emission limits.

**On-Site Enforcement:** The inspector should review the permit set of plans and product data sheets maintained by the contractor to verify finishes specified on the approved plans and specifications are installed, or at least stored on site with the ability to be verified. The inspector may review data on material containers or specifications provided with products or accept self-certification form.

**CALGreen Section: 504.5.3 Filters.** In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a Minimum Efficiency Reporting Value (MERV) of 8.

**Intent:**

The intent of this regulation is to filter particulate matter from the air by the use of at least MERV 8-rated filters for improved air quality.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

**Compliance Method:**

Specify and install prior to occupancy at least MERV 8 filters for the return air grilles.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that the filters are specified to meet MERV 8.

**On-Site Enforcement:** The inspector should review the permit set of plans and product data sheets maintained by the contractor to verify that HVAC filtration specified on the approved plans and specifications are installed, or are stored on site with the ability to be verified. The inspector may check a sample of installed filters to verify the MERV rating.

**CALGreen Section: 5.504.7 Environmental tobacco smoke (ETS) control.** Where outdoor areas are provided for smoking, prohibit smoking within 25 feet of building entries, outdoor air intakes and operable windows and in buildings; or as enforced by ordinances, regulations, or policies of any city, county, city and county, California Community College, campus of the California State University, or campus of the University of California, whichever are more stringent. When ordinances, regulations, or policies are not in place, post signage to inform building occupants of the prohibitions.

**Intent:**

By prohibiting smoking in buildings, and in those instances where outdoor areas are and dedicated for the use of smokers, this provision is intended to improve indoor air quality and to protect non-smokers from second hand smoke.

**Existing Law or Regulation:**

State law prohibits smoking inside most buildings, and many local jurisdictions and college campuses have regulations that require a certain distance that smoking can occur outside a building. AB 1807 (Stats. 1983, c. 1047) is the public policy of the state that emissions of toxic air contaminants should be controlled to levels which prevent harm to the public health.

**Compliance Method:**

Include in the signage specification and post signs that prohibit smoking for an outdoor smoking area within 25 feet of building entries, outdoor air intakes and operable windows where they occur.

***Suggestion:*** *In order to clarify sign placement and smoking area(s), show on one or all of the following plans: Site Plan, Floor Plan, Elevations and/or Detail Sheet.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that, if an outdoor smoking area is shown, signage is specified and located.

**On-Site Enforcement:** The inspector should review the permit set of plans against the outdoor smoking area and verify signage installed in the field.

**CALGreen Section: 5.505.1 Indoor moisture control.** Buildings shall meet or exceed the provisions of California Building Code, CCR, Title 24, Part 2, Sections 1203 (Ventilation) and Chapter 14 (Exterior Walls). For additional measures not applicable to low-rise residential occupancies, see Section 5.407.2 of this code.

**Intent:**

The intent is to direct the code user to other parts of Title 24 and this part for those provisions that are intended to reduce the probability of mold and mildew growth and improve air quality.

**Existing Law or Regulation:**

California Building Code Section 1203 for attic spaces and under-floor ventilation, Chapter 14 for a weather-resistant exterior wall envelope, and Section 5.407.2.2 Entries and openings in this code.

**Compliance Method:**

***Design Team:*** Include details on the construction plans addressing issues of moisture control,

***Contractor:*** Understand and install moisture control according to construction documents and manufacturer's installation recommendations.

***Note:*** Vapor control recommendations for different climate zones may found at [www.buildingscience.com](http://www.buildingscience.com).

**Enforcement:**

***Plan Intake:*** The reviewer and/or plan checker should review the plans and specifications to confirm that moisture control features which meet Title 24 are specified and detailed.

***On-Site Enforcement:*** The inspector should review the permit set of plans and confirm that moisture control measures have been incorporated into the building. Collect a copy of self-certification form if completed and signed by the contractor.

## SECTION 5.506 INDOOR AIR QUALITY

**CALGreen Section: 5.506.1 Outside air delivery.** For mechanically or naturally ventilated spaces in buildings, meet the minimum requirements of Section 121 (Requirements For Ventilation) of the California Energy Code, CCR, Title 24, Part 6, or the applicable local code, whichever is more stringent, and Division 1, Chapter 4 of CCR, Title 8.

### **Intent:**

The purpose is to point building designers and contractors to the ventilation requirements in the California Code of Regulations that are intended to improve indoor air quality for building occupants.

### **Existing Law or Regulation:**

The California Energy Code, CCR, Title 24, Part 6, Sections 121(a) through 121(e) with flow rates as required by Table 121-A. There is a possibility of a more stringent local ordinance.

### **Compliance Method:**

Most engineers and contractors are familiar with following the provisions of the energy code that specify requirements for naturally and mechanically ventilated spaces, and may comply with this provision by using energy code compliance tools currently in place. Title 8 for Cal OSHA may have additional regulations which emphasize air quality for workers in particular environments which should be followed as required.

### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that building ventilation is calculated and specified to Title 24, Part 6, and if applicable, Part 8.

**On-Site Enforcement:** The inspector should review the permit set of plans against the natural ventilation features and mechanical ventilation systems that are installed on the project, requesting results of any testing of ventilation rates. Adequate pre-occupancy building ventilation shall be verified.

**CALGreen Section: 5.506.2 Carbon dioxide (CO<sub>2</sub>) monitoring.** For buildings equipped with demand control ventilation, CO<sub>2</sub> sensors and ventilation controls shall be specified and installed in accordance with the requirements of the current edition of the California Energy Code, CCR, Title 24, Part 6, Section 121(c).

**Intent:**

When demand control ventilation is required by Part 6, this provision intends to maintain CO<sub>2</sub> levels which are within the range that is safe for human occupation.

**Existing Law or Regulation:**

The current edition of the California Energy Code, CCR, Title 24, Part 6, Section 121(c) identifies the sensors, controls and devices required to keep CO<sub>2</sub> emissions at safe levels.

**Compliance Method:**

***Design Team:*** The designer should specify and show calculations and locations for CO<sub>2</sub> sensors in the construction documents. The team familiar with demand control ventilation will be familiar with these requirements.

***Contractor:*** The contractor should install the specified equipment and make sure that it is operating as designed. Again, familiarity with demand control ventilation will be an advantage.

**Suggestion:**

***Contractor:*** Retain product data sheets for onsite verification by the enforcing agency and for the operation and maintenance manual.

**Enforcement:**

***Plan Intake:*** The reviewer and/or plan checker should review the plans, specifications and calculations to confirm that sensors are included which meet the requirements of Part 6.

***On-Site Enforcement:*** The inspector should review the permit set of plans and product data sheets to verify that complying sensors displaying readings are installed in designated locations. He/she should obtain assurance that the readings are recorded as required by Part 6.

## SECTION 5.507 ENVIRONMENTAL COMFORT

**CALGreen Section: 5.507.4 Acoustical control.** Employ building assemblies and components with Sound Transmission Coefficient (STC) values determined in accordance with ASTM E90 and ASTM E413.

**5.507.4.1 Exterior noise transmission.** Wall and roof-ceiling assemblies making up the building envelope shall have an STC of at least 50, and exterior windows shall have a minimum STC of 30 for any of the following building locations:

1. Within 1,000 ft (300 m.) of right of ways of freeways.
2. Within 5 mi. (8 km) of airports serving more than 10,000 commercial jets per year.
3. Where sound levels at the property line regularly exceed 65 decibels, other than occasional sound due to church bells, train horns, emergency vehicles and public warning systems.

**Exception:** Buildings with few or no occupants and where occupants are not likely to be affected by exterior noise, as determined by the enforcement authority, such as factories, stadiums, storage, enclosed parking structures, and utility buildings.

**5.507.4.2 Interior sound.** Wall and floor-ceiling assemblies separating tenant spaces and tenant spaces and public places shall have an STC of at least 40.

**Note:** Example of assemblies and their various STC ratings may be found in the Catalog of STC and IIC Ratings for Wall and Floor/Ceiling Assemblies.

### **Intent:**

Where buildings are sited in the noisy areas described in this provision, the intent is to keep sound levels low enough to carry out the activities that take place inside the building without the distraction or discomfort of unwanted noise.

### **Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision for nonresidential buildings. There may be local ordinances that apply in those communities that have noise exposure such as commercial airports.

### **Compliance Method:**

**Design Team:** The designer should specify and detail wall and ceiling assemblies and show in the construction documents, showing on plans and/or sections the placement of sound walls and floor/ceilings.

**Contractor:** The contractor should install the wall and ceiling assemblies as designed.

### **Suggestion:**

Employing the services of an acoustical engineer is another option to assist with compliance. Choose an assembly from the “examples of assemblies” link that meet the corresponding sound ratings class.

**Note:** *Examples of assemblies and their various STC ratings may be found at:*  
[http://www.toolbase.org/PDF/CaseStudies/stc\\_icc\\_ratings.pdf](http://www.toolbase.org/PDF/CaseStudies/stc_icc_ratings.pdf) .

### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans, specifications and calculations to confirm that STC ratings are included which meet the requirements of Title 24.

**On-Site Enforcement:** The inspector should review the permit set of plans and product data sheets to verify that complying wall and ceiling assemblies are installed correctly.



## SECTION 5.508 OUTDOOR AIR QUALITY

**CALGreen Section: 5.508.1 Ozone depletion and greenhouse gas reductions.** Installations of HVAC, refrigeration and fire suppression equipment shall comply with Sections 5.508.1.1 and 5.508.1.2.

**5.508.1.1 Chlorofluorocarbons (CFCs.)** Install HVAC, refrigeration and fire suppression equipment that do not contain CFCs.

**5.508.1.2 Halons.** Install HVAC, refrigeration and fire suppression equipment that do not contain Halons.

### **Intent:**

This measure eliminates the use of chlorofluorocarbons and Halons in fire suppression, HVAC and refrigeration systems in order to assist in meeting statewide requirements for the reduction of green house gas emissions to 1990 levels and to prevent ozone destruction.

### **Existing Law or Regulation:**

Refrigerants are regulated at the federal level by the Environmental Protection Agency and those containing ozone depleting chemicals are being gradually phased out. In California, the Global Warming Solutions Act of 2006, Assembly Bill 32 (Stats 2006, c. 488), calls for the reduction of green house gas emissions to 1990 levels. Although these damaging compounds have been widely outlawed for most uses, prior to CALGreen, these issues were not addressed by the CCR Title 24 building standards.

### **Compliance Method:**

Clearly note in appropriate place(s) in the construction documents and in the equipment specifications that the required total restriction of these compounds has been followed.

***Note:** Typically, new fire suppression, HVAC and refrigeration systems are designed to operate on a new generation of refrigerants that do not contribute to greenhouse gases; but there is an inventory of CFCs and Halons used for the recharge of existing equipment. Ensure that new equipment is specified and installed, which is usually required in a new project.*

### **Enforcement:**

**Plan Intake:** Enforcement provided by plan check and the on-site inspection by the building official should insure the drawing and installation requirements have been met and that no HVAC, fire suppression or refrigeration systems installed use the above mentioned environmental contaminants.

**On-Site Enforcement:** The inspector should review the permit set of plans and product data sheets to verify that complying equipment is installed. Inspection of this equipment may be combined with verification of building commissioning or testing and adjusting.

## **Part 3 Appendix A5 Nonresidential Voluntary Measures**

### **CALGreen Code Appendix A5**

*Note:*

- 1. Some of the voluntary measures described in the following pages are required for compliance with the voluntary tiers, which themselves are explained in Division A5.6.*
- 2. The tiers and other voluntary measures are intended for a local jurisdiction to adopt as mandatory for its city or county. In that case, they are enforced as are the mandatory provisions of the code.*
- 3. If the owner or developer elects to employ measures voluntarily, he or she should direct attention to those being used on the project when applying for a building permit.*
- 4. Where employed voluntarily by a building owner or developer, voluntary measures should also be enforced by local building departments to make sure they are being met as described in each provision.*

## ***DIVISION A5.1 PLANNING AND DESIGN***

### **A5.103 SITE SELECTION**

**CALGreen Section: A5.103.1 Community connectivity.** Where feasible, locate project on a previously developed site within a ½ mile radius of at least ten basic services, readily accessible by pedestrians, including, but not limited to, one each of bank, place of worship, convenience grocery, day care, cleaners, fire station, barber shop, hardware store, laundry, library, medical clinic, dental clinic, senior care facility, park, pharmacy, post office, restaurant (two may be counted), school, supermarket, theater, community center, fitness center, museum or farmers market. Other services may be considered on a case-by-case basis.

#### **Intent:**

The intent of this code provision is to ensure the reuse of existing sites in developed areas for non-residential districts to help minimize the impact of new site development on undeveloped lands, local air and water quality, as well as to minimize the greenhouse gas emissions generated from the development of a new site.

#### **Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision. However, some jurisdictions may have “Special Districts” or zoning that may benefit from these provisions. Verify with the local enforcing authority the existence of any special zoning conditions prior to implementation of community connectivity for your project.

#### **Compliance Method:**

For newly constructed projects only, select a previously developed site with connectivity to the community that can provide pedestrian access to basic services anticipated to be available within a community (examples listed above). In addition, other types of services may be considered on a case-by-case basis to lend greater flexibility to the site selection process. Provide ½ mile radius map of the project site area showing the ten basic services and their proximity to the site for review and approval.

#### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans, specifications and ½ mile area map to confirm the appropriate site selection has occurred.

**CALGreen Section: A5.103.2 Brownfield or greyfield site redevelopment or infill area development.** If feasible, select for a development a brownfield in accordance with Section A5.103.2.1 or on a greyfield or infill site as defined in Section A5.102.

**A5.103.2.1 Brownfield redevelopment.** Develop a site documented as contaminated by means of an ASTM E1903-97 Phase II Environmental Site Assessment or on a site defined as a brownfield by a local, state or federal government agency. The site must be fully remediated in accordance with EPA regulations to the level required of the anticipated land use.

**Intent:**

The intent of these provisions is to encourage the use of Brownfield sites, previously unusable sites due to contamination, or Greyfield sites, which are 50% covered with impervious materials. The use of these sites can reduce the impact on undeveloped land and greenhouse gas emissions created from the development of new sites as well as enhance the existing developed area with new construction further helping to minimize urban blight and promote economic growth.

**Existing Law or Regulation:**

Environmental Protection Agency (EPA) regulations and ASTM E1903-97 Phase II Environmental Site Assessment apply to Brownfields, and local ordinances may also be in place.

**Compliance Method:**

Prepare documentation regarding remediation of contaminated sites per ASTM and EPA assessment process. Confirm with local enforcing agency any zoning requirements or specific local, state or federal limitations related to Brownfield or Greyfield project sites.

**Enforcement:**

Verification that remediation has occurred in accordance with appropriate local, state or federal requirements for Brownfield or Greyfield development.

## SECTION A5.104 SITE PRESERVATION

**CALGreen Section: A5.104.1 Reduce development footprint and optimize open space.**

Optimize open space on the project site in accordance with Sections A5.104.1.1, A5.104.1.2 or A5.104.1.3.

**A5.104.1.1 Local zoning requirement in place.** Exceed the zoning's open space requirement for vegetated open space on the site by 25 percent.

**A5.104.1.2 No local zoning requirement in place.** Provide vegetated open space area adjacent to the building equal to the building footprint area.

**A5.104.1.3 No open space required in zoning ordinance.** Provide vegetated open space equal to 20 percent of the total project site area.

**Intent:**

The intent of this provision is to optimize the open space on a job site and to encourage the utilization of vegetation within available open spaces. Incorporation of these provisions may result of improving ground water recharge, open space preservation and wildlife habitat preservation, as well as increasing the carbon sink effect, thus reducing green house gas emissions.

**Existing Law or Regulation:**

No known state law exists. However, local zoning ordinances may have impact on these provisions.

**Compliance Method:**

Provide open space for vegetation via local ordinance and document location and calculations on site or landscape plans.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for the open space areas and calculations.

**On Site Enforcement:** The inspector should review the permit set of plans to confirm that the open space represented in the construction documents is preserved and planted as specified.

## SECTION A5.105 DECONSTRUCTION AND REUSE OF EXISTING STRUCTURES

**CALGreen Section: A5.105.1** If feasible, disassemble existing buildings instead of demolishing to allow reuse or recycling of building materials.

**A5.105.1.1 Existing building structure.** Maintain at least 75 percent of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing) based on surface area.

**Exceptions:**

1. Window assemblies and nonstructural roofing material.
2. Hazardous materials that are remediated as a part of the project.
3. A project with an addition of more than two times the square footage of the existing building.

**A5.105.1.2 Existing nonstructural elements.** Reuse existing interior nonstructural elements (interior walls, doors, floor coverings and ceiling systems) in at least 50 percent of the area of the completed building (including additions).

**Exception:** A project with an addition of more than two times the square footage of the existing building.

**A5.105.1.3 Salvage.** Salvage additional items in good condition such as light fixtures, plumbing fixtures and doors as follows. Document the weight or number of the items salvaged.

1. Salvage for reuse on the project items that conform to other provisions of Title 24 in an on-site storage area.
2. Nonconforming items may be salvaged in dedicated collection bins for exempt projects or other uses.

**Intent:**

The intent of these provisions is to reduce the amount of demolished material from an existing project that would otherwise end up in a landfill. It also encourages the reuse of materials, when possible, by integrating them into the new construction. The reuse of existing materials and the reduction in new material needs are established ways to reduce the amount of fuel for delivery vehicles and the amount of new material needed, resulting in reduced green house gas emissions produced during new building construction.

**Existing Law or Regulation:**

No known laws or regulations currently exist. Check with local jurisdiction regarding ordinances for these provisions.

**Compliance Method:**

A5.105.1.1 Existing building structure – Document for verification the calculations performed to establish the 75% minimum requirement for existing building structural components and show on a demolition, site or building plan.

A5.105.1.2 Existing nonstructural elements – Document for verification the calculations performed to establish that at least 50% of the area of the completed building the reuse of existing interior nonstructural elements and show in the plans.

A5.105.1.3 Salvage – Document for verification the calculations performed to establish the salvage weight or number of items salvaged for a given project.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and calculations that show the required percentages of reused existing building elements.

**On Site Enforcement:** The inspector should review the permit set of plans and confirm that the required percentages have been integrated, reused and salvaged as shown.

## SECTION A5.106 SITE DEVELOPMENT

**CALGreen Section: A5.106.2 Storm water design.** Design storm water runoff rate and quantity in conformance with Section A5.106.2.1 and storm water runoff quality by Section A5.106.2.2 or by local requirements, whichever are stricter.

**A5.106.2.1 Storm water runoff rate and quantity.** Implement a storm water management plan resulting in no net increase in rate and quantity of storm water runoff from existing to developed conditions.

**Exceptions:** If the site is already greater than 50 percent impervious, implement a storm water management plan resulting in a 25 percent decrease in the rate and quantity.

**A5.106.2.2 Storm water runoff quality.** Use postconstruction treatment control best management practices (BMPs) to mitigate (infiltrate, filter or treat) storm water runoff from the 85<sup>th</sup> percentile 24-hour runoff event (for volume-based BMPs) or the runoff produced by a rain event equal to two times the 85<sup>th</sup> percentile hourly intensity (for flow-based BMPs).

### **Intent:**

The intent of these provisions is to limit the amount and rate of water runoff to ensure no measurable increase from existing to developed conditions occurs. This will help to prevent the discharge of surface water pollutants from the project site into receiving waters in an attempt to maintain water quality.

These provisions make exception for impervious sites that cannot retain all of the storm water on site.

Additionally, the quality of the water runoff can be increased by incorporating treatment control best management practices (BMPs) through recommendations for project maintenance.

### **Existing Law or Regulation:**

No known laws or regulations currently exist. Check with local jurisdiction regarding ordinances for these provisions.

### **Compliance Method:**

The designer should design the site to insure that storm water runoff quality and rate does not increase from existing conditions. BMPs for storm water treatment control should be employed during construction. Recommendations for continuing treatment control should be included in the operation and maintenance manual.

### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for BMPs to control the storm water runoff rate, quantity and quality.

**On Site Enforcement:** The inspector should review the permit set of plans and verify that on site treatment controls meet with design criteria. He or she may check the operations and maintenance manual for recommendations on ongoing compliance.

**CALGreen Section: A5.106.3 Low impact development (LID).** Reduce peak runoff in compliance with Section 5.106. 1. Employ at least two of the following methods or other best management practices to allow rain water to soak into the ground, evaporate into the air or collect in storage receptacles for irrigation or other beneficial uses. LID strategies include, but are not limited to:

1. Bioretention (rain gardens);
2. Cisterns and rain barrels;
3. Green roof meeting the structural requirements of the building code;
4. Roof leader disconnection;
5. Permeable and porous paving;
6. Vegetative swales and filter strips; tree preservation; and
7. Volume retention suitable for previously developed sites.

**A5.106.3.1 Implementation.** If applicable, coordinate LID projects with the local Regional Water Quality Control Board, which may issue a permit or otherwise require LID.

**Note:** Further information on design of specific control measures may be found on U.S. EPA's website, on SWRCB's website and from local boards that require LID.

**A5.106.3.2 Greyfield or infill site.** Manage 40 percent of the average annual rainfall on the site's impervious surfaces through infiltration, reuse or evapotranspiration.

**Intent:**

A5.106.3.1 - The intent of these provisions is to encourage low impact development to reduce peak rain water runoff by utilizing local Regional Water Quality Control Boards mitigation measures and/or additional mitigation measures listed above.

A5.106.3.2 – For greyfield or infill sites, the intent is to manage rainfall on the site's impervious surfaces at a lower rate than for undeveloped sites.

**Existing Law or Regulation:**

Verify the existence of local Regional Water Quality Control Board mitigation measures required for LID.

**Compliance Method:**

Design specific control measures per EPA requirements of local Regional Water Control Board requirements for implementation on a LID site.

Show site design documents that demonstrate control measures for rainfall for undeveloped sites using mitigation measures listed above or from other referenced sources.

For greyfield or infill sites with impervious surfaces, indicate that at least 40 percent of annual rainfall is to be managed on site.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents to confirm compliance measures have been incorporated in the site design.

**On Site Enforcement:** The inspector should review the permit set of plans and verify that on site control measures meet with design criteria.



**CALGreen Section: A5.106.4.3 Changing rooms.** For buildings with over 10 tenant-occupants, provide changing/shower facilities for tenant-occupants only in accordance with Table A5.106.4.3 or document arrangements with nearby changing/shower facilities.

**Note:** Additional information on recommended bicycle accommodations may be obtained from Sacramento Area Bicycle Advocates.

**Intent:**

Changing rooms are included with the intent of enhancing the mandatory long term bicycle parking requirements by providing changing rooms and showers for tenant-occupants to further encourage alternate means of transportation. The goals are to reduce energy use and greenhouse emissions associated with motorized transportation and provide for the comfort of building occupants.

**Existing Law or Regulation:**

Check with local jurisdiction regarding local ordinances. For projects of the University of California, consult the University of California Policy on Sustainable Practices.

**Compliance Method:**

Provide plans and specifications for the project that show the changing rooms and amenities required per Table A5.106.4.3.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents to confirm compliance measures for changing rooms/shower facilities.

**On Site Enforcement:** The inspector should review the permit set of plans and verify that on site changing rooms/shower facilities meet with design criteria.

**CALGreen Section: A5.106.5.1 Designated parking for fuel-efficient vehicles.** Provide designated parking for any combination of low-emitting, fuel-efficient and carpool/van pool vehicles as shown in Table A5.106.5.1.1 or A5.106.5.1.2.

**A5.106.5.1.3 Parking stall marking.** Paint, in the paint used for stall striping, the following characters such that the lower edge of the last word aligns with the end of the stall striping and is visible beneath a parked vehicle:

CLEAN AIR VEHICLE

**A5.106.5.1.4 Vehicle designations.** Building managers may consult with local community Transit Management Associations (TMAs) for methods of designating qualifying vehicles, such as issuing parking stickers.

**Notes:**

1. Information on qualifying vehicles, car labeling regulations and DMV SOV stickers may be obtained from the following sources:
  - a. California DriveClean
  - b. California Air Resources Board
  - c. U.S. EPA fuel efficiency standards
  - d. Janet Okino, DMV Registration Operations, (916) 657 6678 and John Swanton, ARB Public Information, (626) 575-6858
2. Purchasing policy and refueling sites for low emitting vehicles for state employees use can be found at the Department of General Services.

**Intent:**

These code provisions are to encourage newly constructed projects to provide enhanced designated, reserved parking for clean air vehicles (low-emitting, fuel efficient, and carpool/van pool vehicles). The intent is to promote the use of clean air vehicles and conserve natural resources and reduce greenhouse gas emissions. These voluntary levels of compliance at 10% and 12% are intended to provide “reach” standards to help California meet its energy and greenhouse gas reduction goals.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision. Check to see if local jurisdiction ordinances exist and incorporate which ever is stricter.

**Compliance Method:**

On the site plan for the project provide identification of fuel-efficient parking stall locations, the number of stalls required based on total number of parking spaces and the application method, including the paint type to be used. The size of the characters included in the stall markings should be at least 8” high as for the mandatory Section 5.106.5.2.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents to confirm that fuel-efficient parking stall requirements have been incorporated in the site design.

**On Site Enforcement:** The inspector should review the permit set of plans and verify that on site parking designation meets with design criteria.

**CALGreen Section: A5.106.5.3 Electric vehicle charging.** Provide facilities meeting Section 406.7 (Electric Vehicle) of the *California Building Code* and as follows:

**A5.106.5.3.1 Electric vehicle supply wiring.** For each space required in Table A5.106.5.3.1, provide one 120 VAC 20 amp and one 208/240 V 40 amp, grounded AC outlets or panel capacity and conduit installed for future outlets.

**Intent:**

The intent of these provisions is to encourage the use of electric vehicles as an alternate means of transportation. These vehicles can help to reduce the amount of green house gas emission released into the environment and can assist in reducing personal transportation expenses.

**Existing Law or Regulation:**

The California Building Code has provisions in Chapter 4 regarding electric vehicle charging requirements. Check to see if local jurisdiction ordinances exist and incorporate which ever is stricter.

**Compliance Method:**

Include on the site plan and electrical plans the number of stalls required to have electric vehicle charging stations and the installation method, including the type of wiring to be used and the amperage required for that condition.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents to confirm compliance with the electrical vehicle recharging measures.

**On Site Enforcement:** The inspector should review the permit set of plans and verify that on site electrical vehicle charging stations have been installed on the site or parking garage in accordance with design criteria.

**CALGreen Section: A5.106.6 Parking capacity.** Design parking capacity to meet but not exceed minimum local zoning requirements.

**A5.106.6.1 Reduce parking capacity.** With the approval of the enforcement authority, employ strategies to reduce on-site parking area by

1. Use of on street parking or compact spaces, illustrated on the site plan or
2. Implementation and documentation of programs that encourage occupants to carpool, ride share or use alternate transportation.

**Note:** Strategies for programs may be obtained from local TMAs.

**Intent:**

The intent of these provisions is to provide vehicle parking to meet local zoning requirements but that reduces the on site area needed to accommodate the required number of parking spaces.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision. However, verify if local jurisdiction ordinances or TMA's (Transportation Management Authorities) exist.

**Compliance Method:**

Include on the site plans location and configuration of parking spaces, which could include on-street parking, a mix of standard and compact spaces or other approved strategies. Plans may include a reference to the local TMA program that may be used to reduce parking demand. If a TMA program is cited, include it in the operation and maintenance manual for reference by future building occupants.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents to confirm compliance measures have been incorporated in the site design as they relate to the parking capacity requirements and local zoning ordinances.

**On Site Enforcement:** The inspector should review the permit set of plans and verify that the reduced parking capacity strategies shown in the design have been carried out in construction. He or she may check the operation and maintenance manual if TMA programs are recommended for compliance.

**CALGreen Section: A5.106.7 Exterior wall shading.** Meet requirements in the current edition of the *California Energy Code* and select one of the following for wall surfaces:

1. Provide vegetative or man-made shading devices for east-, south- and west-facing walls with windows, with 30 percent coverage to a height of 20 feet or top of exterior wall, whichever is less, for east and west walls. Calculate shade coverage on the summer solstice at 10 AM for east-facing walls and at 3 PM for west-facing walls. Plant vegetative shade of species documented to reach desired coverage within 5 years of building occupancy.
2. Use wall surfacing with minimum SRI 25 (aged), for 75 percent of opaque wall areas.

**Exception:** Use of vegetated shade in Wildland-Urban Interface Areas as defined in Chapter 7A (Materials and Construction Methods for Exterior Wildfire Exposure) of the *California Building Code* shall meet the requirements of that chapter.

**Note:** If not available from the manufacturer, aged SRI value calculations may be found at the California Energy Commission's web site at [www.energy.ca.gov](http://www.energy.ca.gov) .

**Intent:**

The intent of these provisions is to reduce the amount of heat gain from solar exposure. During certain times of the year the exterior surfaces of a structure are subject to increased solar exposure. The reduction in heat gain through windows can be significantly reduced by exterior shading of the windows. Also, increasing the reflectance of opaque walls is intended to reduce the heat island effect for the area.

**Existing Law or Regulation:**

California Energy Code, Part 6, Title 24, California Code of Regulations regulates the energy efficiency of the building envelope.

**Compliance Method:**

Include in the landscape design and plant specifications species of plants that meet the shading requirements for exterior wall surfaces. Additionally, man-made shading devices can also be specified for exterior wall applications. Energy compliance forms and software programs may serve as documentation of the efficacy of exterior shading and/or solar reflectance.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents to confirm compliance measures have been incorporated in the building and site design.

**On Site Enforcement:** The inspector should review the permit set of plans and verify that man-made or vegetative shading devices are installed as designed and confirm that any exposed opaque walls are compliant with specified SRI values.

**CALGreen Section: A5.106.9 Building orientation.** Locate and orient the building as follows:

1. When site and location permit, orient the building with the long sides facing north and south.
2. Protect the building from thermal loss, drafts and degradation of the building envelope caused by wind and wind-driven materials such as dust, sand, snow and leaves with building orientation and landscape features.

**Note:** For information on sun angles and shading, visit: <http://www2.aud.ucla.edu/energy-design-tools/> . Calculations may be made using the Solar-2 tool.

**Intent:**

The intent of these provisions is to encourage employment of passive solar design principles to moderate the ill effects of solar radiation. This can result in reduced energy usage and greenhouse gas emissions and in reduced cost of operation. Additional measures may be applied to assist in protecting the building envelope during weather events.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision. Verify with local authorities any ordinances that may impact building orientation.

**Compliance Method:**

Include in the site and building plans and landscape plan building location and orientation to consider passive solar principles, as well as landscaping specifications that meet the exterior wall surface protection requirements.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents to confirm compliance measures have been incorporated in the building and site design.

**On Site Enforcement:** The inspector should review the permit set of plans and verify that the building is oriented as intended and that the landscape features are installed as designed.

**CALGreen Section: A5.106.11 Heat island effect.** Reduce nonroof heat islands by Section A5.106.11.1 and roof heat islands by Section A5.106.11.2.

**A5.106.11.1 Hardscape alternatives.** Use one or a combination of strategies 1 through 3 for 50 percent of site hardscape or put 50 percent of parking underground.

1. Provide shade (mature within 5 years of occupancy).
2. Use light colored/high-albedo materials.
3. Use open-grid pavement system.

**A5.106.11.2 Cool roof.** Use roofing materials having a minimum 3-year aged solar reflectance and thermal emittance complying with Sections A5.106.11.2.1 and A5.106.11.2.2 or a minimum aged Solar Reflectance Index (SRI) 3 complying with Section A5.106.11.2.3 and as shown in Table A5.106.11.2.1 or A5.106.11.2.2.

**A5.106.11.2.1 Solar reflectance.** Roofing materials shall have a minimum 3-year aged solar reflectance equal to or greater than the values specified in Table A5.106.11.2.1 for Tier 1 and Table A5.106.11.2.2 for Tier 2. If CRRC testing for 3-year aged reflectance is not available for any roofing products, the 3-year aged value shall be determined using the Cool Roof Rating Council (CRRC) certified initial value using the equation

$$\text{Raged} = [0.2 + 0.7(\text{initial} - 0.2)], \text{ where } \text{initial} = \text{the initial Solar Reflectance.}$$

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

**A5.106.11.2.2 Thermal emittance.** Roofing materials shall have a CRRC initial or 3-year aged thermal emittance equal to or greater than those specified in Table A5.106.11.2.1 for Tier 1 and Table A5.106.11.2.2 for Tier 2. Thermal emittance may also be certified by other supervisory entities approved by the Commission pursuant to Title 24, Part 1, Section 10-113.

**A5.106.11.2.3 Solar reflectance index alternative.** Solar Reflectance Index (SRI) equal to or greater than the values specified in Table A5.106.11.2.1 for Tier 1 and Table A5.106.11.2.2 for Tier 2 may be used as an alternative to compliance with the 3-year aged solar reflectance values and thermal emittance. SRI values used to comply with this section shall be calculated using the Solar Reflective Index (SRI) Calculation Worksheet (SRI-WS) developed by the California Energy Commission or in compliance with ASTM E 1980-01 as specified in Title 24, Part 6, Section 118(i)3. Solar reflectance values used in the SRI-WS shall be based on the 3-year aged reflectance value of the roofing product or the equation in section A5.106.11.2.1 if the CRRC certified aged solar reflectance are not available. Certified Thermal emittance used in the SRI-WS may be either the initial value or the three year aged value listed by the CRRC certified by other supervisory entities approved by the Commission pursuant to Title 24, Part 1, Section 10-113.

**Note:** The Solar Reflective Index Calculation Worksheet (SRI-WS) is available by contacting the Energy Standard Hotline at 1-800-772-3300 or by email at [Title24@energy.state.ca.us](mailto:Title24@energy.state.ca.us)

**A5.106.11.3 Verification of compliance.** If no documentation is available, an inspection shall be conducted to ensure roofing materials meet cool roof aged solar reflectance and thermal emittance or SRI values.

**Intent:**

The intent of these provisions is to minimize the creation of nonroof and roof heat islands in new construction to reduce the energy load for building cooling and to moderate atmospheric temperature.

Additionally, cool roof installations are included in Tier 1 and Tier 2 provisions for adoption by cities and counties wishing to go beyond the minimum mandatory requirements for their communities.

**Existing Law or Regulation:**

California Energy Code, Part 6, Title 24, California Code of Regulations regulates the energy efficiency of the building envelope.

**Compliance Method:**

Show on the site/landscape plan the application of hardscape material with a calculation that represents at least a 50% area for alternatives to hardscape material.

For cool roof application include with the energy calculations a Solar Reflective Index – Work Sheet (SRI-WS) and specifications for cool roof materials selected to comply with the cool roof provisions shown in Table A1.506.11.2.1 or A1.506.11.2.2.

**Suggestion:**

**Contractor:** *Maintain product data sheets for roofing materials for onsite verification by the enforcing agency and for the operation and maintenance manual.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for the hardscape design calculations; and energy compliance forms and specifications for compliance with the cool roof provisions.

**On Site Enforcement:** The inspector should review the permit set of plans and verify that hardscape alternatives are constructed as calculated. He or she should check product data sheets for the roofing materials for compliance with cool roof values. If no documentation is available, he or she should inspect the project to ensure materials selected meet the SRI values.



## **DIVISION A5.2 ENERGY EFFICIENCY**

### **SECTION A5.203 PERFORMANCE APPROACH**

**A5.203.1 Energy performance.** For the purposes of energy efficiency standards in this code the California Energy Commission will continue to adopt mandatory building standards. It is the intent of this code to encourage green buildings to achieve exemplary performance in the area of energy efficiency. Specifically, a green building should achieve more than a 15% reduction in energy usage when compared to the State's mandatory energy efficiency standards.

Using an Alternative Calculation Method approved by the California Energy Commission, calculate each nonresidential building's TDV energy and CO<sub>2</sub> emissions, and compare it to the standard or "budget" building.

**A5.203.1.1 Tier 1 [BSC] Energy efficiency – 15% above Title 24, Part 6 [DSA-SS]** Exceed California Energy Code requirements, based on the 2008 Energy Efficiency Standards, by 15% and meet the requirements of Division A5.6.

**A5.203.1.2 Tier 2 [BSC] Energy efficiency – 30% above Title 24, Part 6 [DSA-SS]** Exceed California Energy Code requirements, based on the 2008 Energy Efficiency Standards, by 30% and meet the requirements of Division A5.6.

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

#### **Intent:**

The intent of these "reach" standards is to encourage building performance beyond the requirements in the 2010 California Energy Code, CCR, Title 24, Part 6, which are based on the Energy Commission's 2008 Building Energy Efficiency Standards. The State 2008 Long Term Energy Efficiency Strategic Plan calls for zero net energy use in newly constructed commercial buildings by 2030, and these reach standards are meant to assist with meeting that goal.

#### **Existing Law or Regulation:**

The 2010 California Energy Code, CCR, Title 24, Part 6 sets the minimum energy efficiency standards for those buildings under the authority of the California Energy Commission, including most commercial occupancies. Some local jurisdictions have adopted stricter energy efficiency standards with the approval of the Energy Commission.

#### **Compliance Method:**

Software used to calculate a building's energy performance for compliance with Part 6 (commonly referred to locally as "Title 24") is also used for the purposes of achieving either 15 percent or 30 percent improvement. Compliance documents should be submitted with the construction documents in whatever format the enforcing agency requires for basic energy code compliance.

**Note:** For guidance on the associated voluntary standards included in the tiers for each project, refer to each section's guidelines in this Part of the Guidebook.

#### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications for the energy compliance forms or other documentation as for basic energy code compliance. He or she should also verify compliance with the associated voluntary measures. (See note above.)

**On-Site Enforcement:** The inspector should review the permit set of plans and energy compliance documents against what features are installed in the project, including HVAC, windows, insulation, roofing, lighting, controls, etc., to make sure the installations comply. This is similar to what site inspectors or third party inspectors do for basic energy code compliance.

## SECTION A5.204 PRESCRIPTIVE APPROACH

**A5.204.1 ENERGY STAR equipment and appliances.** All equipment and appliances provided by the builder shall be ENERGY STAR labeled if ENERGY STAR is applicable to that equipment or appliance.

### **Intent:**

The intent of this provision is to encourage the installation of equipment and appliances that, carrying the ENERGY STAR label, are certified under that national program to be more energy efficient than standard equipment and appliances. ENERGY STAR products meet federal energy efficiency standards (see section immediately following), include features appealing to customers, and are generally available in the marketplace.

### **Existing Law or Regulation:**

The National Appliance Energy Conservation Act (NAECA) of 1987 set minimum energy efficiency standards for residential appliances for all the states. Its updates and subsequent acts in the Energy Policy Act (EPA) of 1992 and 2005 and the Energy Independence and Security Act (EISA) of 2007 broadened the scope of equipment and appliances. The provisions are managed by the Department of Energy. In California, CCR, Title 20 contains appliance energy efficiency standards that address appliances not covered by the federal standards.

### **Compliance Method:**

Specify appliances to be provided by the contractor to be ENERGY STAR where that appellation is available for the products needed. Substitutions may be submitted if data is supplied to show equivalency in energy savings to an ENERGY STAR product. Where a product is not available with an ENERGY STAR designation, make sure that it meets minimum federal and/or state energy efficiency standards.

**Note:** *ENERGY STAR product listing is available on the ENERGY STAR website.*

### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications and/or the energy compliance documentation for ENERGY STAR specifications or equivalency if this voluntary measure is declared for this project.

**On-Site Enforcement:** The inspector should review the permit set of plans and/or energy compliance documents and make sure the equipment and appliances specified to be ENERGY STAR or their equivalents are installed.

**A5.204.2 Energy monitoring.** Provide sub-metering or equivalent combinations of sensor measurements and thermodynamic calculations, if appropriate, to record energy use data for each major energy system in the building, including chillers, heat pumps, packaged AC systems, fans, pumps, cooling towers, boilers and other heating systems, lighting systems, and process loads. This energy use data, once collected, shall be stored within a data management system.

**A5.204.2.1 Data storage.** The data management system must be capable of electronically storing energy data and creating user reports showing hourly, daily, monthly and annual energy consumption for each major energy system. Hourly data shall be retained a minimum of 30 days, daily data shall be retained a minimum of 6 months and monthly data shall be retained a minimum of 2 years.

**A5.204.2.2 Data access.** Hourly energy use data shall be accessible through a central data management system and must be available daily.

**Intent:**

The intent of energy monitoring is to encourage building performance beyond the requirements established by the Energy Commission's Title-24 Part 6 Energy Efficiency Standards. Building monitoring provides continuous data feed which can be used to correct system imbalances, incorrect adjustments and other system problems, assuring optimal system performance when used by maintenance and management staff after building occupancy. The installation of building monitoring requires carefully followed installation protocols to assure that the initial building performance readings are correct. The building performance shall be established by one of the four options provided by the International Performance Measurement and Verification Protocol (IPMVP, 2002).

**Existing Law or Regulation:**

No regulation exists within the state that requires energy monitoring beyond a basic utility level metering for the purpose of tariffs (i.e., end-user billing) at monthly or other acceptable time-scale aggregation of metered reading.

**Compliance Method:**

Based on the type of measures installed in the candidate building that establishes the level of energy performance, select one appropriate IPMVP option (i.e., option A, B, C or D) to showcase the candidate building's performance levels. Once selected, the option will provide the required parameters, methodology, and measurement techniques to establish the building performance levels. Upon the selection of an IPMVP option, the building performance will be established by following the selected option to perform energy assessment (both methodology and measurement techniques) as described in the IPMVP compliance manual and the appendices of the compliance manual.

**Enforcement:**

**Plan intake:** The building owner or their agent will be expected to certify the building performance levels to the building department staff to attain the desired level status to the satisfaction of the enforcing agency.

**On-site enforcement:** Building department staff may complete the process by verifying the performance levels through on-site data (i.e., nameplate data, monitored data) for simple measures and/or using special inspection verification for complex systems. A special inspector or owners' agent may provide the performance verification by providing supporting calculations, calibrated whole-building simulation using the installed monitored parameters and established methodology as outlined for the selected option in the IPMVP.

**A5.204.3 Demand response.** HVAC systems with Direct Digital Control Systems and centralized lighting systems shall include pre-programmed demand response strategies that are automated with either a Demand Response Automation Internet Software Client or dry contact relays.

**A5.204.3.1 HVAC.** The pre-programmed demand response strategies shall be capable of reducing the peak HVAC demand by cooling temperature set point adjustment.

**A5.204.3.2 Lighting.** The pre-programmed demand response strategies shall be capable of reducing the total lighting load by a minimum 30% through dimming control or bi-level switching.

**A5.204.3.3 Software clients.** The software clients shall be capable of communicating with a DR Automation Server.

**Intent:**

The intent of this provision is to encourage the installation of automated controls that can reduce a building's power demand in response to a request signal. The request signal is typically issued by a local utility.

**Existing Law or Regulation:**

Title 24, Part 6 (Sections 122(h), 131(g), 133(a)3 Exception 4), requires installation of controls for certain building types and applications that enable demand response but there is no existing law or regulation that requires enrollment in a demand response program.

When demand response controls are installed, there are portions of numerous existing codes and standards which may be applicable depending on the installed technology.

**Compliance Method:**

Specify and install demand response controls that meet or exceed the requirements for each system type. Include, in the construction documents, load schedules for the amount of power demand that will be reduced for each system type. Enroll in local utility or utility sponsored demand response program.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should verify that demand response controls are specified in construction documents. He or she should review the control diagrams, circuiting/wiring, and load schedules for the appropriate amounts of controlled power demand reduction for each system type.

**On-Site Enforcement:** The inspector should verify that demand response controls, as specified in the construction documents, are installed. To the extent possible, he or she should use the load schedules and a test signal to verify that the appropriate loads are controlled in response to the test signal. To the extent possible, he or she should use the load schedules and a test signal to verify that the appropriate amounts of power demand reduction are achieved in response to the test signal. He or she should verify enrollment in local utility or utility sponsored demand response program.

## SECTION A5.211 RENEWABLE ENERGY

**A5.211.1 On-site renewable energy.** Use on-site renewable energy sources such as solar, wind, geothermal, low-impact hydro, biomass and bio-gas for at least 1% of the electric power calculated as the product of the building service voltage and the amperage specified by the electrical service overcurrent protection device rating or 1kW, (whichever is greater), in addition to the electrical demand required to meet 1% of the natural gas and propane use. The building project's electrical service overcurrent protection device rating shall be calculated in accordance with the 2007 California Electrical Code. Natural gas or propane use is calculated in accordance with the 2007 California Plumbing Code.

**A5.211.1.1 Documentation.** Using a calculation method approved by the California energy Commission, calculate the renewable on-site energy system to meet the requirements of Section A5.211.1, expressed in kW. Factor in net-metering, if offered by local utility, on an annual basis.

### **Intent:**

The intent of this provision is to encourage the installation of on-site renewable energy generation that will offset a portion of the building's energy use.

### **Existing Law or Regulation:**

There are no existing laws or regulations that mandate the installation of on-site renewable energy generation. When on-site renewable energy generation is installed, there are portions of numerous existing codes and standards which may be applicable depending on the installed technology.

### **Compliance Method:**

Specify and install an on-site renewable energy system with an expected annual energy generation equal to or greater than the calculated requirements. Include system sizing calculations in the construction documents. The output of the on-site renewable energy system shall be metered with either a standalone performance meter or inverter-integrated meter for measurement of the system's performance.

### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should verify that an on-site renewable energy system is specified in construction documents and review the system sizing calculations.

**On-Site Enforcement:** The inspector should verify that an on-site renewable energy system, sized as specified in the construction documents, is installed. To the extent possible, he or she should verify that the on-site renewable energy system is functional and producing the expected amount of energy.

**A5.211.3 Green Power.** If offered by local utility provider, participate in a renewable energy portfolio program that provides a minimum of 50% electrical power from renewable sources. Maintain documentation through utility billings.

**Intent:**

The intent of this provision is to encourage the purchase of electricity from a utility that offers a renewable energy portfolio, reducing dependency on carbon-based fuel for energy generation and associated greenhouse gas emissions.

**Existing Law or Regulation:**

There may be regulations for utilities to follow for their portfolios or pricing mechanisms for consumer protection, but there are no building energy standards relative to this concept.

**Compliance Method:**

Indicate in the electrical plans and/or specifications the intent to enroll in the renewable energy portfolio of the local utility to purchase electricity at least at the 50% renewables level. As construction draws to a close, the intent should be recorded in the operation and maintenance manual as a recommended practice in the operation of the building beyond certificate of occupancy.

***Suggestion:*** *If enrolled during construction, the contractor should make available for the enforcing agency utility billings showing the program details.*

**Enforcement:**

**Plan Intake:** If the permittee expresses the intent to participate in the utility's renewable energy portfolio for the purchase of electricity, the reviewer and/or plan checker should review the plans and specifications for the documentation.

**On-Site Enforcement:** The inspector should review the permit set of plans, check any utility electricity billings documenting enrollment in a renewable energy program, and check the operation and maintenance manual for recommendations to continue with the program.

**A5.211.4 Pre-wiring for future solar.** Install conduit from the building roof or eave to a location within the building identified as suitable for future installation of a charge controller (regulator) and inverter.

**A5.211.4.1 Off grid pre-wiring for future solar.** If battery storage is anticipated, conduit should run to a location within the building that is stable, weather-proof, insulated against very hot and very cold weather, and isolated from occupied spaces.

**Intent:**

The intent of this provision is to facilitate the installation of photovoltaic panels on a building in the future, if it is not accomplished during the initial construction of the project.

**Existing Law or Regulation:**

No statewide solar electricity building standards have been adopted for nonresidential new construction. Local jurisdictions may have adopted standards for solar installations. Some utilities and federal agencies offer rebate programs for the installation of photovoltaics to encourage their installation.

**Compliance Method:**

Show in the construction documents the location and specifications for the conduit(s) to be installed, ready for future installation of solar panels and ancillary equipment on the project. For off grid installations, batteries for storage of electricity should be anticipated in extending conduit to an appropriate location in the building.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications for the intended location of the conduit and the sizing to accomplish the purpose.

**On-Site Enforcement:** The inspector should review the permit set of plans and make sure that the specified conduit is installed in the location(s) shown.

## SECTION A5.212 ELEVATORS, ESCALATORS AND OTHER EQUIPMENT

**A5.212.1 Elevators and escalators.** In buildings with more than one elevator or two escalators, provide controls to reduce the energy demand of elevators for part of the day and escalators to reduce speed when no traffic is detected. Document the controls in the project specifications and commissioning plan. **[DSA-SS]** In Public School and Community College buildings, locate stairs conveniently to encourage their use in lieu of elevators or escalators.

**A5.212.1.1 Controls.** Controls that reduce energy demand shall meet requirements of CCR, Title 8, Chapter 4, Subchapter 6 and shall not interrupt emergency operations for elevators required in CCR, Title 24, Part 2, California Building Code.

### **Intent:**

The intent of this provision is to encourage, within the parameters established by Title 8 for elevator and escalator safety and the California Building Standards Code for fire regulations concerning vertical conveyances, installation and controls of elevators and escalators to conserve energy. Regenerative drive systems for both elevators and escalators are currently available for a price; in the case of elevators in a high-rise, approximately a 15% reduction in energy use could be realized, with a payback of 5 to 7 years.

### **Existing Law or Regulation:**

Title 8 contains regulations for elevator and escalator safety, including a reference to ASME A17.1-2004. ASME A17.1, in Section 6.1.4.1, states that "The speed attained by an escalator after start-up shall not be intentionally varied." This could be considered at odds with A5.212.1, and unless the permittee has obtained a variance from Title 8, as was the case at LAX in a recent remodel of the people-mover systems, other options for energy savings for escalators may be sought. The Building Standards Code regulates fire and panic safety concerning vertical conveyances and their controls, including use of elevators for fire access as required in an emergency.

### **Compliance Method:**

Specify elevators and/or escalators that feature energy-saving mechanisms and controls that meet Title 8 and Title 24. One option is include regenerative drive escalators and elevators (where traction elevators are specified). If submitted on a deferred approval basis, actual elevator and/or escalator product data should be made available to the enforcing agency.

### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for elevator and/or escalator specifications that include features for energy-savings and that meet Title 8 and Title 24. He or she should request product data and specifications for elevators and/or escalator information submitted separately as a deferred approval.

**On-Site Enforcement:** The inspector should review the permit set of plans and/or deferred approval submittal to make sure that the elevators and/or escalators and controls specified are installed as intended.



## SECTION A5.213 ENERGY EFFICIENT STEEL FRAMING

**A5.213.1 Steel framing.** Design steel framing for maximum energy efficiency. Techniques for avoiding thermal bridging in the envelope include:

1. Exterior rigid insulation;
2. Punching large holes in the stud web without affecting the structural integrity of the stud;
3. Spacing the studs as far as possible while maintaining the structural integrity of the structure; and
4. Detailed design of intersections of wall openings and building intersections of floors, walls, and roofs.

**Intent:**

The intentions of this provision are to provide means to reduce the thermal bridging of materials in contact with steel framing and to conserve the amount of steel used in a steel framing system.

**Existing Law or Regulation:**

Structural standards for building framing and for steel in particular are found in CCR, Title 24, Part 2, the California Building Code, and building energy efficiency standards are found in Part 6, the California Energy Code.

**Compliance Method:**

Within the structural parameters of the California Building Code and the energy efficiency standards of the energy code, specify material-efficient steel framing for those projects framed in steel. Reflect framing, assembly and intersections details, and material specifications in the construction documents. Where it is feasible, install exterior rigid insulation to avoid the transmission of heat through the steel framing. It is possible that rigid insulation cannot span widely-spaced framing members, so a choice of techniques may need to be made.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications for energy efficiency measures taken with the steel framing system and for compliance with Parts 2 and 6 of Title 24.

**On-Site Enforcement:** The inspector should review the permit set of plans and/or energy compliance documents to make sure that the energy efficiency measures shown in the documents are included on the project. A framing inspection may reveal any steel material conservation measures, and an additional inspection to examine envelope and detailing may be advisable.

## **DIVISION A5.3 WATER EFFICIENCY AND CONSERVATION**

### **SECTION A5.303 INDOOR WATER USE**

#### **CALGreen Section: A5.303.2.3.1 Tier 1 – 30 percent Savings. [BSC] 30 percent Savings.**

**[DSA-SS]** A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by 30 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 30 percent reduction in potable water use shall be demonstrated by one of the following methods.

1. Each plumbing fixture and fitting shall meet the 30 percent reduced flow rate specified in Table A5.303.2.3.1, or
2. A calculation demonstrating a 30 percent reduction in the building “water use baseline” as established in Table A5.303.2.2 shall be provided.

**A5.303.2.3.2 Tier 2 – 35 percent Savings.** A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by 35 percent shall be provided. A calculation demonstrating a 35 percent reduction in the building “water use baseline” as established in Table A5.303.2.2 shall be provided.

**A5.303.2.3.3 40 percent Savings.** A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by 40 percent shall be provided. A calculation demonstrating a 40 percent reduction in the building “water use baseline” as established in Table A5.303.2.2 shall be provided.

#### **Intent:**

The intent of these code provisions is to enhance indoor potable water use reduction beyond the mandatory requirement of 20 percent. They recognize that California’s water supply is unpredictable and likely to be stretched by future population growth and drought periods. The provisions also respond to the energy demands of treating potable water and moving it around the state. A 30 percent reduction is required for the achievement of Tier 1 compliance, and a 35 percent reduction for Tier 2.

#### **Existing Law or Regulation:**

Section 5.303.2 of this code mandates a 20 percent reduction in indoor potable water use through either a prescriptive or performance approach, and there may be a local ordinance in place otherwise for a reduction in water usage.

#### **Compliance Method:**

1. Specify each fixture or fitting to meet the 30 percent reduction shown on Table A5.303.2.
- OR
2. Performance method: As in the 20 percent reduction method, a calculation is performed to demonstrate overall 30, 35 or 40 percent savings using Table A5.303.2.2.

**Note:** *It may prove difficult to locate fixtures needed in a project that have reduced flows beyond the 20 percent level; for example, commercial lavatory faucets, widely available at 0.5 gpm are not widely available in a 0.4 gpm flow rate (20 percent savings), though aerators are available that can reduce flows to .35 gpm. The performance method may be a preferable path of compliance, where, for example, waterless urinals or 1-pint urinals are installed, or recycled water is available for flushing.*

*Sample worksheets are included in Part 4 of the Guide.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that either the prescriptive or performance method has been submitted and check for the 30 percent water reduction compliance. If the performance method is used, review the water calculations showing the 30, 35 or 40 percent reduction.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that the specified water 30 percent efficient plumbing fixtures and fixture fittings are installed. If the performance method was used, the inspector will verify that fixtures or systems used to reduce overall water use by 30, 35 or 40 percent have been installed. The inspector may review the fixture specifications to verify compliance or accept self-certification form.

**CALGreen Section: A5.303.3 Appliances.**

1. Clothes washers shall have a maximum Water Factor (WF) that will reduce the use of water by 10 percent below the California Energy Commissions' WF standards for commercial clothes washers located in Title 20 of the *California Code of Regulations*.
2. Dishwashers shall meet the following water use standards:
  - a. Residential—5.8 gallons per cycle
  - b. Commercial—refer to Table 603.3

**TABLE A5.303.3  
COMMERCIAL DISHWASHER WATER USE**

Type	High-Temperature— maximum gallons per rack	Chemical—maximum gallons per rack
Conveyer	0.70	0.62
Door	0.95	1.16 [BSC] 2.26 [DSA-SS]
Undercounter	0.90	0.98

3. Ice makers shall be air cooled.
4. Food steamers shall be connection-less or boiler-less.
5. **[BSC]** The use and installation of water softeners that discharge to the community sewer system shall be limited or prohibited by local agencies if certain conditions are met.

**Intent:**

The intent of this code provision is to enhance indoor potable water use reduction when a project includes water-using appliances supplied as part of the construction contract, not just plumbing fixtures. It may also be used to assist compliance with the mandatory requirement of 20 percent reduction in Section 5.303.2, the Tiers, or the 40 percent reduction.

**Existing Law or Regulation:**

Section 5.303.2 of this code mandates a 20 percent reduction in indoor potable water use through either a prescriptive or performance approach. If a Tier is adopted by your city or county, a 30 percent or a 35 percent reduction will likely be required, and there may be a local ordinance in place otherwise for a reduction in water usage.

**Compliance Method:**

Show in the construction documents the appliance specifications meeting these criteria. If substitutions are made during construction, provide documentation that the substituted appliances also meet them.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to check for appliance specifications to meet the criteria. Any deferred approvals should be checked for compliance.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that the specified water-using appliances are installed. The inspector may review the fixture specifications or approved substitutions to verify compliance or accept self-certification form.

**CALGreen Section: A5.303.5 Dual plumbing.** New buildings and facilities shall be dual plumbed for potable and recycled water systems for toilet flushing when recycled water is available as determined by the enforcement authority.

**Intent:**

The intent of this code provision is to reduce indoor potable water use when recycled water is available in the community. It can be used to meet the 20 percent, Tier 1 and Tier 2 or 40 percent reduction standards.

**Existing Law or Regulation:**

Section 5.303.2 of this code mandates a 20 percent reduction in indoor potable water use through either a prescriptive or performance approach. If a Tier is adopted by your city or county, a 30 or 35 percent reduction will likely be required, and there may be a local ordinance in place otherwise for a reduction in water usage. Chapter 16A, Division II, of the 2010 California Plumbing Code regulates the installation of dual plumbing systems for potable and recycled water.

**Compliance Method:**

Concurrently with the adoption of this voluntary standard, Department of Water Resources adopted dual plumbing standards for the plumbing code. Those standards must be met to satisfy this voluntary CALGreen provision, with certain exceptions approved by the enforcing agency for pre-plumbed systems. Particular emphasis is placed on prevention of cross-contamination, on labeling of non-potable systems, and on testing.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to verify that the dual plumbing standards in the 2010 California Plumbing Code, Chapter 16A, Division II are used in the design.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that the dual piping is installed and labeled as specified and in accordance with the plumbing code. If recycled water is immediately intended for use in the project, and not just pre-plumbed, the inspector should witness any testing of the system as required by the plumbing code and collect the results of any tests.

## SECTION A5.304 OUTDOOR WATER USE

**CALGreen Section: A5.304.2.1 Outdoor potable water use.** For new water service not subject to the provisions of *Water Code* Section 535, separate meters or submeters shall be installed for indoor and outdoor potable water use for landscaped areas between 500 square feet and 1000 square feet (the level at which Section 5.304.2 applies).

**Intent:**

The intent of this code provision is to enhance outdoor potable water use reduction beyond the mandatory requirement in Section 5.304.2 for separate meters for landscaped areas between 1000 and 5000 square feet, the level at which *Water Code* Section 535 (Stats. 2006, c. 559) applies.

**Existing Law or Regulation:**

The *Water Code* requires that separate meters be installed for landscaped areas more than 5000 square feet. Section 5.304.2 of this code mandates separate meters or submeters for landscaped areas between 1000 square feet and 5000 square feet. A more restrictive local ordinance may be in place.

**Compliance Method:**

1. First, determine if the new project has a landscaped area between 500 and 1,000 square feet. (The subject area is devoted to landscaping. Paved areas, areas of gravel or decomposed granite, or other permanent site features do not need to be included in the area for calculation. Undeveloped areas are included in the calculation to provide for future landscaping.)
2. If so, then Owner or contractor shall install a submeter after the main meter for outdoor potable water use.

***Suggestion:*** Show separate meters and submeters on the plans (*Site Utility Plan*) and specifications.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents to confirm that a separate submeter for landscape irrigation was provided.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that separate meters as specified on the approved construction documents are installed.

**CALGreen Section: A5.304.4 Potable water reduction.** Provide water efficient landscape irrigation design that reduces the use of potable water beyond the initial requirements for plant installation and establishment in accordance with Section A5.304.4.1 or A5.304.4.2. Calculations for the reduction shall be based on the water budget developed pursuant to Section 5.304.1.

**A5.304.4.1 Tier 1.** Reduce the use of potable water to a quantity that does not exceed 60 percent of ETo times the landscape area.

**A5.304.4.2 Tier 2.** Reduce the use of potable water to a quantity that does not exceed 55 percent of ETo times the landscape area.

**Note:** Methods used to accomplish the requirements of this section must be designed to the requirements of the *California Building Standards Code* and shall include, but not be limited to, the following:

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

**A5.304.4.3 Verification of compliance.** A calculation demonstrating the applicable potable water use reduction required by this section shall be provided

**Intent:**

The intent of these code provisions is to reduce the use of potable water for landscape irrigation beyond the mandatory requirements of the water budget in Section 5.304.1. The idea is to recognize that water is a scarce resource in California and take opportunities to reduce use whenever feasible. For this reason, these provisions are made part of the tier structure, which if adopted at the local level, will become minimum mandatory requirements for that community.

**Existing Law or Regulation:**

California Code of Regulations, Title 23, Division 2, Chapter 2.7 is the Department of Water Resources Model Water Efficient Landscape Ordinance (MLO) that contains provisions and calculations to establish water budgets for irrigation. Local jurisdictions may also have adopted landscape irrigation ordinances. As noted above, Section 5.304.1 of the CALGreen Code requires that each new nonresidential project establish a water budget in accordance with the MLO or local ordinance.

**Compliance Method:**

The basic water budget calculation sets up a base rate factor of evapotranspiration (ETo). It is made up of a mix of plant types that yield a plant factor (PF) multiplied by the efficiency of a typical landscape irrigation system (IE). The resulting number is the ETo adjustment factor (ETAF) which is 0.70 of the ETo for the project area.

Tier 1 goes one better by establishing the percentage of ETo, or ETAF, at 60%, 10% more restrictive than the base water budget. Likewise, Tier 2, at 55% drops the percentage of water budget ETo by 15%. These ETAFs are substituted for the one in the water budget formula to comply with Tier 1 or Tier 2.

**Note:** *The guidelines for Section 5.304.1 in this guidebook include sample calculations for the water budget which may also be followed for these tier calculations.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for calculations to confirm that a water budget using the reduced ETo factor is developed by either using the local ordinance and/or the California Department of Water Resources Model Water Efficient Landscape Ordinance.

**On-Site Enforcement:** The inspector should review the permit set of plans and calculations to verify that the approved water budget as specified is followed during construction. The MLO or local ordinance compliance forms may serve this purpose.



**CALGreen Section: A5.304.5 Potable water elimination.** Provide a water efficient landscape irrigation design that eliminates the use of potable water beyond the initial requirements for plant installation and establishment. Methods used to accomplish the requirements of this section must be designed to the requirements of the California Building Standards Code and shall include, but not be limited to, the following:

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

**Intent:**

The intent of these code provisions is to eliminate the use of potable water for landscape irrigation altogether. It emphasizes preserving the resource for human and wildlife consumption and for growing food exclusively.

**Existing Law or Regulation:**

The California Plumbing Code, in Appendix G, includes provisions for the installation of graywater systems. The Water Code contains many sections that encourage the safe use of recycled water for landscape irrigation and in buildings. The California Department of Public Health, the Department of Water Resources, the State Water Resources Control Board, and the nine California regional water boards regulate the treatment and use of recycled water. In Title 23 of the California Code of Regulations, the State Water Resources Control Board sets policy for recycled water projects.

**Compliance Method:**

There are three basic ways with which to comply with this provision:

1. Specify landscaping plant species that do not require irrigation beyond their establishment; for example, cacti, other dry-climate native shrubs, and trees. Show the names and locations of the plants on the landscape plan.
2. Provide a graywater irrigation system complying with California Plumbing Code Appendix G or a recycled water system meeting state standards, where provided by the locality, as acceptable to the local jurisdiction. Detail in construction documents.
3. Use a combination of landscaping that requires no water beyond plant establishment and other landscape materials such as paving, decomposed granite, gravel or mulch. Indicate these on landscape plans and in specifications.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for landscape plans and specifications for landscape materials. He or she should make sure that any alternate source of water for irrigation meets applicable local, regional or state standards.

**On-Site Enforcement:** The inspector should review the permit set of plans for the landscaping or alternative source of irrigation water and make sure that landscaping materials and/or irrigation sources are installed as shown in the plans.

**CALGreen Section: A5.304.6 Restoration of areas disturbed by construction.** Restore all landscape areas disturbed during construction by planting with local adaptive and/or non-invasive vegetation.

**A5.304.7 Previously developed sites.** On previously developed or graded sites restore or protect at least 50% of the site area with adaptive and/or non-invasive vegetation. Projects complying with Section A5.106.3, Item 3 may apply vegetated roof surface to this calculation if the roof plants meet the definition of adaptive and non-invasive.

**Exception:** Area of the building footprint is excluded from the calculation.

**Intent:**

The intent of these code provisions is reduce the use of potable water for landscape irrigation through restoring disturbed or previously developed sites with locally adaptive, including native, vegetation. It is meant to assist with control of erosion and stormwater pollution during and after construction. It also seeks to reduce the possibility of the spread of invasive exotic vegetation that have a tendency to overrun their ecosystems, reducing diversity of flora and fauna.

**Existing Law or Regulation:**

CCR, Title 3, contains Department of Food and Agriculture regulations for invasive plants. Various laws in California's Fish and Game, Food and Agriculture, Harbors and Navigation, and Public Resources Codes address invasive plant and animal species, such as control of species carried in ships' ballast water and of stands of tamarisk, a highly invasive plant species.

Section 5.106.1 of this code and state and local regulations address stormwater pollution prevention, and this voluntary provision can assist with loss of soil due to erosion for the purposes of keeping receiving waters clean.

**Compliance Method:**

Site plans or landscape plans may be used to show where plants are intended to go as construction on the building project winds down. The 50% area calculations for previously developed sites can be shown on the site plan, and if applicable, on the roof plan. Any areas that are disturbed by accessing the building project, installing utilities, or stockpiling of earth for fill, for example, can be remediated using this provision.

Judicial siting of temporary facilities for the contractor's field office, utilities, sanitary facilities, and public access to the project site to disturb as little as possible of the area can assist with compliance with this provision. Restoring these areas as completion nears with the recommended vegetation should be shown on site or landscaping plans.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for landscape plans and specifications for landscape materials. In the case of previously developed sites, he or she should check the calculations for 50% coverage with recommended plantings.

**On-Site Enforcement:** The inspector should review the permit set of plans for the landscaping and make sure that the plants specified are installed in the locations as shown, checking to make sure that disturbed or previously developed or graded areas are covered.

**CALGreen Section: A5.304.8 Graywater Irrigation System.** Install a graywater collection system for onsite subsurface irrigation using graywater collected from bathtubs, showers, bathroom wash basins, and laundry water. See Appendix G, 2010 California Plumbing Code.

**Intent:**

The intent of these code provisions is to eliminate the use of potable water for landscape irrigation. It emphasizes preserving the resource for human and wildlife consumption and for growing food exclusively.

**Existing Law or Regulation:**

The California Plumbing Code, in Appendix G, includes provisions for the installation of graywater systems. There may be local prohibitions or requirements for the use of graywater.

**Compliance Method:**

Provide a graywater irrigation system complying with California Plumbing Code Appendix G as acceptable to the local jurisdiction. Detail in construction documents on a graywater system piping plan and specifications for system components.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for the graywater system piping plan and the component specifications. He or she should make sure that the graywater system for irrigation meets applicable local, regional or state standards.

**On-Site Enforcement:** The inspector should review the permit set of plans for the graywater system and make sure that the system is installed as shown in the drawings, using the specified components.

## **DIVISION A5.4 MATERIAL CONSERVATION AND RESOURCE EFFICIENCY**

### **SECTION A5.404 EFFICIENT FRAMING TECHNIQUES**

**CALGreen Section: A5.404.1 Wood framing.** Employ Advanced Wood Framing Techniques, or Optimum Value Engineering (OVE), as recommended by the US Department of Energy's Office of Building Technology, State and Community Programs and as permitted by the enforcing agency.

**A5.404.1.1 Structural or fire-resistance integrity.** The OVE selected shall not conflict with structural framing methods or fire-rated assemblies required by the California Building Code.

**A5.404.1.2 Framing specifications.** Advanced framing techniques include the following:

1. Building design using 2-foot modules,
2. Spacing wall studs up to 24 inches on center,
3. Spacing floor and roof framing members up to 24 inches on center,
4. Using 2-stud corner framing and drywall clips or scrap lumber for drywall backing,
5. Eliminating solid headers in non-load-bearing walls,
6. Using in-line framing, aligning floor, wall and roof framing members vertically for direct transfer of loads, and
7. Using single lumber headers and top plates where appropriate.

**Note:** Additional information can be obtained at the following web site:  
[www.buildingscience.com](http://www.buildingscience.com)

#### **Intent:**

The intent of this measure is to decrease the quantity of wood needed to achieve structural framing standards that meet or exceed Title 24 wood framing requirements.

A framing plan can do more than just layout studs, openings, floor and roof joists, etc. There are opportunities to value engineer the floor system to and obtain a proper joist count, to ensure all plumbing and HVAC is coordinated with the floor framing and to insure that the "stack framing" concept is followed on the job site. Most importantly, all these issues are resolved on paper prior to casting the foundation

#### **Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

#### **Compliance Method:**

Incorporate as many OVE innovations and techniques to increase the overall efficiency of materials and energy required to achieve equivalent results to standard construction practices. Detailing drawings down to the level of individual framing members will make the plan reviewers' and inspectors' jobs easier. OVE includes more than just the arrangement of wood framing members.

Other categories

- Dimensional design and layout
- Material selection and purchase
- Delivery and on-site storage
- Framing techniques (including an innovative new shear panel)
- Waste and disposal – an innovative structural use of wood waste

(Use (SEE) stud per [www.buildingscience.com](http://www.buildingscience.com) —Advanced Framing: Using Wood Efficiently from Optimizing Design to Minimizing the Dumpster) See Section A5.408 for Tier Requirements)

**Note:** OVE techniques may require alternate material specifications such as drywall thickness, insulation thickness, sheathing thickness and nailing spacing and size. Further information may be found at; [www.buildingscience.com](http://www.buildingscience.com) , [www.eere.energy.gov](http://www.eere.energy.gov) or any other source developed to meet Title 24 Building standards.

**Enforcement:**

**Plan Intake:** The reviewer will review the plans in order to verify that any OVE measures are done in accordance with the innovative developing practices employed and other requirements of Title 24.

**On-Site Enforcement:** The inspector should review the permit set of plans and make sure all measures taken toward this goal are satisfied as drawn and specified. The level of inspection will likely be in proportion to the level of details specified in the construction documents.

## SECTION A5.405 MATERIAL SOURCES

**CALGreen Section: A5.405.1 Regional materials.** Compared to other products in a given product category, select building materials or products for permanent installation on the project that have been harvested or manufactured in California or within 500 miles of the project site.

1. For those materials locally manufactured, select materials manufactured using low embodied energy or those that will result in net energy savings over their useful life.
2. Regional materials shall make up at least 10%, based on cost, of total materials value.
3. If regional materials make up only part of a product, their values are calculated as percentages based on weight.
4. Provide documentation of the origin, net projected energy savings, and value of regional materials.

### **Intent:**

The intent of this code provision is to conserve the energy associated with the transportation of building materials over long distances to the jobsite.

### **Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

### **Compliance Method:**

Identify the available sources of material products and choose the most sustainable and cost effective source within 500 miles of project site or within California. Show in the construction documents those intended to be obtained locally for 10% of materials cost. Keep receipts and records of material supply sources to present to the enforcing agency for verification that at least 10% of building materials, based on cost, are from a source within 500 miles of the project site or from within California.

### **Enforcement:**

**Plan Intake:** **Plan Intake:** The reviewer and/or plan checker should review the construction documents for the building products specified that are locally available and the projected calculation of 10% of materials value.

**On-Site Enforcement:** Using receipts and records supplied by the building contractor, the inspector should verify that 10% has been acquired from a source within 500 miles of project location.

**CALGreen Section: A5.405.2 Bio-based materials.** Select bio-based building materials and products made from solid wood, engineered wood, bamboo, wool, cotton, cork, straw, natural fibers, products made from crops (soy-based, corn-based) and other bio-based materials with at least 50% bio-based content.

**A5.405.2.1 Certified wood.** Certified wood is an important component of green building strategies and the California Building Standards Commission will continue to develop a standard through the next code cycle.

**A5.405.2.2 Rapidly renewable materials.** Use materials made from plants harvested within a ten-year cycle for at least 2.5% of total materials value, based on estimated cost.

**Intent:**

The intent of this code provision is to promote sustainable building practices by using self regenerating materials wherever possible; as opposed to finite and limited source materials.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

**Compliance Method:**

Show in the construction documents bio-based materials intended to be used in the project for 2.5% of materials estimated cost. Retain all certification accompanying the bio-based, certified and rapidly renewable component sources for verification by the enforcing agency for these conservation measures.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for the bio-based materials specified and calculations for 2.5% of estimated materials value.

**On-Site Enforcement:** The inspector should verify, using receipts and certifications provided by the contractor, what portion of the materials used meet the requirements of the bio-based resource conservation measures.

**CALGreen Section: A5.405.3 Reused materials.** Use salvaged, refurbished, refinished, or reused materials for a minimum of 5% of the total value, based on estimated cost of materials on the project. Provide documentation as to the respective values.

**Note:** Sources of some reused materials can be found at [CalRecycle](#).  
See also Appendix A5, Division A5.1, and Section A5.105.1 for on-site materials reuse.

**Intent:**

The intent of this voluntary code measure is to further conserve materials through the re-use of at least 5% of total building materials based on estimated construction cost.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

**Compliance Method:**

Show in the construction documents reused materials intended to be used in the project for 5% of materials estimated cost. Retain all documentation accompanying the reused materials for verification by the enforcing agency.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for the reused materials specified and calculations for 5% of estimated materials value.

**On-Site Enforcement:** The inspector should verify through receipts and other product purchase documentation that the percentage of building materials that have been re-used replacing the need for those additional “new materials” is 5% or greater of the overall material usage.



**CALGreen Section: A5.405.4 Recycled content, Tier 1 [DSA-SS] Recycled content.** Use materials, equivalent in performance to virgin materials, with postconsumer or preconsumer recycled content value (RCV) for a minimum of 10 percent of the total value, based on estimated cost of materials on the project. Provide documentation as to the respective values.

**A5.405.4.1 Recycled content, Tier 2.** Use materials, equivalent in performance to virgin materials, with postconsumer or preconsumer recycled content value (RCV) for a minimum of 15 percent of the total value, based on estimated cost of materials on the project. Provide documentation as to the respective values.

**A5.405.4.2 Determination of recycled content value (RCV)**

The recycled content of a material assembly shall be determined by weight and the fractional value of the weight is then multiplied by the total estimated cost of the material assembly.

**Note:** Sources and recycled content of some recycled materials can be found at CalRecycle.

**Intent:**

The purpose of this code measure is to reduce the use of virgin materials in favor of a percentage of the materials to meet varying levels of pre- or post-consumer recycled content values (RVC). These voluntary levels of compliance at 10% and 15% are intended to provide “reach” standards to help California meet its energy and greenhouse gas reduction goals.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

**Compliance Method:**

The target values are in terms of estimated cost, and cost is determined by the weight of the recycled content. By comparing the cost as determined by the weight the total RCV (defined in Section A5.402) is calculated and Tier levels are achieved accordingly. Show in the construction documents the recycled materials and calculations for 10% or 15% of estimated materials cost.

**Note:** Sources and recycled content of some recycled materials can be found at CalRecycle.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for the reused materials specified and calculations for 10% or 15% of estimated materials value.

**On-Site Enforcement:** The inspector should verify through documentation supplied by the contractor the actual RCV of the materials used and the tier level achieved at either 10% or 15%.

**CALGreen Section: A5.405.5 Cement and concrete.** Use cement and concrete made with recycled products and complying with the following sections.

**A5.405.5.1 Cement.** Meet the following standards for cement:

1. Portland Cement shall meet ASTM C 150, Standard Specification for Portland Cement
2. Blended Cement shall meet ASTM C 595, Standard Specification for Blended Hydraulic Cement or ASTM C 1157, Standard Performance Specification for Hydraulic Cement.

**A5.405.5.2 Concrete.** Unless otherwise directed by the engineer, use concrete manufactured with cementitious materials in accordance with Sections A5.405.5.2.1 and A5.405.5.2.1.1, as approved by the enforcing agency.

**A5.405.5.2.1 Supplementary cementitious materials (SCMs).** Use concrete made with one or more of the following supplementary cementitious materials (SCMs):

1. Fly ash meeting ASTM C 618, Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete-
2. Ultra fine fly ash (UFFA) meeting ASTM C 618, Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete, and CalTrans Standard Specification, Section 90-2.01B.
3. Metakaolin meeting ASTM C 618, Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete, and CalTrans Standard Specification, Section 90-2.01B.
4. Natural pozzolan meeting ASTM C 618, Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
5. Slag cement meeting ASTM C 989, Specification for Ground Granulated Blast-Furnace Slag (GGBFS) for Use in Concrete and Mortars.
6. Silica fume meeting ASTM C 1240, Specification for Silica Fume Used in Cementitious Mixtures.
7. Other materials with comparable or superior environmental benefits, as approved by the engineer and enforcing authority.

**Note:** CalTrans specifications for UFFA and metakaolin may be found in the 2006 CalTrans specifications on pages 339 and 340.

**A5.405.5.2.1.1 Mix design equation.** Use any combination of one or more SCMs, satisfying the equation:

$$F/25 + SL/50 + UF/12 \geq 1 \quad \text{Equation A5.4-1}$$

Where: F = Fly ash, natural pozzolan, or other approved SCM, percent of total cementitious material for concrete on the project

SL = GGBFS, including the amount in blended cement percent of total cementitious material for concrete on the project

UF = Silica fume, metakaolin, or UFFA, including the amount in blended cement, percent of total cementitious material for concrete on the project

**Exception:** Minimums for concrete products requiring high early strength may be lower as directed by the engineer.

**Intent:**

The intent of these measures encourage the use of alternate *supplementary cementitious materials* (SCMs) (which would otherwise be industrial byproducts that would make its way into the waste stream) as a replacement for the energy intensive transformation of limestone and clay to cement in the manufacture of concrete. Using ASTM Standards listed above see Equation A5.4-1 and Exception to determine minimum portions of the various SCMs that may be substituted for cement.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

**Compliance Method:**

**Design Team:** Show in the engineering specification the concrete mix designs intended to be used on the project contain the required amount of SCMs. Total SCMs including F, SL and/or UF (as defined above) may be added in any combination that satisfies ASTM Standards listed above and Equation A5.4-1 where the *total minimum SCMs for amount of concrete being mixed* is one (1).

***Example use of Equation A5.4-1:***

For a batch of concrete that requires 400 lb of cementitious materials with a 50% addition of cement and 50% SCMs

Using Equation A5.4-1 ---  $F/25 + SL/50 + UF/12 \geq 1$ ; adding 80lb of F or 20% and  
120lb of SL or 30% then

$$20/25 + 30/50 + 0/12 = .8 + .6 = 1.4 \text{ which is } \geq 1; \text{ so mix is OK}$$

**Contractor:** Place concrete for the specified uses that complies with the engineer's mix design and minimum amount of SCMs.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the engineer's specifications for the minimum SCMs and for any calculations. (All concrete used on the project must also meet the structural provisions of the California Building Code.)

**On-Site Enforcement:** The building inspector should verify mix designs of concrete per industry standards for substitution of SCMs as prescribed in A5.405.5 – A5.405.2.1.1.

**CALGreen Section: A5.405.5.3 Additional means of compliance.** Any of the following measures may be employed for the production of cement or concrete, depending on their availability and suitability, in conjunction with A5.405.5.2.

**A5.405.5.3.1 Cement.** The following measures may be used in the manufacture of cement.

**A5.405.5.3.1.1 Alternative fuels.** Where permitted by state or local air quality standards, use alternative fuels.

**A5.405.5.3.1.2 Alternative power.** Use alternate electric power generated at the cement plant and/or green power purchased from the utility meeting the requirements of A5.211.

**A5.405.5.3.1.3 Alternative ingredients.** Use inorganic processing additions and limestone meeting ASTM C 150, Standard Specifications for Portland Cement.

**A5.405.5.3.2 Concrete.** The following measures may be used in the manufacture of concrete.

**A5.405.5.3.2.1 Alternative energy.** Use renewable or alternative energy meeting the requirements of Section A5.211.

**A5.405.5.3.2.2 Recycled aggregates.** Use concrete made with one or more of the following materials:

1. Blast furnace slag as a lightweight aggregate in nonreinforced concrete.
2. Recycled concrete that meets grading requirements of ASTM C 33, Standard Specification for Concrete Aggregates.
3. Other materials with comparable or superior environmental benefits, as approved by the engineer and enforcing authority.

**A5.405.5.3.2.3 Mixing water.** Use water meeting ASTM C1602, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete, either recycled water provided by the local water purveyor or water reclaimed from manufacturing processes.

**Intent:**

These measures encourage the use of alternative energy sources, mined aggregate replacement and an alternative to potable water in the manufacture of concrete in addition to the provisions of Sections A5.405.5 – A5.405.2.1.1 in an overall approach of conserving energy and materials in order to achieve resource efficiency.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

**Compliance Method:**

Use any combination of the alternative materials and manufacturing methods listed above. Show in the construction documents. Contractor should keep all receipts and paperwork to show the enforcing agency which alternate methods of compliance were used in manufacture of cement or concrete.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for any cement or concrete alternates employed in addition to the provisions in Sections A5.405.5 – A5.405.2.1.1.

**On-Site Enforcement:** The building inspector should verify documentation of cement or concrete alternates employed on the project.

## SECTION A5.406 ENHANCED DURABILITY AND REDUCED MAINTENANCE

**CALGreen Section: A5.406.1 Choice of materials.** Compared to other products in a given product category, choose materials proven to be characterized by one or more of the following.

**A5.406.1.1 Service life.** Select materials for longevity and minimal deterioration under conditions of use.

[DSA-SS] Use materials, equivalent in performance to virgin materials, with post-consumer or pre-consumer recycled content value (RVC) for a minimum of 10 percent of the total value, based on estimated cost of materials on the project. Provide documentation as to the respective values.

**A5.406.1.2 Reduced maintenance.** Select materials that require little, if any, finishing. For those with surface protection, choose materials that do not require frequent applications of toxic or malodorous finishes.

### **Intent:**

The intent of this code provision is to reduce the consumption of resources by specifying the use of those materials shown to have a longer service life; reduced maintenance materials that require a minimum of other material maintenance and materials that are able to be cycled cradle to cradle rather than cradle to grave (recyclability). It is a conservation measure to create structures that are more durable and require less maintenance in order to increase the service life of the entire building, this approach requires consideration of all materials and equipment to work together to increase the usable service life of a building.

### **Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

### **Compliance Method:**

Compliance with this voluntary measure relies mainly with the designer and his selection and specification of materials. The building contractor shall retain all receipts, written verification or other documentation that verifies the service life of materials selected from this category. In order to comply with this provision in a meaningful way, it is important to carry the concept of materials and equipment that have an inherent quality (i.e. – increased service life) throughout the project. For example the selection and use of color impregnated stucco versus wood exterior finish— reduces maintenance and increases service life. Using masonry walls, with a non service life increase in the roof and window systems, would not meet the intent of this voluntary regulation. If you choose to create a building with enhanced durability and reduced maintenance, the lifespan of all systems and components must have a reasonably balanced durability.

### **Enforcement:**

The enforcement of this voluntary requirement will require life cycle analysis information to evolve to a level which proves the durability of systems have lifespan ratings or warranties in order to evaluate overall building durability. Until that time, the assessed durability will be more subjective. Objectivity in this pursuit is the goal. That is achievable at this time by choosing a 50 year roof rather than one with a 15 year warranty or lifespan.

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for any materials from this section that are used may be verified according to the requirements listed above.

**On-Site Enforcement:** The building inspector should verify documentation of all enhanced materials called for and verify that those materials have been installed according to required standards.

## SECTION A5.408 CONSTRUCTION WASTE REDUCTION, DISPOSAL, AND RECYCLING

**CALGreen Section: A5.408.3.1 Enhanced construction waste reduction.** Divert to recycle or salvage non-hazardous construction and demolition debris generated at the site in compliance with one of the following:

**Tier 1** At least a 65% reduction.

**Tier 2.** At least an 80% reduction.

**A5.408.3.1.1 Verification of compliance.** A copy of the completed waste management report shall be provided.

### **Intent:**

This code provision is to go beyond the mandatory 50% salvage of all non-hazardous, “new” construction waste; for Tier 1—65% and for Tier 2—80% or as required by local ordinance whichever is more restrictive; reducing the amount of construction waste from new construction that would be sent to the landfills, thereby extending the life of the landfills. Its purpose is also to encourage material resource efficiency through re-use and recycling of construction waste products.

### **Existing Law or Regulation:**

AB 939 (Stats. 1989, c. 1095) mandated a 50% diversion of all waste by 2000, but the CALGreen regulation targets 50% of new construction waste that makes up a smaller percentage of the total waste stream. There are some local jurisdictions that have ordinances in place that have more restrictive requirements for this provision.

### **Compliance Method:**

Complete waste management report in order to verify that you are meeting Tier 1 or Tier 2, whichever level of material conservation is chosen.

### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for the level of enhanced construction waste reduction called for by the designer and make sure a report is called for showing the level indicated.

**On-Site Enforcement:** The building inspector should verify documentation according to available report or other equivalent documentation to show that at least 65% to (meet Tier 1) or 80% (to meet Tier 2) of construction waste is re-used/ recycled if option 408.3.1 is chosen as a conservation measure.

## SECTION A5.409 LIFE CYCLE ASSESSMENT

**CALGreen Section: A5.409.1 Materials and system assemblies.** Select materials assemblies based on life cycle assessment of their embodied energy and/or green house gas emission potentials.

**Notes:**

1. Software for calculating life cycle costs for materials and assemblies may be found at:  
The Athena Institute web site;  
The NIST BEES web site;  
Life Cycle assessment may also be done in accordance with ISO Standard 14044.
2. More information on life cycle assessment may be found at the Sustainable Products Purchasers Coalition; at the American Center for Life Cycle Assessment; at U.S. EPA Life Cycle Assessment Research; and at U.S. EPA Environmentally Preferable Products.

**Intent:**

The intent of this code provision is to indirectly conserve energy and resources by creating buildings with a longer life cycle. If one building lasts 100 years and a similar building occupancy building lasts a mere 30 years, the energy and resources to rebuild that particular building will be saved twice by merely increasing its usefulness (life-cycle) by a factor of 3.

**Existing Law or Regulation:**

Data is being created and collected on all types of materials and systems by the organizations named above. For long span life cycle analysis, clearly the collection of this data needs to continue over several generations. Only then can the cost along with the life cycle be quantified, so a more objective data set will exist for the “most” efficient materials and systems for a given use.

**Compliance Method:**

The generation of cost to life cycle analysis is in its early stages. This type of analysis is by definition a very lengthy process. Until the energy and resources to produce a material or product is fully quantified, then objectively joined to the life-cycle of the materials and products, an accurate overall efficiency may be placed on the cost to life-cycle ratio, which will help designers make the best choices for specified materials and products.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the construction documents for buildings using the increased durability inherent in materials and products intended to create a longer lifecycle; a data base should be instituted to keep information on the projected life cycle vs. actual lifecycle will be the means by which such types of buildings have a superior overall energy and resource efficiency when compared to less durable construction materials, methods and products.

**On-Site Enforcement:** The building inspector should verify that all applicable standards are met in the quality of construction of buildings designed to be more durable.

## **DIVISION A5.5 ENVIRONMENTAL QUALITY**

### **SECTION A5.504 POLLUTANT CONTROL**

**CALGreen Section: A5.504.1 Indoor air quality (IAQ) during construction.** Maintain IAQ as provided in Sections A5.504.1.1 and A5.504.1.2.

**A5.504.1.1 Temporary ventilation.** Provide temporary ventilation during construction in accordance with Section 121 (Requirements for Ventilation) of the California Energy Code, CCR, Title 24, Part 6, and Chapter 4 of CCR, Title 8, and as follows:

1. Ventilation during construction shall be achieved through openings in the building shell using fans to produce a minimum of three air changes per hour.
2. During dust-producing operations, protect supply and return HVAC system openings from dust.
3. The permanent HVAC system shall only be used during construction if necessary to condition the building within the required temperature range for material and equipment installation. If the HVAC system is used during construction, use return air filters with a Minimum Efficiency Reporting Value (MERV) of 8, based on ASHRAE 52.2-1999, or an average efficiency of 30% based on ASHRAE 52.1-1992. Replace all filters immediately prior to occupancy.
4. If the building is occupied during demolition or construction, meet or exceed the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 1995, Chapter 3.

**A5.504.1.2 Additional IAQ measures.** Employ additional measures as follows:

1. When using generators to generate temporary power, use generators meeting the requirements of CCR, Title 13, Chapter 9, or local ordinance, whichever is more stringent.
2. Protect on-site absorbent materials from moisture. Remove and replace any materials with evidence of mold, mildew, or moisture infiltration.
3. Store odorous and high VOC-emitting materials off-site, without packaging, for a sufficient period to allow odors and VOCs to disperse.
4. When possible, once materials are on the jobsite, install odorous and high VOC-emitting materials prior to those that are porous or fibrous.
5. Clean oil and dust from ducts prior to use.

#### **Intent:**

The intent of this voluntary provision is to promote practices to maintain healthy air quality during the construction process to protect worker health and leave the building prepared for occupancy.

Section A5.504.1.1 addresses means of ventilating the building while protecting HVAC systems from contamination. It allows ventilation using air conditioning systems if necessary, though this practice is noted not to be an optimum choice due to possible damage to equipment that may jeopardize a warranty.

Section A5.504.1.2 directs the user to additional practices for the use of materials on the project to make sure they are aired or dried, installed to prevent cross-contamination, and cleaned prior to certification of occupancy. Use of clean generators is promoted for those urban areas where noxious fumes may affect adjacent neighbors.

#### **Existing Law or Regulation:**

The California Energy Code, CCR, Part 6 contains ventilation standards for conditioned spaces. CCR, Title 8 contains additional regulations for the protection of worker safety.



**Compliance Method:**

Engineers and designers should include the measures intended to promote air quality in the project specifications for ventilation, materials and others as applicable. The contractor should be responsible for employing them on the job and being able to demonstrate that the practices are being followed if requested by the enforcing agency.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications for directions on ventilation practices to be followed by the contractor.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify which air quality practices the contractor is to use on the project and ask for demonstration of their employment during site visits.

**CALGreen Section: A5.504.2 IAQ Post-construction.** After all interior finishes have been installed, flush out the building by supplying continuous ventilation with all air handling units at their maximum outdoor air rate and all supply fans at their maximum position and rate for at least 14 days.

1. During this time, maintain an internal temperature of at least 60°F, and relative humidity no higher than 60%. If extenuating circumstances make these temperature and humidity limits unachievable, the flush out may be conducted under conditions as close as possible to these limits, provided that documentation of the extenuating circumstances is provided in writing.
2. Occupancy may start after 4 days, provided flush-out continues for the full 14 days. During occupied times, the thermal comfort conditions of Title 24 must be met.
3. For buildings that rely on natural ventilation, exhaust fans and floor fans must be used to improve air mixing and removal during the 14-day flush out, and windows should remain open.
4. Do not “bake out” the building by increasing the temperature of the space.
5. (If continuous ventilation is not possible, flush-out air must total the equivalent of 14 days of maximum outdoor air.) the equivalent of 14 days of maximum outdoor air shall be calculated by multiplying the maximum feasible air flow rate (in ft<sup>3</sup>/m). The air volumes for each period are then calculated and summed, and the flush out continues until the total equals the target air volume.

**Intent:**

The intent of this voluntary provision is to promote practices to insure healthy air quality at the close of construction, after all finishes are installed, to protect occupant health after Certification of Occupancy or Temporary Occupancy. It spells out the means of flushing out air contaminated by pollution from materials and construction activities. It is intended to allow early occupancy when needed by an owner by providing flush-out recommendations for that situation.

**Existing Law or Regulation:**

The California Energy Code, CCR, Part 6 contains ventilation standards for conditioned spaces. CCR, Title 8 contains additional regulations for the protection of worker safety.

**Compliance Method:**

Engineers and designers should include the requirements for flush out, including by mechanical or outside air, contingency plans, early occupancy, etc. in the project specifications for ventilation and others as applicable. The contractor should be responsible for employing them on the job and being able to demonstrate that the practices are being followed if requested by the enforcing agency. Extenuating circumstances should be documented in writing, and the contractor should be able to verify the dates or volume equivalencies of the 14-day flush-out period.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications for directions on flush-out practices to be followed by the contractor.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify which flush-out practices the contractor is to use on the project and ask for documentation of their employment at the conclusion of the construction process.

**CALGreen Section: A5.504.2.1 IAQ Testing.** If the engineer determines that building flush-out pursuant to Section A5.504.2 is not feasible, a testing alternative may be employed after all interior finishes have been installed, using testing protocols recognized by the United State Environmental Protection Agency (US EPA).

**A5.504.2.1.1 Maximum levels of contaminants.** Allowable levels of contaminant concentrations measured by testing shall not exceed the following:

1. Carbon Monoxide (CO): 9 parts per million, not to exceed outdoor levels by 2 parts per million;
2. Formaldehyde: 27 parts per billion;
3. Particulates (PM10): 50 micrograms per cubic meter;
4. 4-Phenylcyclohexene (4-PCH), if fabrics and carpets with styrene butadiene rubber (SBR) latex backing, are installed: 6.5 micrograms per cubic meter; and
5. Total Volatile Organic Compounds (TVOC): 300 micrograms per cubic meter.

**A5.504.2.1.2 Test protocols.** Testing of indoor air quality should include the following elements:

1. The contaminant sampling and averaging times and the measurement methods should be sufficient to achieve a Limit of Detection that is below the maximum allowable concentrations.
2. Testing should be conducted with the HVAC system operated at the minimum design outdoor air ventilation rate.
3. Air samplers and monitors should be located near likely sources of formaldehyde and other volatile organic compounds, at a height of 3-6 feet from the floor, and well away from walls and air diffusers.
4. The test protocols should be justified with documentation to show that appropriate sampling methods and times were used.

**A5.504.2.1.3 Non-complying building areas.** For each sampling area of the building exceeding the maximum concentrations specified in Section A5.504.2.1.1, flush out with outside air and retest samples taken from the same area. Repeat the procedures until testing demonstrates compliance.

**Note:** US EPA-recognized testing protocols may be found on the Air Resources Board website at: <http://www.arb.ca.gov/research/indoor/methods.htm>.

**Intent:**

The intent of this voluntary provision is to provide a testing alternative to building flush-out to promote practices to insure healthy air quality at the close of construction. It spells out test protocols, allowable levels of pollutants, and retesting requirements if needed. Testing can be more expensive than building flush-out, but it is noted that, with CALGreen's requirements for low VOC-emitting materials, pollutant levels from finishes may be low; testing could target those areas of potential problems if building flush-out is determined by the engineer to be infeasible.

**Existing Law or Regulation:**

The California Energy Code, CCR, Part 6 contains ventilation standards for conditioned spaces. CCR, Title 8 contains additional regulations for the protection of worker safety.

**Compliance Method:**

Engineers and designers should include the requirements for testing of pollutant levels of air and materials in the project specifications for ventilation and others as applicable. Materials to be tested and test methods and protocols should be included. As determined in the contract for construction, a testing laboratory or other qualified personnel should be engaged to conduct IAQ tests according to the protocols. If test results show excessive concentrations, retesting should be carried out until compliance is achieved. Test methods and results should be made available to the enforcement agency.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications for the engineer's testing alternative to building flush-out.

**On-Site Enforcement:** The inspector should review the permit set of plans to verify that testing is to be employed on the project and ask for documentation of test methods and results at the conclusion of the construction process.

**CALGreen Section: A5.504.4.5.1 Early compliance with formaldehyde limits.** Where complying composite wood product is readily available for non-residential occupancies, meet requirements before the compliance dates indicated in Table A5.504.8.5 (Tier 1), or use composite wood products made with either CARB-approved no-added formaldehyde (NAF) resins or CARB-approved ultra-low emitting formaldehyde (ULEF) resins (Tier 2).

**Intent:**

The intent of this voluntary provision is to encourage the use of low- or no-formaldehyde-emitting composite wood products ahead of the schedule indicated in Section 5.504.5 and Table A5.504.8.5. Providing composite wood materials that beat the schedule satisfies a Tier 1 “reach” component. Using no-added or ultra-low emitting formaldehyde resins in the composites wood products is indicated for compliance with Tier 2.

**Existing Law or Regulation:**

The California Air Resources Board (CARB) adopted regulations for low formaldehyde-emitting composite wood products in CCR, Title 17, that are reprised in Section 5.504.5 for building standards. Compliance is according to a timetable adopted by CARB, shown in Table 5.504.5, which is reprinted as Table A5.504.8.5 in the voluntary appendix.

**Compliance Method:**

Specify levels of formaldehyde in composite wood products on the plans or in the project specifications that show earlier dates than that those in Table A5.504.8.5 (Tier 1), or specify NAF or ULEF resins (Tier 2).

**Suggestion:**

**Contractor:** *Retain product data sheets for onsite verification by the enforcing agency and for the operation and maintenance manual.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that the composite wood products and/or resins are specified to beat the CARB timetable or meet the ultra-low formaldehyde levels.

**On-Site Enforcement:** The inspector should review the permit set of plans and product data sheets to verify that composite wood products specified on the approved plans and specifications are installed, or at least stored on site with the ability to be verified.

**CALGreen Section: A5.504.4.7 Resilient flooring systems, Tier 1 [DSA-SS] Resilient flooring systems** For 80% of floor area receiving resilient flooring, install resilient flooring complying with the VOC-emission limits defined in the 2009 Collaborative for High Performance Schools (CHPS) criteria and listed on its Low-emitting Materials List or certified under the FloorScore program of the Resilient Floor Covering Institute.

**A5.504.4.7.1 Resilient flooring systems, Tier 2** For 90% of floor area receiving resilient flooring, install resilient flooring complying with the VOC-emission limits defined in the 2009 Collaborative for High Performance Schools (CHPS) criteria and listed on its Low-emitting Materials List (or Product Registry) or certified under the FloorScore program of the Resilient Floor Covering Institute.

**Note:** Products compliant with CHPS criteria certified under the Greenguard Children and Schools program may also be used.

**A5.504.4.7.2 Verification of compliance.** Documentation shall be provided verifying that resilient flooring materials meet the pollutant emission limits.

**A5.504.4.8 Thermal insulation, Tier 1 [DSA-SS] Thermal insulation** Comply with Chapter 12-13 (Standards for Insulating Material) in Title 24, Part 12, the California Referenced Standards Code, and with the VOC-emission limits defined in 2009 CHPS criteria and listed on its Low-emitting Materials List, [BSC] (or Product Registry).

**A5.504.4.8.1 Thermal insulation, Tier 2 [BSC] Thermal insulation, No-Added Formaldehyde [DSA-SS]** Install No-Added Formaldehyde thermal insulation in addition to meeting the 2009 CHPS criteria and listed on its Low-Emitting Materials List (or Product Registry).

**A5.504.4.8.2 Verification of compliance.** Documentation shall be provided verifying that thermal insulation materials meet the pollutant emission limits.

**A5.504.4.9 Acoustical ceilings and wall panels.** Comply with Chapter 8 in Title 24, Part 2, the California Building Code, and with the VOC-emission limits defined in the 2009 CHPS criteria and listed on its Low-emitting Materials List, [BSC, OSHPD 1, 2 & 4] (or Product Registry).

**A5.504.4.9.1 Verification of compliance.** Documentation shall be provided verifying that acoustical finish materials meet the pollutant emission limits.

**Note:** Products compliant with CHPS criteria certified under the Greenguard Children and Schools program may also be used.

**Intent:**

The purpose of these measures is to reduce the volatile organic compounds (VOC) of finish materials commonly installed on a project, which will help improve air quality for the building occupants. These regulations exceed the mandatory provisions in Chapter 5, Division 5.5 as “reach” standards and are components of the tier structure in Division A5.6.

**Existing Law or Regulation:**

The low-VOC provisions are based on the recommendations, guidelines and regulations of the Air Resources Board cited in each section. Regulations for aerosol adhesives and paints and for composite wood products are found in California Code of Regulations, Title 17 as noted above.

**Compliance Method:**

Specify finish materials that meet the limits of VOC criteria as tested by the listed organizations. Substitutes may be approved by the local enforcing authority if it deems equivalency.

**Notes:** Some compliant products may be found on the following websites:

1. CHPS Low-emitting Materials List may be found at [www.chpsregistry.com/live](http://www.chpsregistry.com/live) or <http://www.chps.net/dev/Drupal/node/381> .
2. Products certified under the FloorScore program may be found at: [http://www.rfci.com/int\\_FS-ProdCert.htm](http://www.rfci.com/int_FS-ProdCert.htm)
3. Products certified under the Greenguard Children & Schools program and compliant with CHPS criteria may be found at: <http://www.greenguard.org/Default.aspx?tabid=135>.

**Suggestion:**

**Contractor:** Retain product data sheets for onsite verification by the enforcing agency and for the operation and maintenance manual. Sample compliance forms can be found in Part 4 of this Guide.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that the finishes are specified to meet VOC emission limits.

**On-Site Enforcement:** The inspector should review the permit set of plans and product data sheets maintained by the contractor to verify finishes specified on the approved plans and specifications are installed, or at least stored on site with the ability to be verified. The inspector may review specifications provided with products or accept self-certification form.

**CALGreen Section: A5.504.5 Hazardous particulates and chemical pollutants.** Minimize and control pollutant entry into buildings and cross-contamination of regularly occupied areas.

**A5.504.5.1 Entryway systems.** Install permanent entryway systems measuring at least six feet in the primary direction of travel to capture dirt and particulates at entryways directly connected to the outdoors.

1. Qualifying entryways are those that serve as regular entry points for building users.
2. Acceptable entryway systems include, but are not limited to, permanently installed grates, grilles, or slotted systems that allow cleaning underneath.
3. Roll-out mats are acceptable only when maintained regularly by janitorial contractors as documented in service contract, or by in-house staff as documented by written policies and procedures.

**Intent:**

The purpose of these measures is to reduce the amount of pollutants brought into a building at points of entry from people's shoes or rain-soaked apparel. This keeps the air and finish surfaces free of contaminants that may be tracked into regularly occupied spaces and is intended to maintain good air quality for building occupants.

**Existing Law or Regulation:**

There is **NO** current law or regulation for this code provision.

**Compliance Method:**

Specify entrance mats that are permanently fixed and cleanable from debris. The specifications should include a maintenance schedule to be followed after certification of occupancy.

Roll out mats are not recommended, usually not considered contract furnishings and with maintenance an uncertain prospect. If specified, however, recommend a maintenance schedule to be followed after occupancy.

**Suggestion:**

**Contractor:** *Retain product data sheets and recommended maintenance for onsite verification by the enforcing agency and for the operation and maintenance manual.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to confirm that the entrance mats are included and that a maintenance schedule is also recommended in the specifications.

**On-Site Enforcement:** The inspector should review the permit set of plans and product data sheets maintained by the contractor to verify mats specified on the approved plans and specifications are installed, or at least stored on site with the ability to be verified. The inspector may review specifications and maintenance recommendations provided with products or accept self-certification from the contractor.



## SECTION A5.507 ENVIRONMENTAL COMFORT

**CALGreen Section: A5.507.1 Lighting and thermal comfort controls.** Provide controls in the workplace as described in Sections A5.507.1.1 and A5.507.1.2.

**A5.507.1.1 Single-occupant spaces.** Provide individual controls that meet energy use requirements in the California Energy Code in accordance with Sections A5.507.1.1.1 and A5.507.1.1.2.

**A5.507.1.1.1 Lighting.** Provide individual task lighting and/or daylighting controls for at least 90% of the building occupants.

**A5.507.1.1.2 Thermal comfort.** Provide individual thermal comfort controls for at least 50% of the building occupants.

1. Occupants shall have control over at least one of the factors of air temperature, radiant temperature, air speed, and humidity as described in ASHRAE 55-2004.
2. Occupants inside 20 feet of the plane of and within 10 feet either side of operable windows can substitute windows to control thermal comfort. The areas of operable window must meet the requirements of Section 121 (Requirement for Ventilation) of the California Energy Code

**A5.507.1.2 Multi-occupant spaces.** Provide lighting and thermal comfort system controls for all shared multi-occupant spaces, such as classrooms and conference rooms.

### **Intent:**

The purpose of these measures is to allow building occupants a measure of control within their workspaces as to lighting levels and thermal comfort, including multi-occupant spaces where they can reach consensus on ambient lighting and temperature, humidity and air speed. Though scant research exists to support claims of higher productivity or attendance for workers who have control of lighting and thermal comfort, the goal is increase their satisfaction with the workplace and reap whatever benefits to them and their employers there may be.

### **Existing Law or Regulation:**

The California Energy Code, CCR, Title 24, Part 6, regulates energy use associated with lighting, air conditioning and ventilation of conditioned spaces. ASHRAE 55 contains standards for thermal comfort.

### **Compliance Method:**

Provide, in plans and specifications, lighting locations, fixture types and access to daylight for a minimum of 90% of occupants. Show means of thermal control, such as thermostats, directional air registers, and proximity to solar gain for a minimum of 50% of occupants. Contract furnishings for control of light and heat through windows may be shown. Make sure that compliance with the California Energy Code is maintained.

### **Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to verify the lighting and thermal control means are shown for at least 90% and 50% of occupants, respectively. Verify energy code compliance is demonstrated.

**On-Site Enforcement:** The inspector should review the permit set of plans and/or specifications and verify that lighting and thermal controls are installed as shown and that the building complies with provisions in the California Energy Code.

**CALGreen Section: A5.507.2 Daylight.** Provide daylit spaces as required for toplighting and sidelighting in the California Energy Code. In constructing a design, consider the following:

1. Use of light shelves and reflective room surfaces to maximize daylight penetrating the rooms.
2. Means to eliminate glare and direct sun light, including through skylights.
3. Use of photosensors to turn off electric lighting when daylight is sufficient.
4. Not using diffuse daylighting glazing where views are desired.

**A5.507.3 Views.** Achieve direct line of sight to the outdoor environment via vision glazing between 2'6" and 7'6" above finish floor for building occupants in 90% of all regularly occupied areas as demonstrated by plan view and section cut diagrams.

**A5.507.3.1 Interior office spaces.** Entire areas of interior office spaces may be included in the calculation if at least 75% of each area has direct line of sight to perimeter vision glazing.

**A5.507.3.2 Multi-occupant spaces.** Include in the calculation the square footage with direct line of sight to perimeter vision glazing.

**Exceptions to Sections A5.507.2 and A5.507.3:** Copy/printing rooms, storage areas, mechanical spaces, restrooms, auditoria, and other intermittently or infrequently occupied spaces or spaces where daylight would interfere with use of the space.

**Intent:**

The purposes of these provisions are to achieve building lighting through the use of daylight and to provide sightlines to outdoor environments whenever possible. This reduces the need for electrical lighting during normal work hours and saves energy. It also creates a pleasant ambience of high-quality light and views, which may have a salutary effect on building occupants, such as reducing eye strain exacerbated by increasing use of electronic devices in the workplace.

**Existing Law or Regulation:**

The California Energy Code, CCR, Title 24, Part 6, regulates energy use associated with electrical lighting, and with toplighting and sidelighting with daylight.

**Compliance Method:**

Provide, in plans and specifications, means of achieving daylighting and views on the project while minimizing glare and direct sunlight. Wall and ceiling finishes and colors may need to be identified on a finish schedule. Make sure that compliance with the California Energy Code is maintained.

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to verify the daylighting strategies and line-of-sight calculations employed on the project. Verify energy code compliance is demonstrated.

**On-Site Enforcement:** The inspector should review the permit set of plans and/or specifications and verify that daylighting features are installed and view access is provided as shown and that the building complies with provisions in the California Energy Code.

## SECTION A5.508 OUTDOOR AIR QUALITY

**CALGreen Section: A5.508.1.3 Hydrochlorofluorocarbons (HCFCs).** Install HVAC and refrigeration equipment that do not contain HCFCs.

**A5.508.1.4 Hydrofluorocarbons (HFCs).** Install HVAC complying with either of the following:

1. Install HVAC, refrigeration and fire suppression equipment that do not contain HFCs or that do not contain HFCs with a global warming potential greater than 150.
2. Install HVAC and refrigeration equipment that limit the use of HFC refrigerant through the use of a secondary heat transfer fluid with a global warming potential no greater than 1.

**Intent:**

The purpose of these provisions is to reduce voluntarily the use of refrigerants that deplete the ozone layer and contribute to the greenhouse effect. These are gradually being phased out of use by the EPA, but voluntary implementation of these standards can accelerate the process and protect our atmosphere.

**Existing Law or Regulation:**

The California Mechanical Code, CCR, Title 24, Part 4 and California Fire Code, CCR, Title 24, Part 9, regulate fire suppression equipment and refrigerants.

**Compliance Method:**

Provide specifications for equipment that uses refrigerants and include the specifications for the refrigerants to be used. Include recommendations in the Operation and Maintenance Manual for replenishment of refrigerants to meet these regulations, since inventory of phased-out refrigerants still exists for maintenance of older equipment.

**Suggestion:**

**Contractor:** *Retain product data sheets and recommended maintenance for onsite verification by the enforcing agency and for the operation and maintenance manual.*

**Enforcement:**

**Plan Intake:** The reviewer and/or plan checker should review the plans and specifications to verify the equipment and refrigerant types on the project.

**On-Site Enforcement:** The inspector should review the permit set of plans and/or specifications and product data sheets and verify that specified equipment and refrigerants are indeed installed on the project.

## DIVISION A5.6 VOLUNTARY TIERS

### A5.601.2 CALGREEN TIER 1

**A5.601.2.1 Prerequisites.** To achieve *CALGreen* Tier 1 status, a project must meet all of the mandatory measures in Chapter 5, and, in addition, meet the provisions of this section.

**A5.601.2.2 Energy performance.** For the purposes of energy efficiency standards in this code the California Energy Commission will continue to adopt mandatory building standards.

Using an alternative calculation method approved by the California Energy Commission, calculate each nonresidential building's TDV energy and CO<sub>2</sub> emissions and compare it to the standard or "budget" building.

**A5.601.2.3 Tier 1.** Exceed California Energy Code requirements, based on the 2008 Energy Efficiency Standards, by 15 percent. Field verify and document the measures and calculations used to reach the desired level of efficiency following the requirements specified in the Title 24 Nonresidential Alternative Calculation Method Manual.

**A5.601.2.4 Voluntary measures for *CALGreen* Tier 1.** In addition to the provisions of Sections A5.601.2.1 and A5.601.2.3 above, compliance with the following voluntary measures from Appendix A5 is required for Tier 1:

1. From Division A5.1,
  - a) Comply with the designated parking requirements for fuel efficient vehicles for a minimum of 10 percent of parking capacity per Section A5.106.5.1 and Table A5.106.5.1.1.
  - b) Comply with thermal emittance, solar reflectance, or SRI values for cool roofs in Section A5.106.11.2 and Table A5.106.11.2.1.<sup>1</sup>
  - c) Comply with one elective measure selected from this division.
2. From Division A5.3,
  - a) Comply with the reduction for indoor potable water use in Section A5.303.2.3.1.
  - b) Comply with the reduction in outdoor potable water use in Section A5.304.4.1.
  - c) Comply with one elective measure selected from this division.
3. From Division A5.4,
  - a) Comply with recycled content of 10 percent of materials based on estimated total cost in Section A5.405.4.
  - b) Comply with the 65 percent reduction in construction waste in Section A5.408.3.1.
  - c) Comply with one elective measure selected from this division.
4. From Division A5.5,
  - a) Comply with resilient flooring systems for 80 percent of resilient flooring in Section A5.504.4.7.
  - b) Comply with thermal insulation meeting 2009 CHPS low-emitting materials list Section A5.504.4.8.
  - c) Comply with one elective measure selected from this division.
5. Comply with one additional elective measure selected from any division.

### A5.601.3 CALGREEN TIER 2

**A5.601.3.1 Prerequisites.** To achieve *CALGreen* Tier 2 status, a project must meet all of the mandatory measures in Chapter 5, and, in addition, meet the provisions of this section.

**A5.601.3.2 Energy performance.** For the purposes of energy efficiency standards in this code the California Energy Commission will continue to adopt mandatory building standards.

Using an Alternative Calculation Method approved by the California Energy Commission, calculate each nonresidential building's TDV energy and CO<sub>2</sub> emissions, and compare it to the standard or "budget" building.

**A5.601.3.3 Tier 2.** Exceed California Energy Code requirements, based on the 2008 Energy Efficiency Standards, by 30 percent. Field verify and document the measures and calculations used to reach the desired level of efficiency following the requirements specified in the Title 24 Nonresidential Alternative Calculation Method Manual.

**A5.601.3.4 Voluntary measures for *CALGreen* Tier 2.** In addition to the provisions of Sections A5.601.3.1 and A5.601.3.3 above, compliance with the following voluntary measures from Appendix A5 and additional elective measures shown in Table A5.601.3.4 is required for Tier 2:

1. From Division A5.1,
  - a) Comply with the designated parking requirements for fuel efficient vehicles for a minimum of 12 percent of parking capacity per Section A5.106.5.1 and Table A5.106.5.1.2.
  - b) Comply with thermal emittance, solar reflectance or SRI values for cool roofs in Section A5.106.11.2 and Table A5.106.11.2.2.<sup>1</sup>

- c) Comply with three elective measures selected from this division.
- 2. From Division A5.3,
  - a) Comply with the reduction for indoor potable water use in Section A5.303.2.3.2.
  - b) Comply with the reduction in outdoor potable water use in Section A5.304.4.2.
  - c) Comply with three elective measures selected from this division.
- 3. From Division A5.4,
  - a) Comply with recycled content of 15 percent of materials based on estimated total cost in Section A5.405.4.1.
  - b) Comply with the 80 percent reduction in construction waste in Section A5.408.3.1.
  - c) Comply with three elective measures selected from this division.
- 4. From Division A5.5,
  - a) Comply with resilient flooring systems for 90 percent of resilient flooring in Section A5.504.4.7.1.
  - b) Comply with thermal insulation meeting 2009 CHPS low-emitting materials list and no added formaldehyde in Section A5.504.4.8.1.
  - c) Comply with three elective measures selected from this division.
- 5. Comply with three additional elective measures selected from any division.

**A5.601.4 Compliance verification.** Compliance with Section A5.601.2 or A5.601.3 shall be as required in Chapter 7 of this code. Compliance documentation shall be made part of the project record as required in Section 5.410.2 or 5.410.3.

<sup>1</sup> Cool roof is required for compliance with Tiers 1 and 2 and may be used to meet energy standards in Part 6, exceed energy standards by 15 or 30 percent, and to mitigate heat island effect.

**Intent:**

Tier 1 and Tier 2 are included in the Appendix of the CALGreen Code for cities, counties, and city and county that wish to adopt more stringent standards than the mandatory measures. Because of the increased energy savings and additional provisions that are required for each tier, these standards are meant to assist the state in achieving its greenhouse gas emission and net zero energy goals. Coupled with the energy efficiency savings, cool roofs and enhanced water use reduction and construction waste diversion are examples of this combined approach.

A city, county, or city and county that wishes to adopt a tier will pass an ordinance, like any other ordinance to adopt an appendix chapter or other local amendment to the California Building Standards Code, and must make appropriate findings. Because the tiers contain energy efficiency standards more rigorous than those required by Part 6, the California Energy Code, the local agency must submit its amendment package to the California Energy Commission for approval prior to filing it with the California Building Standards Commission as required by section §101.7.1 of the CALGreen code.

This edition includes guidelines for all of the voluntary measures including those required to fulfill each tier. A table which simplifies the narrative language from the tier provisions follows.

**Table 1: NON-RESIDENTIAL BUILDINGS: Green Building Standards Code  
Proposed Performance Approach**

<b>Category</b>	<b>Environmental Performance Goal</b>	<b>Tier 1</b>	<b>Tier 2</b>
<b>All</b>	Minimum Mandatory	Meet all of the provisions of Chapter 5	Meet all of the provisions of Chapter 5
<b>Planning and Design</b>	Designated Parking for Fuel Efficient Vehicles	10 percent of total spaces	12 percent of total spaces
	Cool Roof to Reduce Heat Island Effect	Roof Slope < 2:12 SRI 64 Roof Slope > 2:12 SRI 16	Roof Slope < 2:12 SRI 78 Roof Slope > 2:12 SRI 20
		1 additional Elective from Division A5.1	3 additional Electives from Division A5.1
<b>Energy Efficiency</b>	Energy Performance	Exceed 2008 CA Energy Code by 15 percent	Exceed 2008 CA Energy Code by 30 percent
<b>Water Efficiency and Conservation</b>	Indoor Water Use	30 percent Savings	35 percent Savings
	Outdoor Water Use	60 percent of ETo times the landscape area	55 percent of ETo times the landscape area
		1 additional Elective from Division A5.3	3 additional Electives from Division A5.3
<b>Material Conservation and Resource Efficiency</b>	Construction Waste Reduction	At least 65 percent reduction	At least 80 percent reduction
	Recycled Content	Utilize recycled content materials for 10 percent of total material cost	Utilize recycled content materials for 15 percent of total material cost
		1 additional Elective from Division A5.4	3 additional Electives from Division A5.4
<b>Environmental Quality</b>	Low-VOC Resilient Flooring	80 percent of flooring meets CHPS VOC limits	90 percent of flooring meets CHPS VOC limits
	Low-VOC Thermal Insulation	Comply with CHPS VOC limits	Install no-added formaldehyde insulation & comply with CHPS VOC limits
		1 additional Elective from Division A5.5	3 additional Electives from Division A5.5
<b>Additional Measures</b>	Added measures shall be achieved across at least 3 categories	1 Additional Elective	3 Additional Electives
<b>Approximate Total Measures</b>		14	24

## **Part 4 – Suggested Forms and Templates**

BLANK PAGE



**SOIL LOSS PREVENTION PLAN CHECKLIST  
FOR NEW PROJECTS LESS THAN ONE ACRE**

CALGreen  
Std. BSC-5.1-1  
10-05-10

**Project location:** \_\_\_\_\_

**Project area:** \_\_\_\_\_

**Contact Name & Title:** \_\_\_\_\_

**Telephone:** \_\_\_\_\_

**Cell Phone:** \_\_\_\_\_

**Date plan submitted:** \_\_\_\_\_

**On plans**

**Separately**

BMP NAME	APPLICABLE TO THIS PROJECT	CONTR. INITIAL
<b>EROSION AND SEDIMENT CONTROL BMPs</b>		
Scheduling construction activity	<input type="checkbox"/>	
Preservation of natural features, vegetation and soil	<input type="checkbox"/>	
Drainage swales or lined ditches to control stormwater flow	<input type="checkbox"/>	
Mulching or hydroseeding to stabilize soils	<input type="checkbox"/>	
Erosion control covers to protect slopes	<input type="checkbox"/>	
Protection of storm drain inlets (gravel bags or catch basin inserts)	<input type="checkbox"/>	
Perimeter sediment control (perimeter silt fence, fiber rolls)	<input type="checkbox"/>	
Sediment trap or sediment basin to retain sediment on site	<input type="checkbox"/>	
Stabilized construction exits	<input type="checkbox"/>	
Wind erosion control	<input type="checkbox"/>	
Others (specify):	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
<b>HOUSEKEEPING BMPs</b>		
Material handling and waste management	<input type="checkbox"/>	
Building materials stockpile management	<input type="checkbox"/>	
Management of washout areas (concrete, paints, stucco, etc.)	<input type="checkbox"/>	
Control of vehicle/equipment fueling to contractor's staging area	<input type="checkbox"/>	
Vehicle and equipment cleaning performed off site	<input type="checkbox"/>	
Spill prevention and control	<input type="checkbox"/>	
Others (specify):	<input type="checkbox"/>	
	<input type="checkbox"/>	

	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
<b>STORM EVENT INSPECTIONS (If applicable during project construction)</b>		
Date and time:	<input type="checkbox"/>	
Date and time:	<input type="checkbox"/>	
Date and time:	<input type="checkbox"/>	
Date and time:	<input type="checkbox"/>	
Date and time:	<input type="checkbox"/>	
Date and time:	<input type="checkbox"/>	
Date and time:	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	
	<input type="checkbox"/>	

<b>Contractor (Documentation Author's /Responsible Designer's Declaration Statement)</b>	
<ul style="list-style-type: none"> <li>• I certify that this Certificate of Compliance documentation is accurate and complete.</li> <li>• I certify that the features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 11 of the California Code of Regulations.</li> <li>• The design features identified on this Certificate of Compliance are consistent with the information documented on other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with the permit application.</li> </ul>	
Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:

## WORKSHEET (WS-1) BASELINE WATER USE

**CALGreen  
Std. – BSC-5.3-1  
7-16-10**

BASELINE WATER USE CALCULATION TABLE											
Fixture Type	Quantity		Flow-rate (gpm)		Duration		Daily uses		Occupants <sup>3,4</sup>		Gallons per day
Showerheads		X	2.5	X	5 min.	X	1	X		=	
Showerheads Residential		X	2.5	X	8 min.	X	1	X		=	
Lavatory Faucets Residential		X	2.2	X	.25 min.	X	3	X		=	
Kitchen Faucets		X	2.2	X	4 min.	X	1	X		=	
Replacement Aerators		X	2.2	X		X		X		=	
Wash Fountains		X	2.2	X		X		X		=	
Metering Faucets		X	0.25	X	.25 min.	X	3	X		=	
Metering Faucets for Wash Fountains		X	2.2	X	.25 min.	X		X		=	
Gravity tank type Water Closets		X	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
Flushometer Tank Water Closets		X	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
Flushometer Valve Water Closets		X	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
Electromechanical Hydraulic Water Closets		X	1.6	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
Urinals		X	1.0	X	1 flush	X	2 male	X			
Total daily baseline water use (BWU)										=	
_____ (BWU) X .80 = _____ Allowable water use											

<sup>1</sup> Except for low-rise residential occupancies, 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, 2010 California Plumbing Code, for occupant load factors.

<b>Contractor (Documentation Author's /Responsible Designer's Declaration Statement)</b>	
<ul style="list-style-type: none"> <li>• I certify that this Certificate of Compliance documentation is accurate and complete.</li> <li>• I certify that the features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 11 of the California Code of Regulations.</li> <li>• The design features identified on this Certificate of Compliance are consistent with the information documented on other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with the permit application.</li> </ul>	
Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:

<b>WORKSHEET (WS-2)</b> <b>20% REDUCTION WATER USE CALCULATION TABLE</b>	<b>CALGreen</b> <b>Std. – BSC-5.3-2</b> <b>7-16-10</b>
---	--

20% REDUCTION WATER USE CALCULATION TABLE											
Fixture Type	Quantity		Flow-rate (gpm) <sup>2</sup>		Duration		Daily uses		Occupants <sup>3,4</sup>		Gallons per day
Showerheads		X		X	5 min.	X	1	X		=	
Showerheads Residential		X		X	8 min.	X	1	X		=	
Lavatory Faucets Residential		X		X	.25 min.	X	3	X		=	
Kitchen Faucets		X		X	4 min.	X	1	X		=	
Replacement Aerators		X		X		X		X		=	
Wash Fountains		X		X		X		X		=	
Metering Faucets		X		X	.25 min.	X	3	X		=	
Metering Faucets for Wash Fountains		X		X	.25 min.	X		X		=	
Gravity tank type Water Closets		X		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
HET <sup>5</sup> High Efficiency Toilet		X	1.28	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
Flushometer Tank Water Closets		X		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
Flushometer Valve Water Closets		X		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
Electromechanical Hydraulic Water Closets		X		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
Urinals		X		X	1 flush	X	2 male	X			
Urinals Non-Water Supplied		X	0.0	X	1 flush	X	2 male	X		=	
Proposed water use										=	
_____ (BWU from WS-1) X .80 = _____ Allowable water use											

<sup>1</sup> Except for low-rise residential occupancies, 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, 2010 California Plumbing Code, for occupant load factors.  
<sup>5</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.

Plumbing fixtures installed meet the requirements of Section 5.303.6.

<b>Contractor (Documentation Author's /Responsible Designer's Declaration Statement)</b>	
<ul style="list-style-type: none"><li>• I certify that this Certificate of Compliance documentation is accurate and complete.</li><li>• I certify that the features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 11 of the California Code of Regulations.</li><li>• The design features identified on this Certificate of Compliance are consistent with the information documented on other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with the permit application.</li></ul>	
Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:

<b>WORKSHEET (WS-3)</b> <b>30%, 35% or 40% REDUCTION WATER USE CALCULATION TABLE</b>	<b>CALGreen</b> <b>Std. – BSC-5.3-3</b> <b>7-16-10</b>
---	--

30%, 35% or 40% REDUCTION WATER USE CALCULATION TABLE											
Fixture Type	Quantity		Flow-rate (gpm) <sub>2</sub>		Duration		Daily uses		Occupants <sup>3</sup>		Gallons per day
Showerheads		X		X	5 min.	X	1	X		=	
Showerheads Residential		X		X	8 min.	X	1	X		=	
Lavatory Faucets Residential		X		X	.25 min.	X	3	X		=	
Kitchen Faucets		X		X	4 min.	X	1	X		=	
Replacement Aerators		X		X		X		X		=	
Wash Fountains		X		X		X		X		=	
Metering Faucets		X		X	.25 min.	X	3	X		=	
Metering Faucets for Wash Fountains		X		X	.25 min.	X		X		=	
Gravity tank type Water Closets		X		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
HET <sup>4</sup> High Efficiency Toilet		X	1.12	X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
Flushometer Tank Water Closets		X		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
Flushometer Valve Water Closets		X		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
Electromechanical Hydraulic Water Closets		X		X	1 flush	X	1 male <sup>1</sup> 3 female	X		=	
Urinals		X		X	1 flush	X	2 male	X			
Urinals Non-Water Supplied		X	0.0	X	1 flush	X	2 male	X		=	
Proposed water use										=	
30% Reduction _____ (BWU from WS-1) X .70 = _____ Allowable water use 35% Reduction _____ (BWU from WS-1) X .65 = _____ Allowable water use 40% Reduction _____ (BWU from WS-1) X .60 = _____ Allowable water use											

1, 2, 3, 4 and 5: See footnotes for Water Use Worksheet WS-2.

Plumbing fixtures installed meet the requirements of Section 5.303.6.

<b>Contractor (Documentation Author's /Responsible Designer's Declaration Statement)</b>	
<ul style="list-style-type: none"> <li>• I certify that this Certificate of Compliance documentation is accurate and complete.</li> <li>• I certify that the features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 11 of the California Code of Regulations.</li> <li>• The design features identified on this Certificate of Compliance are consistent with the information documented on other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with the permit application.</li> </ul>	
Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:



**WORKSHEET (WS-4)  
FIXTURE FLOW RATES**

**CALGreen  
Std. – BSC-5.3-4  
7-16-10**

<b>Fixture Type</b>	<b>Flow-rate</b>	<b>Maximum flow rate at 20% Reduction</b>	<b>Number installed</b>	<b>SUB-CONTR. INITIAL</b>
Showerheads	2.5 gpm @ 80 psi	2 gpm @ 80 psi		
Lavatory Faucets Nonresidential	0.5 gpm @ 60 psi	0.4 gpm @ 60 psi		
Kitchen Faucets	2.2 gpm @ 60 psi	1.8 gpm @ 60 psi		
Wash Fountains	2.2 [rim space (in.) / 20 gpm @ 60 psi]	1.8 [rim space (in.) / 20 gpm @ 60 psi]		
Metering Faucets	0.25 gallons/cycle	0.2 gallons/cycle		
Metering Faucets for Wash Fountains	.25 [rim space (in.) / 20 gpm @ 60 psi]	.20 [rim space (in.) / 20 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.

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.

Plumbing fixtures installed meet the requirements of Section 5.303.6.

**Contractor (Documentation Author's /Responsible Designer's Declaration Statement)**

- I certify that this Certificate of Compliance documentation is accurate and complete.
- I certify that the features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 11 of the California Code of Regulations.
- The design features identified on this Certificate of Compliance are consistent with the information documented on other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with the permit application.

Signature:

Company:

Date:

Address:

License:

City/State/Zip:

Phone:

# CONSTRUCTION WASTE MANAGEMENT (CWM) PLAN WORKSHEET

CALGreen  
Std. – BSC-5.4-1  
7-16-10

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. Each 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

CALGreen  
Std. – BSC-5.4-2  
7-16-10

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

**Project Name:** \_\_\_\_\_  
**Job Number:** \_\_\_\_\_  
**Project Manager:** \_\_\_\_\_  
**Waste Hauling Company:** \_\_\_\_\_

## Construction Waste Management (CWM) Plan

Waste Material Type	Diversion Method:		Projected Diversion Rate
	Commingled and Sorted Off-site	Source Separated Onsite	
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:			
Other:			

<b>Other:</b>			
---------------	--	--	--

<p><b>Contractor (Documentation Author's /Responsible Designer's Declaration Statement)</b></p> <ul style="list-style-type: none"> <li>• I certify that this Certificate of Compliance documentation is accurate and complete.</li> <li>• I certify that the features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 11 of the California Code of Regulations.</li> <li>• The design features identified on this Certificate of Compliance are consistent with the information documented on other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with the permit application.</li> </ul>	
Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:



<b>Contractor (Documentation Author's /Responsible Designer's Declaration Statement)</b>	
<ul style="list-style-type: none"> <li>• I certify that this Certificate of Compliance documentation is accurate and complete.</li> <li>• I certify that the features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 11 of the California Code of Regulations.</li> <li>• The design features identified on this Certificate of Compliance are consistent with the information documented on other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with the permit application.</li> </ul>	
Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:



*[The Owner's Project Requirements (OPR) is a step of commissioning required for compliance with the 2010 CALGREEN Code, section 5.410.2.1, for newly constructed buildings greater than 10,000 sq. ft. This template is a guide to collecting the information recommended for the OPR. The information should be developed by the project team in collaboration with the Owner.]*

## **Owner and User Requirements**

- a) *[Typically already covered in Project Scope as described in the building program. Includes primary purpose, program and use of project. May also describe future expansion needs, flexibility, quality of materials, construction and operation costs.]*

## **Environmental and Sustainability Goals**

- a) Project shall meet performance requirements required by the owner.
- b) Other Owner requirements: *[e.g. Owner priorities among CALGREEN Code or other areas]*

## **Energy Efficiency Goals**

- a) Project shall comply with Title 24 building energy efficiency standards, or achieve increased level of efficiency determined by owner.
- b) Lighting systems offer cost effective energy savings potential, and lighting fixtures and/or controls shall be selected to exceed Title 24 minimum efficiency requirements by level determined by owner.
- c) High efficiency HVAC equipment offers cost effective energy savings, and HVAC equipment shall be selected that exceeds Title 24 minimum efficiency requirements by level determined by owner.
- d) Additional energy efficiency measures that provide cost effective energy savings shall be included wherever feasible.
- e) Other Owner requirements: *[e.g. orientation, siting, daylighting, cool roof, natural ventilation, landscaping]*

## **Indoor Environmental Quality Requirements**

- a) Indoor lighting requirements: *[List any specific non-standard requirements. E.g. pendant-mounted lighting, illumination requirements, special applications.]*
- b) Occupant lighting control requirements: *[List any non-standard requirements. E.g. multi-mode controls for assembly spaces]*
- c) Thermal comfort requirements: *[List any non-standard temperature or humidity requirements]*

- d) Ventilation and filtration requirements: *[List any non-standard requirements]*
- e) Occupancy HVAC control requirements: *[List any non-standard requirements. E.g. integration with existing control systems]*
- f) Acoustic environment requirements: *[List any non-standard requirements. E.g. local noise sources requiring mitigation, spaces such as classrooms that require low background noise and short reverberation times]*
- g) Other Owner requirements: *[E.g. natural ventilation, operable windows, daylight, views]*

### **Equipment and Systems Expectations**

- a) Special HVAC equipment requirements: *[E.g. equipment type, quality, reliability, efficiency, control system type, preferred manufacturers, maintenance requirements]*
- b) Unacceptable HVAC system types or equipment: *[List if applicable]*
- c) Special lighting equipment requirements: *[E.g. list preferred lamp and ballast types that comply with Owner standards if applicable]*
- d) Other system requirements:

### **Building Occupant and O&M Personnel Expectations**

**Day-to-day HVAC operation by:** *[occupants, operating staff]*

**Periodic HVAC maintenance performed by:** *[building occupants, operating staff, service company, Owner staff, other]*

**Lighting system maintenance will be performed by:** *[building occupants, operating staff, service company, Owner staff, other]*

**Training required for building occupants:** *[e.g. demonstration, instruction documents]*

**Training required for operating and maintenance staff:** *[e.g. demonstration, classroom training, instruction documents]*

**Other Owner requirements:**

# CALGreen Compliance Form- Owner's Project Requirements (OPR)

CALGreen  
Std. BSC-5.4-5  
10-08-10

The following form may be required to be printed on the permit set of construction drawings or submitted separately. Italicized text indicates direct or partial quotes from the CALGreen Code.

## CALGreen Commissioning Requirement 5.410.2.1-Owner's Project Requirements (OPR)

*5.410.2.1 Owner's Project Requirements (OPR). The expectations and requirements of the building appropriate to its phase shall be documented before the design phase of the project begins. The OPR includes the checked elements listed below and have been approved by the Owner or Owner Representative.*

	<b>OPR Elements</b>	<b>Included</b>
1.	Environmental and Sustainability Goals.	<input type="checkbox"/>
2.	Energy Efficiency Goals.	<input type="checkbox"/>
3.	Indoor Environmental Quality Requirements.	<input type="checkbox"/>
4.	Project program, including facility functions and hours of operation, and need for after hours operation.	<input type="checkbox"/>
5.	Equipment and Systems Expectations.	<input type="checkbox"/>
6.	Building Occupant and O&M Personnel Expectations.	<input type="checkbox"/>

\_\_\_\_\_  
Owner / Owner Representative Signature

\_\_\_\_\_  
Date

# CALGreen Compliance Template- Basis of Design (BOD)

CALGreen  
Std. BSC-5.4-6  
10-08-10

*[Documentation of the Basis of Design (BOD) is a step required for compliance with 2010 CALGREEN Code, section 5.410.2.1, for newly constructed buildings greater than 10,000 sq. ft. This template is a guide for use by the design team.]*

## 1. HVAC System

### 1.1. Narrative Description of System

- A. [System type(s), location, control type, efficiency features, outdoor air ventilation strategy, indoor air quality features, noise reduction features, environmental benefits, other special features]
- B. [Describe how system meets any special requirements listed in the Owner's Project Requirements document.]

### 1.2. Reasons for System Selection

- A. [Reasons that the selected system is a better choice than alternatives. E.g. comfort performance, efficiency, reliability, flexibility, simplicity, cost, owner preferences, site constraints, climate, availability of maintenance, acoustics]

### 1.3. Load Calculations

- A. Load calculation method/software: \_\_\_\_\_
- B. Summer outdoor design conditions: \_\_ °F drybulb, \_\_ °F wetbulb
- C. Winter outdoor design conditions: \_\_ °F drybulb
- D. Indoor design conditions: \_\_ °F, \_\_%RH cooling; \_\_ °F heating
- E. **Internal heat gain assumptions:**

Space	Lighting Load	Plug Load	Occupant Load	Infiltration Load	Other:

### F. Calculated cooling loads and system size:

System/ Air Handler ID	Calculated Peak Cooling Load	Selected System Cooling Capacity	Reasons for difference between calculated load and selected system capacity

- G. Other load calculation assumptions:

### 1.4. Sequence of Operations

- A. [Operating schedules, setpoints, etc. May refer to plans and/or specifications if sequence of operations is included there.]

## 2. Indoor Lighting System

### 2.1. Narrative Description of System

- A. Fixture type(s)
- B. Lamp and ballast type
- C. Control type

D. [Describe how system meets any special requirements listed in the Owner’s Project Requirements document.]

**2.2. Reasons for System Selection**

A. [Reasons that the selected lighting system is a better choice than alternatives. E.g. visual comfort performance, efficiency, reliability, flexibility, simplicity, cost, owner preferences, color rendering, integration with daylighting, ease of maintenance, etc.]

**2.3. Lighting Design Criteria**

Space ID	Space Type	Illumination Design Target (footcandles)	Source of Target (e.g. IES Standard, Owner Requirement)	Other Lighting Design Criteria: [e.g. CRI, CCT]

**2.4. Lighting Power Design Targets**

Space Type	Title 24 Lighting Power Allowance (watts/ft <sup>2</sup> )	Lighting Power Design Target (watts/ft <sup>2</sup> )

**3. Water Heating System**

**3.1. Narrative Description of System**

- A. [System type(s), location, control type, efficiency features, environmental benefits, other special features]
- B. [Describe how system meets any special requirements listed in the Owner’s Project Requirements document.]

**3.2. Reasons for System Selection**

A. [Reasons that the selected water heating system is a better choice than alternatives. E.g. performance, efficiency, reliability, simplicity, space constraints, cost, owner preferences, ease of maintenance, utility company incentives, etc.]

**3.3. Water Heating Load Calculations**

A. [Describe sizing calculation method, assumptions, and results]

**4. Renewable Energy Systems**

**4.1. Narrative Description of System**

- A. [System type(s), location, inverter type, control type, performance, efficiency, energy savings, payback period]
- B. [Describe how system meets any special requirements listed in the Owner’s Project Requirements document.]

**4.2. Reasons for System Selection**

A. [Reasons that the selected renewable energy systems are a better choice than alternatives. E.g. performance, efficiency, reliability, flexibility, simplicity, expandability, cost, payback period, utility company incentives, owner preference, space constraints, cost, owner preferences, ease of maintenance, etc.]

- 4.3. Renewable Energy System Generation Calculations**
  - A. [Describe sizing calculation method, assumptions, and results]
- 5. Landscape Irrigation Systems**
  - 5.1. Narrative Description of System**
    - A. [System type(s), location, control type, performance, efficiency, water savings]
    - B. [Describe how system meets any special requirements listed in the Owner's Project Requirements document.]
  - 5.2. Reasons for System Selection**
    - A. [Reasons that the selected landscape irrigation systems are a better choice than alternatives. E.g. performance, efficiency, reliability, flexibility, simplicity, expandability, cost, payback period, utility company incentives, owner preference, cost, owner preferences, ease of maintenance, etc.]
  - 5.3. Landscape Irrigation System Calculations**
    - A. [Describe sizing calculation method, assumptions, and results]
- 6. Water Reuse Systems**
  - 6.1. Narrative Description of System**
    - A. [System type(s), location, space requirements, equipment requirements, control type, performance, efficiency, potable water savings, payback period]
    - B. [Describe how system meets any special requirements listed in the Owner's Project Requirements document.]
  - 6.2. Reasons for System Selection**
    - A. [Reasons that the selected water reuse systems are a better choice than alternatives. E.g. performance, efficiency, reliability, flexibility, simplicity, expandability, cost, payback period, utility company incentives, owner preference, space constraints, cost, owner preferences, ease of maintenance, etc.]
  - 6.3. Water Reuse System Calculations**
    - [Describe sizing calculation method, assumptions, and results]

**CALGreen Compliance Form-  
Commissioning Measures in the Construction Documents**

**CALGreen  
Std. BSC-5.4-7  
10-08-10**

The following form may be required to be printed on the permit set of construction drawings or submitted separately. Italicized text indicates direct or partial quotes from the CALGreen Code.

**CALGreen Commissioning Requirement 5.410.2-Commissioning Measures in the Construction Documents**

*5.410.2. Commissioning measures shall be shown in the construction documents. The commissioning measures shown in the construction documents include the checked elements listed below and have been approved by the Owner, Owner Representative or Designer of record.*

	<b>Commissioning Measure Elements</b>	<b>Included</b>
1.	Measures shown in the specifications and cross referenced	<input type="checkbox"/>
2.	List of commissioned equipment and systems	<input type="checkbox"/>
3.	Cx roles and responsibilities of all parties	<input type="checkbox"/>
4.	Meeting requirements	<input type="checkbox"/>
5.	Commissioning schedule management procedures	<input type="checkbox"/>
6.	Procedures for addressing outstanding issues or non-compliance	<input type="checkbox"/>
7.	Requirements for execution and documentation of installation and equipment start up	<input type="checkbox"/>
8.	Specific testing requirements for each system type <sup>1</sup>	<input type="checkbox"/>
9.	Submittal review and approval requirements	<input type="checkbox"/>
10.	Contents and approval process of the commissioning plan	<input type="checkbox"/>
11.	Cx documentation and reporting requirements	<input type="checkbox"/>
12.	Facility staff training requirements and verification procedures	<input type="checkbox"/>
13.	O&M manual review and approval procedures	<input type="checkbox"/>
14.	Systems manual development and approval procedures	<input type="checkbox"/>
15.	Definitions	<input type="checkbox"/>

<sup>1</sup>These are not the detailed step-by-step test procedures, but are lists of features, elements, modes and conditions of tests for specific equipment.

\_\_\_\_\_  
Owner / Owner Representative  
or Designer of Record Signature

\_\_\_\_\_  
Date

# CALGreen Compliance Form- Commissioning Plan

CALGreen  
Std. BSC-5.4-8  
10-08-10

The following form may be required to be printed on the permit set of construction drawings or submitted separately. Italicized text indicates direct or partial quotes from the CALGreen Code.

## CALGreen Commissioning Requirement 5.410.2.3-Commissioning Plan

*5.410.2.3 Prior to permit issuance a commissioning plan shall be completed to document how the project will be commissioned and shall be started during the design phase of the building project. The commissioning plan includes the checked elements listed below and has been approved by the Owner or Owner Representative.*

	<b>Commissioning Plan Elements</b>	<b>Included</b>
1.	General project information	<input type="checkbox"/>
2.	Commissioning goals	<input type="checkbox"/>
4.	An explanation of original design intent	<input type="checkbox"/>
5.	Equipment and systems to be commissioned and tested, including extent of tests	<input type="checkbox"/>
6.	Functions to be tested and conditions of tests <sup>1</sup>	<input type="checkbox"/>
7.	Measurable performance criteria	<input type="checkbox"/>
8.	Cx team information	<input type="checkbox"/>
9.	Cx activities, schedules and responsibilities	<input type="checkbox"/>

<sup>1</sup>These are not the detailed step-by-step test procedures, but are lists of features, elements, modes and conditions of tests for specific equipment.

\_\_\_\_\_  
Owner / Owner Representative Signature

\_\_\_\_\_  
Date



**CALGreen Compliance Form-  
Functional Performance Testing**

**CALGreen  
Std. BSC-5.4-9  
10-08-10**

Italicized text indicates direct or partial quotes from the CALGreen Code.

**CALGreen Commissioning Requirement 5.410.2.4-Functional Performance Testing**

*5.410.2.4 Functional performance tests shall demonstrate the correct installation and operation of each component, system, and system-to-system interface in accordance with the approved plans and specifications. Functional performance testing reports shall contain information addressing each of the building components tested, the testing methods utilized, and include any readings and adjustments made. Test forms have been developed for each piece of commissioned equipment and system and include the checked elements listed below. These tests have been executed with deficiencies corrected.*

	<b>Functional Test Elements</b>	<b>Included</b>
1.	Date and parties participating	<input type="checkbox"/>
2.	Signature block attesting test is complete and accurate	<input type="checkbox"/>
3.	Prerequisites	<input type="checkbox"/>
4.	Precautions	<input type="checkbox"/>
5.	Instrumentation required	<input type="checkbox"/>
6.	Reference to the source of what is being confirmed (sequences, packaged features, etc.)	<input type="checkbox"/>
7.	Detailed step-by-step test instructions	<input type="checkbox"/>
8.	Acceptance criteria	<input type="checkbox"/>
9.	Results	<input type="checkbox"/>
10.	Confirmation of returning to normal	<input type="checkbox"/>
11.	Deficiency list	<input type="checkbox"/>

\_\_\_\_\_  
Cx Coordinator Signature

\_\_\_\_\_  
Date

# CALGreen Compliance Form- Systems Manual

CALGreen  
Std. BSC-5.4-10  
10-08-10

Italicized text indicates direct or partial quotes from the CALGreen Code.

CALGreen Commissioning Requirement 5.410.2.5.1-Documentation and Training-  
Systems Manual

*5.410.2.5.1 Systems Manual. Documentation of the operational aspects of the building shall be completed within the Systems Manual and delivered to the building owner or representative and facilities operator. The Systems Manual includes the checked elements listed below.*

	<b>System Manual Elements</b>	<b>Included</b>
1.	Site information including facility description, history and current requirements	<input type="checkbox"/>
2.	Site contact information	<input type="checkbox"/>
3.	Basic operations and maintenance and troubleshooting	<input type="checkbox"/>
4.	Systems covered include major systems listed under the BOD.	<input type="checkbox"/>
5.	Site equipment inventory and maintenance notes	<input type="checkbox"/>
6.	Special inspection verifications	<input type="checkbox"/>
7.	Other resources and documentation	<input type="checkbox"/>

\_\_\_\_\_  
Owner or Owner Representative Signature

\_\_\_\_\_  
Date

# CALGreen Compliance Form- Training

CALGreen  
Std. BSC-5.4-11  
10-08-10

Italicized text indicates direct or partial quotes from the CALGreen Code.

## CALGreen Commissioning Requirement 5.410.2.5.2-Documentation and Training- Training

*5.410.2.5.2 Systems Operations Training. The training of the appropriate maintenance staff for each equipment type and/or system shall be documented in the commissioning report. The written training program includes the checked elements listed below.*

	<b>Training Program Elements</b>	<b>Included</b>
1.	System/equipment overview (what it is, what it does and with what other systems and/or equipment it interfaces)	<input type="checkbox"/>
2.	Review and demonstration of servicing & preventive maintenance	<input type="checkbox"/>
3.	Review of the information in the Systems Manual	<input type="checkbox"/>
4.	Review of the record drawings on the system/equipment	<input type="checkbox"/>

The Owner or Owner Representative attest that when the appropriate maintenance staff are made available prior to certificate of occupancy that the written training program was executed with these staff. Or, that if appropriate maintenance staff are not available, that the written training program was submitted and approved by the Owner or Owner Representative.

\_\_\_\_\_  
Owner or Owner Representative Signature

\_\_\_\_\_  
Date

# CALGreen Compliance Form- Commissioning Report

CALGreen  
Std. BSC-5.4-12  
10-08-10

Italicized text indicates direct or partial quotes from the CALGreen Code.

## CALGreen Commissioning Requirement 5.410.2.6-Commissioning Report

*5.410.2.6 Commissioning Report. A complete report of commissioning process activities undertaken through the design, construction and reporting recommendations for post-construction phases of the building project shall be completed and provided to the owner or representative. The commissioning report includes the checked elements listed below and has been approved by the Owner or Owner Representative.*

	<b>Commissioning Report Elements</b>	<b>Included</b>
1.	Executive summary with conclusions and outstanding issues	<input type="checkbox"/>
2.	History of system deficiencies and resolution	<input type="checkbox"/>
3.	Summary of system functional test results	<input type="checkbox"/>
4.	Summary of training completion	<input type="checkbox"/>
5.	Attachments of Commissioning plan, OPR, BOD, executed (filled in) installation checklists, executed functional tests, recommendations for end-of-warranty review	<input type="checkbox"/>

\_\_\_\_\_  
Owner / Owner Representative Signature

\_\_\_\_\_  
Date

**FINISH MATERIAL CERTIFICATE – ADHESIVES & SEALANTS**

CALGreen  
Std. BSC-5.5-1  
7-16-10

<b>FINISH</b>	<b>WHERE USED (TYPE)</b>	<b>MANUFACTURER</b>	<b>VOC LIMIT (GPL)<sup>1,2</sup></b>	<b>SUB- CONTR. INITIAL</b>
<b><u>ADHESIVES</u></b>				
Indoor carpet adhesives			50	
Carpet pad adhesives			50	
Outdoor carpet adhesives			150	
Wood flooring adhesives			100	
Rubber floor adhesives			60	
Subfloor adhesives			50	
Ceramic tile adhesives			65	
VCT and asphalt tile adhesives			50	
Drywall & panel adhesives	Wall Surface		50	
Cove base adhesives	Floor Base		50	
Multi-purpose construction adhesives	Varies		70	
Structural glazing adhesives	Glazing		100	
Single-ply adhesives	Roof		250	
Other adhesive not specifically listed			50	
<b><u>SPECIALTY APPLICATIONS</u></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			250	
Structural wood member			140	
Top and trim adhesive			250	
<b><u>SUBSTRAIGHT SPECIFIC APPLICATION</u></b>				
Metal to metal			30	
Plastic foams / porous material			50	
Wood			30	
Fiberglass			80	
<b><u>SEALANTS &amp; CAULKS</u></b>				
Architectural			250	
Marine deck			760	
Nonmembrane roof			300	
Roadway			250	
Single-ply roof membrane			450	
Other			420	
<b><u>SEALANT PRIMERS</u></b>				
Architectural nonporous			250	
porous			775	
Modified bituminous			500	
Marine deck			760	
Other			750	

1. (GPL) = Grams per liter
2. Where no local or regional air pollution control or quality management district rules are applicable, use the VOC limits in this table.

<b>Contractor (Documentation Author's /Responsible Designer's Declaration Statement)</b>	
<ul style="list-style-type: none"> <li>• I certify that this Certificate of Compliance documentation is accurate and complete.</li> <li>• I certify that the features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 11 of the California Code of Regulations.</li> <li>• The design features identified on this Certificate of Compliance are consistent with the information documented on other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with the permit application.</li> </ul>	
Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:

# FINISH MATERIAL CERTIFICATE – ARCHITECTURAL COATINGS

CALGreen  
Std. BSC-5.5-2  
7-16-10

FINISH	WHERE USED (TYPE)	MANUFACTURER	VOC LIMIT (GPL) <sup>1</sup>	SUB- CONTR. INITIAL
<b><u>PAINTS &amp; COATINGS</u></b>				
Flat coatings			50	
Nonflatlat coatings			100	
Nonflat high gloass coatings			150	
<b><u>Specialty coatings</u></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 coverings			100	
Form-release compounds			250	
Graphic arts coatings (sign paints)			500	
High-temperature coatings			420	
Industrial maintenance coatings			250	
Low solids coatings <sup>2</sup>			120	
Magnesite cement coatings			450	
Mastic texture coatings			100	
Metallic pigmented coatings			500	
Multicolor coatings			250	
Pretreatment wash primers			420	

Primers, sealers and undercoaters			100	
Reactive penetrating sealers			350	
Recycled coatings			250	
Roof coatings			50	
Rust preventative coatings			400/250 <sup>3</sup>	
Shellacs: Clear Opaque			730 550	
Specialty primers, sealers and undercoaters			350/100 <sup>3</sup>	
Stains			250	
Stone consolidants			450	
Swimming pool coatings			340	
Traffic marking coatings			100	
Tub and tile refinish coatings			420	
Waterproofing membranes			250	
Wood coatings			275	
Wood preservatives			350	
Zinc-rich primers			340	

1. (GPL) = Grams per liter of coating
2. Grams of VOC per liter of coating, including water and including exempt compounds.
3. Effective on January 1, 2012

<b>Contractor (Documentation Author's /Responsible Designer's Declaration Statement)</b>	
<ul style="list-style-type: none"> <li>• I certify that this Certificate of Compliance documentation is accurate and complete.</li> <li>• I certify that the features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 11 of the California Code of Regulations.</li> <li>• The design features identified on this Certificate of Compliance are consistent with the information documented on other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with the permit application.</li> </ul>	
Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:



**FINISH MATERIAL CERTIFICATE –  
COMPOSITE WOOD PRODUCTS**

**CALGreen  
Std. BSC-5.5-3  
7-16-10**

<b>FINISH</b>	<b>FORMALDEHYDE LIMITS<sup>1</sup></b> (Max. emissions in Parts per Million)	<b>Effective JAN. 1, 2012</b>	<b>Effective JUL. 1, 2012</b>	<b>SUB- CONTR. INITIAL</b>
<b><u>Composite wood products</u></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		

1. Values in this table are derived from those specified by the California Air Resources Board, Air Toxics Control Measure for Composite Wood as tested in accordance with ASTM E 1333-96 (2002). For additional information, see *California Code of Regulations*, Title 17, Sections 93120 through 93120.12.
2. Thin medium density fiberboard has a maximum thickness of eight millimeters.

<b>Contractor (Documentation Author's /Responsible Designer's Declaration Statement)</b>	
<ul style="list-style-type: none"> <li>• I certify that this Certificate of Compliance documentation is accurate and complete.</li> <li>• I certify that the features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 11 of the California Code of Regulations.</li> <li>• The design features identified on this Certificate of Compliance are consistent with the information documented on other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with the permit application.</li> </ul>	
Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:

**FINISH MATERIAL CERTIFICATE – FLOORING**  
**(CARPET, CARPET CUSHION & RESILIENT)**

CALGreen  
 Std. BSC-5.5-4  
 7-16-10

FINISH	MANUFACTURER	CERTIFICATION ORGANIZATION	SUB-CONTR. INITIAL
<b><u>FLOORING</u></b>			
Carpet 1		Carpet and Rug Institute – Green Label Plus Program	
		Specification 01350	
		NSF/ANSI 140 – Gold	
		Scientific Certification Systems – Sustainable Choice	
Carpet 2		Carpet and Rug Institute – Green Label Plus Program	
		Specification 01350	
		NSF/ANSI 140 – Gold	
		Scientific Certification Systems – Sustainable Choice	
Carpet cushion 1		Carpet and Rug Institute – Green Label Plus Program	
Carpet cushion 2		Carpet and Rug Institute – Green Label Plus Program	
Resilient flooring 1		CHPS Product Registry	
		RFCI – Floor Score Program	
		Greenguard Children & Schools	

Resilient flooring 2		CHPS Product Registry	
		RFCI – Floor Score Program	
		Greenguard Children & Schools	

<b>Contractor (Documentation Author's /Responsible Designer's Declaration Statement)</b>	
<ul style="list-style-type: none"> <li>• I certify that this Certificate of Compliance documentation is accurate and complete.</li> <li>• I certify that the features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 11 of the California Code of Regulations.</li> <li>• The design features identified on this Certificate of Compliance are consistent with the information documented on other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with the permit application.</li> </ul>	
Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:

## **Appendix A: Commissioning Project Sample(s) and Additional Forms and Templates**

This appendix is supplemental to the Guide to the California Green Building Standards Code – Non-Residential (Commissioning), and is intended to provide additional resources for commissioning.

1. Commissioning sample project(s):

<http://www.documents.dgs.ca.gov/bsc/CALGreen/CX-SAMPLE-PROJECT.pdf>

2. Commissioning sample Performance and Functional Testing (FPT) Template:

<http://www.documents.dgs.ca.gov/bsc/CALGreen/FPT-SAMPLE-TEMPLATE.pdf>

## **Appendix B: Additional Commissioning Resources**

This appendix is supplemental to the Guide to the California Green Building Standards Code – Non-Residential (Commissioning), and is intended to provide additional resources for commissioning.

Building Commissioning Cost Benefit Assessment report by the Lawrence Berkeley National Laboratory

<http://cx.lbl.gov/2009-assessment.html>

California Commissioning Collaborative

<http://cacx.org>