

# REVISION RECORD FOR THE STATE OF CALIFORNIA

## ERRATA

January 1, 2014

### 2013 Title 24, Part 11, California Code of Regulations

#### General Information:

1. The date of this erratum is for identification purposes only. See the History Note Appendix on the back side or accompanying page.
2. This erratum is issued by the California Building Standards Commission in order to correct nonsubstantive printing errors or omissions in California Code of Regulations, Title 24, Part 11, of the 2013 *California Green Building Standards Code*. Instructions are provided below.
3. Health and Safety Code Section 18938.5 establishes that only building standards in effect at the time of the application for a building permit may be applied to the project plans and construction. This rule applies to both adoptions of building standards for Title 24 by the California Building Standards Commission, and local adoptions and ordinances imposing building standards. An erratum to Title 24 is a nonregulatory correction because of a printing error or omission that does not differ substantively from the official adoption by the California Building Standards Commission. Accordingly, the corrected code text provided by this erratum may be applied on and after the stated effective date.
4. You may wish to retain the superseded material with this revision record so that the prior wording of any section can be easily ascertained.

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# California Code of Regulations, Title 24

## California Agency Information Contact List

### Board of State and Community Corrections

www.bscc.ca.gov .....(916) 445-5073  
Local Adult Jail Standards  
Local Juvenile Facility Standards

### California Building Standards Commission

www.bsc.ca.gov .....(916) 263-0916

### California Energy Commission

www.energy.ca.gov ..... **Energy Hotline** (800) 772-3300  
Building Efficiency Standards  
Appliance Efficiency Standards  
Compliance Manual/Forms

### California State Lands Commission

www.slc.ca.gov .....(562) 499-6312  
Marine Oil Terminals

### California State Library

www.library.ca.gov .....(916) 654-0266

### Department of Consumer Affairs:

#### Acupuncture Board

www.acupuncture.ca.gov .....(916) 515-5200  
Office Standards

#### Board of Pharmacy

www.pharmacy.ca.gov .....(916) 574-7900  
Pharmacy Standards

#### Bureau of Barbering and Cosmetology

www.barbercosmo.ca.gov .....(916) 952-5210  
Barber and Beauty Shop,  
and College Standards

#### Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation

www.bearhfti.ca.gov .....(916) 999-2041  
Insulation Testing Standards

#### Structural Pest Control Board

www.pestboard.ca.gov .....(800) 737-8188  
Structural Standards

#### Veterinary Medical Board

www.vmb.ca.gov .....(916) 263-2610  
Veterinary Hospital Standards

### Department of Food and Agriculture

www.cdfa.ca.gov  
Meat & Poultry Packing Plant Standards (916) 654-0509  
Dairy Standards (916) 654-0773

### Department of Housing and Community Development

www.hcd.ca.gov .....(916) 445-9471

Residential- Hotels, Motels, Apartments,  
Single-Family Dwellings; and  
Permanent Structures in Mobilehome &  
Special Occupancy Parks

(916) 445-3338

Factory-Built Housing, Manufactured Housing &  
Commercial Modular

Mobilehome- Permits & Inspections  
Northern Region-(916) 255-2501  
Southern Region-(951) 782-4420

(916) 445-9471

Employee Housing Standards

### Department of Public Health

www.dph.ca.gov .....(916) 449-5661

Organized Camps Standards  
Public Swimming Pools Standards

### Division of the State Architect

www.dgs.ca.gov/dsa .....(916) 445-8100

#### Access Compliance

#### Structural Safety

Public Schools Standards  
Essential Services Building Standards  
Community College Standards

#### State Historical Building Safety Board

Alternative Building Standards

### Office of Statewide Health Planning and Development

www.oshpd.ca.gov .....(916) 440-8356

Hospital Standards  
Skilled Nursing Facility Standards &  
Clinic Standards  
Permits

### Office of the State Fire Marshal

osfm.fire.ca.gov .....(916) 445-8200

Code Development and Analysis  
Fire Safety Standards



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# CALIFORNIA GREEN BUILDING STANDARDS CODE – MATRIX ADOPTION TABLE

## CHAPTER 4 – RESIDENTIAL MANDATORY MEASURES

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the user.  
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	SFM	HCD			DSA		OSHPD				BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
			1	2	1-AC	AC	SS	1	2	3	4								
Adopt entire CA chapter																			
Adopt entire chapter as amended (amended sections listed below)																			
Adopt only those sections that are listed below			X																
Chapter/Section																			
4.1			X																
4.2			†													X			
4.3			X																
4.4			X																
4.5			X																

The state agency does not adopt sections identified by the following symbol: †.

## CHAPTER 4

### RESIDENTIAL MANDATORY MEASURES

#### Division 4.1 – PLANNING AND DESIGN

#### SECTION 4.101 GENERAL

**4.101.1 Scope.** The provisions of this division outline planning, design and development methods that include environmentally responsible site selection, building design, building siting and development to protect, restore and enhance the environmental quality of the site and respect the integrity of adjacent properties.

#### SECTION 4.102 DEFINITIONS

**4.102.1 Definitions.** The following terms are defined in Chapter 2.

**FRENCH DRAIN.**

**WATTLES.**

#### SECTION 4.103 SITE SELECTION (Reserved)

#### SECTION 4.104 SITE PRESERVATION (Reserved)

#### SECTION 4.105 DECONSTRUCTION AND REUSE OF EXISTING STRUCTURES (Reserved)

#### SECTION 4.106 SITE DEVELOPMENT

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

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

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

## RESIDENTIAL MANDATORY MEASURES

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

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

**Exception:** Additions and alterations not altering the drainage path.



## CHAPTER 4

# RESIDENTIAL MANDATORY MEASURES

### *Division 4.4 – MATERIAL CONSERVATION AND RESOURCE EFFICIENCY*

#### SECTION 4.401 GENERAL

**4.401.1 Scope.** The provisions of this chapter shall outline means of achieving material conservation and resource efficiency through protection of buildings from exterior moisture; construction waste diversion; employment of techniques to reduce pollution through recycling of materials; and building commissioning or testing, adjusting and balancing.

#### SECTION 4.402 DEFINITIONS

**4.402.1 Definitions.** Reserved.

#### SECTION 4.403 FOUNDATION SYSTEMS (Reserved)

#### SECTION 4.404 EFFICIENT FRAMING TECHNIQUES (Reserved)

#### SECTION 4.405 MATERIAL SOURCES (Reserved)

#### SECTION 4.406 ENHANCED DURABILITY AND REDUCED MAINTENANCE

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

#### SECTION 4.407 WATER RESISTANCE AND MOISTURE MANAGEMENT (Reserved)

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

**4.408.1 Construction waste management.** Recycle and/or salvage for reuse a minimum of 50 percent of the nonhazardous construction and demolition waste in accordance with either Section 4.408.2, 4.408.3 or 4.408.4, or meet a more stringent local construction and demolition waste management ordinance.

**Exceptions:**

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

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

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

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

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

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

> **4.408.4.1 Waste stream reduction alternative.** Projects that generate a total combined weight of construction and demolition waste disposed of in landfills, which do not exceed two (2) pounds per square foot of the building area, shall meet the minimum 50-percent construction waste reduction requirement in Section 4.408.1.

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

**Notes:**

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

consumption, including recycle programs and locations.

4. Public transportation and/or carpool options available in the area.
5. Educational material on the positive impacts of an interior relative humidity between 30–60 percent and what methods an occupant may use to maintain the relative humidity level in that range.
6. Information about water-conserving landscape and irrigation design and controllers which conserve water.
7. Instructions for maintaining gutters and downspouts and the importance of diverting water at least 5 feet away from the foundation.
8. Information on required routine maintenance measures, including, but not limited to, caulking, painting, grading around the building, etc.
9. Information about state solar energy and incentive programs available.
10. A copy of all special inspection verifications required by the enforcing agency or this code.

**SECTION 4.409  
LIFE CYCLE ASSESSMENT  
(Reserved)**

**SECTION 4.410  
BUILDING MAINTENANCE AND OPERATION**

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

1. Directions to the owner or occupant that the manual shall remain with the building throughout the life cycle of the structure.
2. Operation and maintenance instructions for the following:
  - a. Equipment and appliances, including water-saving devices and systems, HVAC systems, water-heating systems and other major appliances and equipment.
  - b. Roof and yard drainage, including gutters and downspouts.
  - c. Space conditioning systems, including condensers and air filters.
  - d. Landscape irrigation systems.
  - e. Water reuse systems.
3. Information from local utility, water and waste recovery providers on methods to further reduce resource

**CALIFORNIA GREEN BUILDING STANDARDS CODE – MATRIX ADOPTION TABLE  
CHAPTER 5 – NONRESIDENTIAL MANDATORY MEASURES  
DIVISION 5.1 – PLANNING AND DESIGN**

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the user.  
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	SFM	HCD			DSA		OSHPD				BSCC	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												
5.106.4.2 and subsections							X												
5.106.8							X												
5.106.10							X												

**CHAPTER 5  
NONRESIDENTIAL MANDATORY MEASURES**

*Division 5.1 – PLANNING AND DESIGN*

**SECTION 5.101  
GENERAL**

**5.101.1 Scope.** The provisions of this chapter outline planning, design and development methods that include environmentally responsible site selection, building design, building siting and development to protect, restore and enhance the environmental quality of the site and respect the integrity of adjacent properties.

**SECTION 5.102  
DEFINITIONS**

**5.102.1 Definitions.** The following terms are defined in Chapter 2.

**CUTOFF LUMINAIRES.**

**LOW-EMITTING AND FUEL EFFICIENT VEHICLES.**

**NEIGHBORHOOD ELECTRIC VEHICLE (NEV).**

**TENANT-OCCUPANTS.**

**VANPOOL VEHICLE.**

**ZEV.**

**SECTION 5.103  
SITE SELECTION  
(Reserved)**

**SECTION 5.104  
SITE PRESERVATION  
(Reserved)**

**SECTION 5.105  
DECONSTRUCTION AND REUSE OF EXISTING  
STRUCTURES  
(Reserved)**

**SECTION 5.106  
SITE DEVELOPMENT**

**5.106.1 Storm water pollution prevention.** Newly constructed projects and additions which disturb less than one acre of land shall prevent the pollution of stormwater runoff from the construction activities through one or more of the following measures:

**5.106.1.1 Local ordinance.** Comply with a lawfully enacted stormwater management and/or erosion control ordinance.

**5.106.1.2 Best management practices (BMP).** Prevent the loss of soil through wind or water erosion by implementing an effective combination of erosion and sediment control and good housekeeping BMP.

1. Soil loss BMP that should be considered for implementation as appropriate for each project include, but are not limited to, the following:
  - a. Scheduling construction activity.

**NONRESIDENTIAL MANDATORY MEASURES**

- 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.
  - k. Other soil loss BMP acceptable to the enforcing agency.
2. Good housekeeping BMP to manage construction equipment, materials and wastes that should be considered for implementation as appropriate for each project include, but are not limited to, the following:
- 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.
  - g. Other housekeeping BMP acceptable to the enforcing agency.

**5.106.4 Bicycle parking.** For buildings within the authority of California Building Standards Commission as specified in Section 103, comply with Section 5.106.4.1. For buildings within the authority of the Division of the State Architect pursuant to Section 105, comply with Section 5.106.4.2.

**5.106.4.1 Bicycle parking. [BSC]** Comply with Sections 5.106.4.1.1 and 5.106.4.1.2; or meet the applicable local ordinance, whichever is stricter.

**5.106.4.1.1 Short-term bicycle parking. [BSC]** If the new project or an addition or alteration 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 new visitor motorized vehicle parking spaces being added, with a minimum of one two-bike capacity rack.

**Exception:** Additions or alterations which add nine or less visitor vehicular parking spaces.

**5.106.4.1.2 Long-term bicycle parking.** For new buildings with over 10 tenant-occupants or for additions or alterations that add 10 or more tenant vehicular parking

spaces, provide secure bicycle parking for 5 percent of the tenant vehicular parking spaces being added, with a minimum of one space. Acceptable parking facilities shall be convenient from the street and shall meet one of the following:

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

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

**5.106.4.2 Bicycle parking. [DSA-SS]** For public schools and community colleges, comply with Sections 5.106.4.2.1 and 5.106.4.2.2.

**5.106.4.2.1 Short-term bicycle parking.** Provide permanently anchored bicycle racks within 200 feet of the student entrance, readily visible to passers-by, for 5 percent of the student population based on the total occupant load of the campus with a minimum of one two-bike capacity rack.

**5.106.4.2.2 Long-term bicycle parking.** Provide secure bicycle parking for 5 percent of employees, based on the total number of motorized vehicle parking capacity in the staff parking lot, with a minimum of one space. Acceptable bicycle parking facilities shall be convenient from the street or staff parking area and shall meet one of the following:

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

**5.106.5.2 Designated parking.** In new projects or additions or alterations that add 10 or more vehicular parking spaces, provide designated parking for any combination of low-emitting, fuel-efficient and carpool/van pool vehicles as follows:

**TABLE 5.106.5.2**

TOTAL NUMBER OF PARKING SPACES	NUMBER OF REQUIRED SPACES
0–9	0
10–25	1
26–50	3
51–75	6
76–100	8
101–150	11
151–200	16
201 and over	At least 8 percent of total

**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/  
VANPOOL/EV

**Note:** Vehicles bearing Clean Air Vehicle stickers from expired HOV lane programs may be considered eligible for designated parking spaces.

**5.106.8 Light pollution reduction.** [N] Outdoor lighting systems shall be designed and installed to comply with the following:

1. The minimum requirements in the *California Energy Code* for Lighting Zones 1-4 as defined in Chapter 10 of the California Administrative Code; and
2. Backlight, Uplight and Glare (BUG) ratings as defined in IES TM-15-11; and
3. Allowable BUG ratings not exceeding those shown in Table 5.106.8, or

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

**Exceptions:** [N]

1. Luminaires that qualify as exceptions in Section 140.7 of the *California Energy Code*.
2. Emergency lighting.

**Note:** [N] See also *California Building Code*, Chapter 12, Section 1205.6 for college campus lighting requirements for parking facilities and walkways.

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

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

**Exception:** Additions and alterations not altering the drainage path.

**TABLE 5.106.8 [N]  
MAXIMUM ALLOWABLE BACKLIGHT, UPLIGHT AND GLARE (BUG) RATINGS<sup>1,2</sup>**

ALLOWABLE RATING	LIGHTING ZONE 1	LIGHTING ZONE 2	LIGHTING ZONE 3	LIGHTING ZONE 4
<b>Maximum Allowable Backlight Rating<sup>3</sup></b>				
Luminaire greater than 2 mounting heights (MH) from property line	No Limit	No Limit	No Limit	No Limit
Luminaire back hemisphere is 1 – 2 MH from property line	B2	B3	B4	B4
Luminaire back hemisphere is 0.5 – 1 MH from property line	B1	B2	B3	B3
Luminaire back hemisphere is less than 0.5 MH from property line	B0	B0	B1	B2
<b>Maximum Allowable Uplight Rating</b>				
For area lighting <sup>4</sup>	U0	U0	U0	U0
For all other outdoor lighting, including decorative luminaires	U1	U2	U3	U4
<b>Maximum Allowable Glare Rating<sup>5</sup></b>				
Luminaire greater than 2 MH from property line	G1	G2	G3	G4
Luminaire front hemisphere is 1 – 2 MH from property line	G0	G1	G1	G2
Luminaire front hemisphere is 0.5 – 1 MH from property line	G0	G0	G1	G1
Luminaire back hemisphere is less than 0.5 MH from property line	G0	G0	G0	G1

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



2. For a map of known pest and/or disease quarantine zones, consult with the California Department of Food and Agriculture. ([www.cdffa.ca.gov](http://www.cdffa.ca.gov))

**SECTION 5.409  
LIFE CYCLE ASSESSMENT  
(Reserved)**

**SECTION 5.410  
BUILDING MAINTENANCE AND OPERATION**

**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 or meet a lawfully enacted local recycling ordinance, if more restrictive.

**5.410.1.1 Additions.** [A] All additions conducted within a 12-month period under single or multiple permits, resulting in an increase of 30 percent or more in floor area, shall provide recycling areas on site.

**Exception:** Additions within a tenant space resulting in less than a 30-percent increase in the tenant space floor area.

**5.410.1.2 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 CalRecycle's web site.

**5.410.2 Commissioning.** [N] 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 or owner representative's project requirements.
2. Basis of design.
3. Commissioning measures shown in the construction documents.
4. Commissioning plan.
5. Functional performance testing.
6. Documentation and training.
7. Commissioning report.

**Exceptions:**

1. Dry storage warehouses of any size.

2. Areas under 10,000 square feet used for offices or other conditioned accessory spaces within dry storage warehouses.
3. Tenant improvements under 10,000 square feet as described in Section 303.1.1.
4. Commissioning requirements for energy systems covered by the 2013 *California Energy Code*.

All building operating systems 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.

**5.410.2.1 Owner's or Owner representative's Project Requirements (OPR).** [N] 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 [Refer to 2013 *California Energy Code*, Section 120.8(b)].
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 operation and maintenance (O&M) personnel expectations.

**5.410.2.2 Basis of Design (BOD).** [N] 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. The Basis of Design document shall cover the following systems:

1. Heating, ventilation, air conditioning [HVAC] systems and controls. (Refer to 2013 *California Energy Code*, Section 120.8(c)).
2. Indoor lighting system and controls [Refer to 2013 *California Energy Code* Section 120.8(c)].
3. Water heating system [Refer to 2013 *California Energy Code* Section 120.8(c)].
4. Renewable energy systems.
5. Landscape irrigation systems.
6. Water reuse systems.

**5.410.2.3 Commissioning plan.** [N] Prior to permit issuance a commissioning plan shall be completed to document how the project will be commissioned. 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 shall be included.

**5.410.2.4 Functional performance testing.** [N] 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.

**5.410.2.5 Documentation and training.** [N] 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.

**5.410.2.5.1 Systems manual.** [N] Documentation of the operational aspects of the building shall be completed within the systems manual and delivered to the building owner or representative. The systems manual shall include the following:

1. Site information, including facility description, history and current requirements.
2. Site contact information.
3. Basic operations and 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 verifications required by the enforcing agency or this code.
7. Other resources and documentation, if applicable.

**5.410.2.5.2 Systems operations training.** [N] A program for training of the appropriate maintenance staff for each equipment type and/or system shall be developed and 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.

**5.410.2.6 Commissioning report.** [N] A report of commissioning process activities undertaken through the design and construction phases of the building project shall be completed and provided to the owner or representative.

**5.410.4 Testing and adjusting.** Testing and adjusting of systems shall be required for new buildings less than 10,000 square feet or new systems to serve an addition or alteration subject to Section 303.1.

**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, 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 manufacturer's specifications and applicable standards on each system.

**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, balance the system in accordance with the procedures defined by the Testing Adjusting and Balancing Bureau National Standards; the National Environmental Balancing Bureau Procedural Standards; Associated Air Balance Council National Standards or as approved by the enforcing agency.

**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 warranties/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.



value shall be included in the operation and maintenance manual.

**Exceptions:**

1. An ASHRAE 10-percent to 15-percent efficiency filter shall be permitted for an HVAC unit meeting the 2013 *California Energy Code* having 60,000 Btu/h or less capacity per fan coil, if the energy use of the air delivery system is 0.4 W/cfm or less at design air flow.
2. Existing mechanical equipment.

**5.504.5.3.1 Labeling.** Installed filters shall be clearly labeled by the manufacturer indicating the MERV rating.

**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 within the building as already prohibited by other laws or regulations; 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.

## SECTION 5.505 INDOOR MOISTURE CONTROL

**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.

## SECTION 5.506 INDOOR AIR QUALITY

**5.506.1 Outside air delivery.** For mechanically or naturally ventilated spaces in buildings, meet the minimum requirements of Section 120.1 (Requirements For Ventilation) of the 2013 *California Energy Code*, or the applicable local code, whichever is more stringent, and Division 1, Chapter 4 of CCR, Title 8.

**5.506.2 Carbon dioxide (CO<sub>2</sub>) monitoring.** For buildings or additions 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 2013 *California Energy Code*, Section 120(c)(4).

## SECTION 5.507 ENVIRONMENTAL COMFORT

**5.507.4 Acoustical control.** Employ building assemblies and components with Sound Transmission Class (STC) values determined in accordance with ASTM E 90 and ASTM E 413 or Outdoor-Indoor Sound Transmission Class (OITC) determined in accordance with ASTM E 1332, using either the pre-

scriptive or performance method in Section 5.507.4.1 or 5.507.4.2.

**Exception:** Buildings with few or no occupants or 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.

**Exception: [DSA-SS]** For public schools and community colleges, the requirements of this section and all subsections apply only to new construction.

**5.507.4.1 Exterior noise transmission, prescriptive method.** Wall and roof-ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 in the following locations:

1. Within the 65 CNEL noise contour of an airport.

**Exceptions:**

1. L<sub>dn</sub> or CNEL for military airports shall be determined by the facility Air Installation Compatible Land Use Zone (AICUZ) plan.
2. L<sub>dn</sub> or CNEL for other airports and heliports for which a land use plan has not been developed shall be determined by the local general plan noise element.
2. Within the 65 CNEL or L<sub>dn</sub> noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway source as determined by the Noise Element of the General Plan.

**5.507.4.1.1 Noise exposure where noise contours are not readily available.** Buildings exposed to a noise level of 65 dB L<sub>eq</sub>-1-hr during any hour of operation shall have building, addition or alteration exterior wall and roof-ceiling assemblies exposed to the noise source meeting a composite STC rating of at least 45 (or OITC 35), with exterior windows of a minimum STC of 40 (or OITC 30).

**5.507.4.2 Performance method.** For buildings located as defined in Section 5.507.4.1 or 5.507.4.1.1, wall and roof-ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level (L<sub>eq</sub>-1Hr) of 50 dBA in occupied areas during any hour of operation.

**5.507.4.2.1 Site features.** Exterior features such as sound walls or earth berms may be utilized as appropriate to the building, addition or alteration project to mitigate sound migration to the interior.

**5.507.4.2.2 Documentation of compliance.** An acoustical analysis documenting complying interior sound levels shall be prepared by personnel approved by the architect or engineer of record.

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

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

## SECTION 5.508 OUTDOOR AIR QUALITY

**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.

**5.508.2 Supermarket refrigerant leak reduction.** New commercial refrigeration systems shall comply with the provisions of this section when installed in retail food stores 8,000 square feet or more conditioned area, and that utilize either refrigerated display cases, or walk-in coolers or freezers connected to remote compressor units or condensing units. The leak reduction measures apply to refrigeration systems containing high-global-warming potential (high-GWP) refrigerants with a GWP of 150 or greater. New refrigeration systems include both new facilities and the replacement of existing refrigeration systems in existing facilities.

**Exception:** Refrigeration systems containing low-global warming potential (low-GWP) refrigerant with a GWP value less than 150 are not subject to this section. Low-GWP refrigerants are nonozone-depleting refrigerants that include ammonia, carbon dioxide (CO<sub>2</sub>), and potentially other refrigerants.

**5.508.2.1 Refrigerant piping.** Piping compliant with the *California Mechanical Code* shall be installed to be accessible for leak protection and repairs. Piping runs using threaded pipe, copper tubing with an outside diameter (OD) less than 1/4 inch, flared tubing connections and short radius elbows shall not be used in refrigerant systems except as noted below.

**5.508.2.1.1 Threaded pipe.** Threaded connections are permitted at the compressor rack.

**5.508.2.1.2 Copper pipe.** Copper tubing with an OD less than 1/4 inch may be used in systems with a refrigerant charge of 5 pounds or less.

**5.508.2.1.2.1 Anchorage.** One-fourth-inch OD tubing shall be securely clamped to a rigid base to keep vibration levels below 8 mils.

**5.508.2.1.3 Flared tubing connections.** Double-flared tubing connections may be used for pressure controls, valve pilot lines and oil.

**Exception:** Single-flared tubing connections may be used with a multiring seal coated with industrial seal-

ant suitable for use with refrigerants and tightened in accordance with manufacturer's recommendations.

**5.508.2.1.4 Elbows.** Short radius elbows are only permitted where space limitations prohibit use of long radius elbows.

**5.508.2.2 Valves.** Valves and fittings shall comply with the *California Mechanical Code* and as follows.

**5.508.2.2.1 Pressure relief valves.** For vessels containing high-GWP refrigerant, a rupture disc shall be installed between the outlet of the vessel and the inlet of the pressure relief valve.

**5.508.2.2.1.1 Pressure detection.** A pressure gauge, pressure transducer or other device shall be installed in the space between the rupture disc and the relief valve inlet to indicate a disc rupture or discharge of the relief valve.

**5.508.2.2.2 Access valves.** Only Schrader access valves with a brass or steel body are permitted for use.

**5.508.2.2.2.1 Valve caps.** For systems with a refrigerant charge of 5 pounds or more, valve caps shall be brass or steel and not plastic.

**5.508.2.2.2.2 Seal caps.** If designed for it, the cap shall have a neoprene O-ring in place.

**5.508.2.2.2.2.1 Chain tethers.** Chain tethers to fit over the stem are required for valves designed to have seal caps.

**Exception:** Valves with seal caps that are not removed from the valve during stem operation.

**5.508.2.3 Refrigerated service cases.** Refrigerated service cases holding food products containing vinegar and salt shall have evaporator coils of corrosion-resistant material, such as stainless steel; or be coated to prevent corrosion from these substances.

**5.508.2.3.1 Coil coating.** Consideration shall be given to the heat transfer efficiency of coil coating to maximize energy efficiency.

**5.508.2.4 Refrigerant receivers.** Refrigerant receivers with capacities greater than 200 pounds shall be fitted with a device that indicates the level of refrigerant in the receiver.

**5.508.2.5 Pressure testing.** The system shall be pressure tested during installation prior to evacuation and charging.

**5.508.2.5.1 Minimum pressure.** The system shall be charged with regulated dry nitrogen and appropriate tracer gas to bring system pressure up to 300 psig minimum.

**5.508.2.5.2 Leaks.** Check the system for leaks, repair any leaks, and retest for pressure using the same gauge.

**5.508.2.5.3 Allowable pressure change.** The system shall stand, unaltered, for 24 hours with no more than a +/- one pound pressure change from 300 psig, measured with the same gauge.

**5.508.2.6 Evacuation.** The system shall be evacuated after pressure testing and prior to charging.

# CALIFORNIA GREEN BUILDING STANDARDS CODE – MATRIX ADOPTION TABLE

## APPENDIX A4 – RESIDENTIAL VOLUNTARY MEASURES

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the user.  
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	SFM	HCD			DSA		OSHDP				BSCC	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																			
A4.1			X																
A4.2			†													X			
A4.3			X																
A4.4			X																
A4.5			X																

The state agency does not adopt sections identified by the following symbol: †.

## APPENDIX A4

# RESIDENTIAL VOLUNTARY MEASURES

*Some of the measures contained in this appendix are not mandatory unless adopted by a city, county, or city and county as specified in Section 101.7 and provide additional measures that designers, builders and property owners may wish to consider during the planning, design and construction process.*

### Division A4.1 – PLANNING AND DESIGN

#### PREFACE

Given that land use and planning are largely regulated locally, cities, counties, and cities and counties should consider reducing greenhouse gas emissions associated with development through local land-use practices in conjunction with enforcing the provisions of this code. Specific land use strategies a city, county, or city and county may wish to consider include but are not limited to the following:

**Site selection.** Develop sites for buildings, hardscape, roads or parking areas consistent with the local general plan and regional transportation plan pursuant to SB 375 (Stats 2008, Ch. 728).

**Regional sustainable communities strategy.** Site selection and building design and use shall conform the project with the prevailing regional sustainable communities strategy or alternative planning strategy, whichever meets the greenhouse gas target established by the California Air Resources Board pursuant to SB 375 (Stats. 2008, Ch. 728), including the general location of uses, residential densities and building intensities.

**Transit priority projects.** To qualify as a transit priority project, the project shall meet three criteria:

- (1) (a) contain at least 50 percent residential use, based on total building square footage and, if the project contains between 26 and 50 percent nonresidential uses, a floor area ratio of not less than 0.75; (b) provide a minimum net density of at least 20 dwelling units per acre; and (c) be within one-half mile of a major transit stop or high-quality transit corridor included in a regional transportation plan as described in Section 21155 of Stats. 2008, Ch. 728;
- (2) be consistent with the prevailing sustainable communities strategy or alternative planning strategy, whichever

meets the greenhouse gas target established by the California Air Resources Board, including the general location of uses, residential densities and building intensities; and

- (3) have all necessary entitlements required by the applicable local government.

**Note:** For additional information, see *Government Code* Sections 65080, 65080.1, 65400, and 65470, and *Public Resources Code* Sections 21061.3 and 21155.

#### SECTION A4.101 GENERAL

**A4.101.1 Scope.** The provisions of this division outline planning, design and development methods that include environmentally responsible site selection, building design, building siting and development to protect, restore and enhance the environmental quality of the site and respect the integrity of adjacent properties.

#### SECTION A4.102 DEFINITIONS

**A4.102.1 Definitions.** The following terms are defined in Chapter 2.

**BROWNFIELD SITE.**

**DEVELOPMENT FOOTPRINT.**

**GREENFIELDS.**

**GREYFIELD SITE.**

**INFILL SITE.**

**PERMEABLE PAVING.**

### SECTION A4.103 SITE SELECTION

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

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

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

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

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

### SECTION A4.104 SITE PRESERVATION

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

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

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

### SECTION A4.105 DECONSTRUCTION AND REUSE OF EXISTING MATERIALS

**A4.105.1 General.** Existing buildings on the site are deconstructed and the salvaged materials are reused. Reused materi-

als or products must comply with current building standards requirements or be an accepted alternate method or material.

**A4.105.2 Reuse of materials.** Materials which can be easily reused include but are not limited to the following:

1. Light fixtures.
2. Plumbing fixtures.
3. Doors and trim.
4. Masonry.
5. Electrical devices.
6. Appliances.
7. Foundations or portions of foundations.

**Note:** Reused material must be in compliance with the appropriate Title 24 requirements.

### SECTION A4.106 SITE DEVELOPMENT

**A4.106.1 Reserved.**

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

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

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

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

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

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

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

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



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

1. Areas disrupted during construction are restored to be consistent with native vegetation species and patterns.
2. Limit turf areas to the greatest extent possible.
  - Tier 1 not more than 50 percent of the total landscaped area.
  - Tier 2 not more than 25 percent of the total landscaped area.
3. Utilize at least 75 percent native California or drought tolerant plant and tree species appropriate for the climate zone region.
4. Hydrozoning irrigation techniques are incorporated into the landscape design.

**A4.106.4 Water permeable surfaces.** Permeable paving is utilized for the parking, walking or patio surfaces in compliance with the following.

- Tier 1. Not less than 20 percent of the total parking, walking or patio surfaces shall be permeable.
- Tier 2. Not less than 30 percent of the total parking, walking or patio surfaces shall be permeable.

**Exceptions:**

1. The primary driveway, primary entry walkway and entry porch or landing shall not be included when calculating the area required to be a permeable surface.
2. Required accessible routes for persons with disabilities as required by *California Code of Regulations*, Title 24, Part 2, Chapter 11A and/or Chapter 11B as applicable.

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

**Exceptions:**

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

**A4.106.5.1 Solar reflectance.** Roofing materials shall have a minimum 3-year aged solar reflectance equal to or greater than the values specified in Tables A4.106.5.1(1) and A4.106.5.1(3) for Tier 1 and Tables A4.106.5.1(2) and A4.105.5.1(4) for Tier 2.

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

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

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

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

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

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

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

SRI values used to comply with this section shall be calculated using the Solar Reflectance Index (SRI) Calculation Worksheet (SRI-WS) developed by the California Energy Commission or in compliance with ASTM E1980-01 as specified in the 2013 *California Energy Code*. Solar reflectance values used in the SRI-WS shall be based on the aged reflectance value of the roofing product or the equation in Section A4.106.5.1 if the CRRC certified aged solar reflectance are not available. Certified thermal emittance used in the SRI-WS may be either the initial value or the aged value listed by the CRRC.

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

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

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

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

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

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

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

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

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

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

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

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

**A4.106.7 Reduction of heat island effect for nonroof areas.** Reduce nonroof heat islands for 50 percent of sidewalks, patios, driveways or other paved areas by using one or more of the methods listed.

1. Trees or other plantings to provide shade and that mature within 15 years of planting. Trees should be native or adaptive to the region and climate zones and noninvasive; hardy and resistant to drought, insects and disease; easy to maintain (no frequent shedding of twigs, branches, unwanted fruit or seed pods); and suitable in mature size and environmental requirements for the site. Tree selection and placement should consider location and size of areas to be shaded, location of utilities, views from the structure, distance to sidewalks and foundations, overhangs onto adjacent properties and streets; other infrastructure and adjacent to landscaping. In addition, shading shall not cast a shadow, as specified, on any neighboring solar collectors pursuant to *Public Resources Code* Section 25981, et seq. (Solar Shade Control Act).
2. Use high albedo materials with an initial solar reflectance value of at least 0.30 as determined in accordance with American Society for Testing and Materials (ASTM) Standards E 1918 or C 1549.

3. Use open grid pavement system or pervious or permeable pavement system.
4. Locate 50 percent of parking underground or use multi-level parking.
5. Other methods of reducing heat island effects acceptable to the enforcing agency.

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

**A4.106.8 Electric vehicle (EV) charging.** Dwellings shall comply with the following requirements for the future installation of electric vehicle supply equipment (EVSE).

**A4.106.8.1 One-and two-family dwellings.** Install a listed raceway to accommodate a dedicated branch circuit. The raceway shall not be less than trade size 1 (nominal 1-inch inside diameter). The raceway shall be securely fastened at the main service or subpanel and shall terminate in close proximity to the proposed location of the charging system into a listed cabinet, box or enclosure. Raceways are required to be continuous at enclosed or concealed areas and spaces. A raceway may terminate in an attic or other approved location when it can be demonstrated that the area is accessible and no removal of materials is necessary to complete the final installation.

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

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

**A4.106.8.1.1 Labeling requirement.** A label stating “EV CAPABLE” shall be posted in a conspicuous place at the service panel or subpanel and next to the raceway termination point.

**A4.106.8.2 Multifamily dwellings.** At least 3 percent of the total parking spaces, but not less than one, shall be capable of supporting future electric vehicle supply equipment (EVSE).

**A4.106.8.2.1 Single charging space required.** When only a single charging space is required, install a listed raceway capable of accommodating a dedicated branch circuit. The raceway shall not be less than trade size 1 (nominal 1-inch inside diameter). The raceway shall be securely fastened at the main service or subpanel and shall terminate in close proximity to the proposed location of the charging system into a listed cabinet, box or enclosure.

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

## APPENDIX A4

# RESIDENTIAL VOLUNTARY MEASURES

### Division A4.2 – ENERGY EFFICIENCY

#### SECTION A4.201 GENERAL

**A4.201.1 Scope.** For the purposes of mandatory energy efficiency standards in this code, the California Energy Commission will continue to adopt mandatory standards. It is the intent of these voluntary standards to encourage buildings to achieve exemplary performance in the area of energy efficiency.

#### SECTION A4.202 DEFINITIONS

**A4.202.1. Definitions.** The following terms are defined in Chapter 2.

**ENERGY BUDGET.**

**ENERGY DESIGN RATING.**

**TIME DEPENDENT VALUATION (TDV) ENERGY.**

#### SECTION A4.203 PERFORMANCE APPROACH FOR NEWLY CONSTRUCTED BUILDINGS

**A4.203.1 Energy efficiency.** Newly constructed low-rise residential buildings shall comply with Sections A4.203.1.1 and either A4.203.1.2.1 or A4.203.1.2.2.

**A4.203.1.1 Tier 1 and Tier 2 prerequisites.** Each of the following efficiency measures is required for all applicable components of the building project.

**A4.203.1.1.1 Energy design rating.** An energy design rating for the Proposed Design Building shall be computed by Compliance Software certified by the Energy Commission and this rating shall be included in the Certificate of Compliance documentation.

**A4.203.1.1.2 Quality Insulation Installation (QII).** The QII procedures specified in the Building Energy Efficiency Standards Reference Residential Appendix RA3.5 shall be completed.

**A4.203.1.1.3 Lighting.** Comply with all applicable requirements of Title 24, Part 6, Section 150.0(k). In addition:

1. All permanently installed lighting shall be high efficacy. Permanently installed lighting shall be installed in kitchens, bathrooms, utility rooms, and private garages at a minimum.

#### Exceptions:

1. Night lights which comply with Title 24, Part 6, Section 150.0(k)1E.

2. Lighting integral to exhaust fans which comply with Title 24, Part 6, Section 150.0(k)1F.
2. All permanently installed lighting in bathrooms shall be controlled by a vacancy sensor.

**Exception:** One high efficacy luminaire with total lamp wattage rated to consume no greater than 26 watts of power.

3. Every room greater than 70 square feet, which does not have permanently installed lighting and has receptacles installed, shall have at least one switched receptacle installed.
4. For single-family residences, all permanently installed outdoor lighting shall have controls complying with Title 24, Part 6, Sections 150.0(k)9Ai and iii. For multifamily residential buildings, all permanently installed outdoor lighting controlled from within a dwelling unit shall have controls complying with Title 24, Part 6, Sections 150.0(k)9Ai and 150.0(k)9Aiii. For multifamily residential buildings, all permanently installed outdoor lighting which is not controlled from within a dwelling unit shall have controls complying with Title 24, Part 6, Section 150.0(k)9Bii.

**A4.203.1.2 Performance standard.** Comply with one of the advanced efficiency levels indicated below.

**A4.203.1.2.1 Tier 1.** Buildings complying with the first level of advanced energy efficiency shall have an Energy Budget that is no greater than 85 percent of the Title 24, Part 6 Energy Budget for the Proposed Design Building as calculated by Compliance Software certified by the Energy Commission.

**A4.203.1.2.2 Tier 2.** Buildings complying with the second level of advanced energy efficiency shall have an Energy Budget that is no greater than 70 percent of the Title 24, Part 6 Energy Budget for the Proposed Design Building as calculated by Compliance Software certified by the Energy Commission.

**Note:** For Energy Budget calculations, high-rise residential and hotel/motel buildings are considered non-residential buildings.

**Authority:** *Public Resources Code* Sections 25218, subd. (e), 25402, 25402.1, 25402.4, 25402.5, 25402.5.4, 25402.8, 25910 and 25943, and *Health and Safety Code* Sections 18930.5 and 18941.5.

**Reference:** *Public Resources Code* Sections 25402, subd. (a)-(c), 25402.1, 25402.4, 25402.5, 25402.5.4, 25402.8, 25910 and 25943, and *Health and Safety Code* Sections 18930.5 and 18941.5.

## SECTION A4.204 PERFORMANCE APPROACH FOR ADDITIONS AND ALTERATIONS

**A4.204.1 Energy efficiency.** Additions and alterations to low-rise residential buildings shall comply with Sections A4.204.1.1 and either A4.204.1.2.1 or A4.204.1.2.2.

**A4.204.1.1 Tier 1 and Tier 2 prerequisites.** Each of the following efficiency measures is required if applicable to the addition or alteration building project:

**A4.204.1.1.1 Lighting.** Comply with all applicable requirements of Title 24, Part 6, Section 150.0(k). In addition:

1. All newly installed, permanently installed lighting shall be high efficacy.

**Exceptions:**

1. Night lights complying with Title 24, Part 6, Section 150.0(k)1E.
2. Lighting integral to exhaust fans complying with Title 24, Part 6, Section 150.0(k)1F.
2. All newly installed, permanently installed lighting in bathrooms shall be controlled by a vacancy sensor.

**Exception:** One high efficacy luminaire with total lamp wattage rated to consume no greater than 26 watts of power.

3. Every new room greater than 70 square feet which does not have newly installed, permanently installed lighting and has newly installed receptacles shall have at least one switched receptacle installed.
4. For single-family residences, all newly installed, permanently installed outdoor lighting shall have controls complying with Title 24, Part 6, Sections 150.0(k)9Ai and 150.0(k)9Aiii. For multifamily residential buildings, all newly installed, permanently installed outdoor lighting controlled from within a dwelling unit shall have controls complying with Title 24, Part 6, Sections 150.0(k)9Ai and 150.0(k)9Aiii. For multifamily residential buildings, all newly installed, permanently installed outdoor lighting which is not controlled from within a dwelling unit shall have controls complying with Title 24, Part 6, Section 150.0(k)9Bii.

**A4.204.1.2 Performance standard.** Comply with one of the advanced efficiency levels indicated below.

**A4.204.1.2.1 Tier 1.** Buildings complying with the first level of advanced energy efficiency shall have an Energy Budget that is no greater than indicated below, depending on the number of mechanical systems added or modified. Space heating systems, space cooling systems and

water heating systems are each separate mechanical systems for the purpose of complying with this requirement. If the addition or alteration changes only the envelope with no change to any mechanical system, then no additional performance requirements above Title 24, Part 6 are required.

1. For one and only one mechanical system: No greater than 95 percent of the Title 24, Part 6 Energy Budget for the Proposed Design Building as calculated by Compliance Software certified by the Energy Commission.
2. For two or more mechanical systems: No greater than 90 percent of the Title 24, Part 6 Energy Budget for the Proposed Design Building as calculated by Compliance Software certified by the Energy Commission.

**A4.204.1.2.2 Tier 2.** Buildings complying with the second level of advanced energy efficiency shall have an Energy Budget that is no greater than indicated below, depending on the number of mechanical systems added or modified. Space heating systems, space cooling systems and water heating systems are each separate mechanical systems for the purpose of complying with this requirement. If the addition or alteration changes only the envelope with no change to any mechanical system, then no additional performance requirements above Title 24, Part 6 are required.

1. For one and only one mechanical system: No greater than 90 percent of the Title 24, Part 6 Energy Budget for the Proposed Design Building as calculated by Compliance Software certified by the Energy Commission.
2. For two or more mechanical systems: No greater than 85 percent of the Title 24, Part 6 Energy Budget for the Proposed Design Building as calculated by Compliance Software certified by the Energy Commission.

**Note:** For Energy Budget calculations, high-rise residential and hotel/motel buildings are considered non-residential buildings.



**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.

**A5.106.4 Reserved.**

**A5.106.4.1 Reserved.**

**A5.106.4.2 Reserved.**

**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.

**TABLE A5.106.4.3**

NUMBER OF TENANT-OCCUPANTS	SHOWER/CHANGING FACILITIES REQUIRED <sup>2</sup>	2-TIER (12" X 15" X 72") PERSONAL EFFECTS LOCKERS <sup>1,2</sup> REQUIRED
0–10	0	0
11–50	1 unisex shower	2
51–100	1 unisex shower	3
101–200	1 shower stall per gender	4
Over 200	1 shower stall per gender for each 200 additional tenant-occupants	One 2-tier locker for each 50 additional tenant-occupants

- One 2-tier locker serves two people. Lockers shall be lockable with either padlock or combination lock.
- Tenant spaces housing more than 10 tenant-occupants within buildings sharing common toilet facilities need not comply; however, such common shower facilities shall accommodate the total number of tenant-occupants served by the toilets and include a minimum of one unisex shower and two 2-tier lockers.

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

**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.

**A5.106.5.1.1 Tier 1. Ten percent of total spaces. [BSC]** Provide 10 percent of total designated parking spaces for any combination of low-emitting, fuel-efficient and carpool/van pool vehicles as follows:

**TABLE A5.106.5.1.1**

TOTAL NUMBER OF PARKING SPACES	NUMBER OF REQUIRED SPACES
0–9	0
10–25	2
26–50	4
51–75	6
76–100	9
101–150	11
151–200	18
201 and over	At least 10 percent of total

**A5.106.5.1.2 Tier 2.** Provide 12 percent of total designated parking spaces for any combination of low-emitting, fuel-efficient, and carpool/van pool vehicles as follows:

**TABLE A5.106.5.1.2**

TOTAL NUMBER OF PARKING SPACES	NUMBER OF REQUIRED SPACES
0–9	1
10–25	2
26–50	5
51–75	7
76–100	9
101–150	13
151–200	19
201 and over	At least 12 percent of total

**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/  
VANPOOL/EV

**Note:** Vehicles bearing Clean Air Vehicle stickers from expired HOV lane programs may be considered eligible for designated parking spaces.

**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:**

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

**A5.106.5.3 Electric vehicle charging.** Provide facilities meeting Section 406.9 (Electric Vehicle) of the *California Building Code* and as follows:

**A5.106.5.3.1 Single charging space requirements.** When only a single charging space is required, install a listed raceway capable of accommodating a dedicated branch circuit. The raceway shall not be less than trade size 1. The raceway shall be securely fastened at the main

service or subpanel and shall terminate in close proximity to the proposed location of the charging system into a listed cabinet, box or enclosure.

**Exception:** Other preinstallation methods approved by the local enforcing agency that provide sufficient conductor sizing and service capacity to install Level 2 electric vehicle supply equipment (EVSE).

**A5.106.5.3.2 Multiple charging spaces required.**

When multiple charging spaces are required, plans shall include the location(s) and type of the EVSE, raceway method(s), wiring schematics and electrical calculations to verify that the electrical system has sufficient capacity to charge simultaneously all the electrical vehicles (EV) at all designated EV charging spaces at their full rated amperage. Plan design shall be based on Level 2 EVSE at its maximum operating ampacity. Provide raceways from the electrical service panel to the designated parking areas which are required to be installed at the time of construction.

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

**A5.106.5.3.3 Tier 1.** At least 3 percent of the total parking spaces, but not less than one, shall be capable of supporting installation of future electric vehicle supply equipment (EVSE).

**A5.106.5.3.4 Tier 2.** At least 5 percent of the total parking spaces, but not less than two, shall be capable of supporting installation of future EVSE.

**A5.106.5.3.5 Labeling requirement.** A label stating “EV CHARGE CAPABLE” shall be posted in a conspicuous place at the service panel or subpanel and the EV charging space.

**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.

**A5.106.7 Exterior wall shading.** Meet requirements in the current edition of the *California Energy Code* and comply with either Section A5.106.7.1 or A5.106.7.2 for wall surfaces. If using vegetative shade, plant species documented to reach desired coverage within 5 years of building occupancy.

**A5.106.7.1 Fenestration.** Provide vegetative or man-made shading devices for all fenestration on east-, south-, and west-facing walls.

**A5.106.7.1.1 East and west walls.** Shading devices shall have 30-percent coverage to a height of 20 feet or to the top of the exterior wall, whichever is less. Calculate shade coverage on the summer solstice at 10 AM for east-facing walls and at 3 PM for west-facing walls.

**A5.106.7.1.2 South walls.** Shading devices shall have 60-percent coverage to a height of 20 feet or to the top of the exterior wall, whichever is less.

**A5.106.7.2 Opaque wall areas.** 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).

**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 and 2 for 50 percent of site hardscape or put 50 percent of parking underground.

1. Use light colored materials with an initial solar reflectance value of at least .30 as determined in accordance with American Society for Testing and Materials (ASTM) Standards E 1918 or C 1549.
2. Use open-grid pavement system or pervious or permeable pavement system.

**A5.106.11.2 Cool roof for reduction of heat island effect.**

Use roofing materials having a minimum 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) complying with Section A5.106.11.2.3 and as shown in Table A5.106.11.2.2 for Tier 1 or Table A5.106.11.2.3 for Tier 2.

**Exceptions:**

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

**A5.106.11.2.1 Solar reflectance.** Roofing materials shall have a minimum aged solar reflectance equal to or

**CALIFORNIA GREEN BUILDING STANDARDS CODE – MATRIX ADOPTION TABLE**  
**APPENDIX A5 – NONRESIDENTIAL VOLUNTARY MEASURES**  
**DIVISION A5.2 – ENERGY EFFICIENCY**

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the user.  
 See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	SFM	HCD			DSA		OSHPD				BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
			1	2	1-AC	AC	SS	1	2	3	4								
Adopt entire CA chapter																			
Adopt entire chapter as amended (amended sections listed below)																			
Adopt only those sections that are listed below	<b>X</b>																		
Chapter/Section																			
A5.201.1	X																		
A5.202.1 Definitions	X																		
A5.203.1	X																		
A5.203.1.1	X																		
A5.203.1.1.1	X																		
A5.203.1.1.2	X																		
A5.203.1.1.3	X																		
A5.203.1.2	X																		
A5.203.1.2.1	X																		
A5.203.1.2.2	X																		
A5.211.1	X																		
A5.211.1.1	X																		
A5.211.3	X																		
A5.212.1	X																		
A5.212.1.1 and subsection	X																		
A5.212.1.2	X																		
A5.212.1.4	X																		
A5.213	X																		

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# APPENDIX A5

## NONRESIDENTIAL VOLUNTARY MEASURES

### Division A5.2 – ENERGY EFFICIENCY

#### SECTION A5.201 GENERAL

**A5.201.1 Scope.** For the purposes of energy efficiency standards in this appendix, the California Energy Commission will continue to adopt mandatory standards. It is the intent of these voluntary standards to encourage buildings to achieve exemplary performance in the area of energy efficiency.

#### SECTION A5.202 DEFINITIONS

**A5.202.1 Definitions.** The following terms are defined in Chapter 2.

**ENERGY BUDGET.**

**GEOHERMAL.**

**PROCESS.**

**SOLAR ACCESS.**

**TIME DEPENDENT VALUATION (TDV) ENERGY.**

#### SECTION A5.203 PERFORMANCE APPROACH

**A5.203.1 Energy efficiency.** Nonresidential, high-rise residential and hotel/motel buildings that include lighting and/or mechanical systems shall comply with Sections A5.203.1.1 and either A5.203.1.2.1 or A5.203.1.2.2. Newly constructed buildings, as well as additions and alterations, are included in the scope of these sections. Buildings permitted without lighting or mechanical systems shall comply with Section A5.203.1.1 but are not required to comply with Sections A5.203.1.1.2 or A5.203.1.2.

**A5.203.1.1 Tier 1 and Tier 2 prerequisites.** Each of the following efficiency measures is required for all applicable components of the building project.

**A5.203.1.1.1 Outdoor lighting.** Newly installed outdoor lighting power shall be no greater than 90 percent of the Title 24, Part 6 calculated value of allowed outdoor lighting power.

**A5.203.1.1.2 Service water heating in restaurants.** Newly constructed restaurants 8,000 square feet or greater and with service water heaters rated 75,000 Btu/h or greater shall install a solar water-heating system with a minimum solar savings fraction of 0.15.

##### Exceptions:

1. Buildings with a natural gas service water heater with a minimum of 95-percent thermal efficiency.

2. Buildings where greater than 75 percent of the total roof area has annual solar access that is less than 70 percent. Solar access is the ratio of solar insolation, including shade, to the solar insolation without shade. Shading from obstructions located on the roof or any other part of the building shall not be included in the determination of annual solar access.

**A5.203.1.1.3 Functional areas where compliance with residential lighting standards is required.** For newly constructed high-rise residential dwelling units and hotel and motel guest rooms, indoor lighting shall comply with the applicable requirements in Appendix A4 Residential Voluntary Measures, Division A4.2 – Energy Efficiency, Section A4.203.1.1.3. For additions and alterations to high-rise residential dwelling units and hotel and motel guest rooms, indoor lighting shall comply with the applicable requirements in Appendix A4 Residential Voluntary Measures, Division A4.2 – Energy Efficiency, Section A4.204.1.1.1.

**A5.203.1.2 Performance standard.** Comply with one of the advanced efficiency levels indicated below.

**A5.203.1.2.1 Tier 1.** Buildings complying with the first level of advanced energy efficiency shall have an Energy Budget that is no greater than indicated below, depending on the type of energy systems included in the building project. If the newly constructed building, addition or alteration does not include indoor lighting or mechanical systems, then no additional performance requirements above Title 24, Part 6 are required.

1. For building projects that include indoor lighting or mechanical systems, but not both: No greater than 95 percent of the Title 24, Part 6, Energy Budget for the Proposed Design Building as calculated by compliance software certified by the Energy Commission.
2. For building projects that include indoor lighting and mechanical systems: No greater than 90 percent of the Title 24, Part 6 Energy Budget for the Proposed Design Building as calculated by compliance software certified by the Energy Commission.

**A5.203.1.2.2 Tier 2.** Buildings complying with the second level of advanced energy efficiency shall have an Energy Budget that is no greater than indicated below, depending on the type of energy systems included in the building project. If the newly constructed building, addition or alteration does not include indoor lighting or mechanical systems, then no additional performance requirements above Title 24, Part 6 are required.

1. For building projects that include indoor lighting or mechanical systems, but not both: No greater

than 90 percent of the Title 24, Part 6, Energy Budget for the Proposed Design Building as calculated by compliance software certified by the Energy Commission.

2. For building projects that include indoor lighting and mechanical systems: No greater than 85 percent of the Title 24, Part 6, Energy Budget for the Proposed Design Building as calculated by compliance software certified by the Energy Commission.

**Note:** For Energy Budget calculations, high-rise residential and hotel/motel buildings are considered nonresidential buildings.

### 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 percent 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 percent of the natural gas and propane use. The building project's electrical service overcurrent protection device rating shall be calculated in accordance with the 2013 *California Electrical Code*. Natural gas or propane use is calculated in accordance with the 2013 *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.

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

### 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 systems and controls to reduce the energy demand of elevators and escalators as follows. Document systems operation and controls in the project specifications and commissioning plan.

**A5.212.1.1 Elevators.** Traction elevators shall have a regenerative drive system that feeds electrical power back into the building grid when the elevator is in motion.

**A5.212.1.1.1 Car lights and fan.** A parked elevator shall turn off its car lights and fan automatically until the elevator is called for use.

**A5.212.1.2 Escalators.** An escalator shall have a VVVF motor drive system that is fully regenerative when the escalator is in motion.

**A5.212.1.4 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.

### 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.



# APPENDIX A5

## NONRESIDENTIAL VOLUNTARY MEASURES

**Division A5.3 – WATER EFFICIENCY AND CONSERVATION**

**SECTION A5.303  
INDOOR WATER USE**

**SECTION A5.301  
GENERAL**

**A5.301.1 Scope.**

**SECTION A5.302  
DEFINITIONS**

**A5.302.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**COMPACT DISHWASHER.**

**HYDROZONE.**

**LANDSCAPE (PLANT) COEFFICIENT [KL].**

**MODEL WATER EFFICIENT LANDSCAPE ORDINANCE.**

**PLANTS.**

**POTABLE WATER.**

**RECYCLED WATER.**

**REFERENCE EVAPOTRANSPIRATION ( $ET_0$ ).**

**STANDARD DISHWASHER.**

**SUBMETER.**

**A5.303.2.3.1 Tier 1 – 30-percent savings. [BSC]** 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. Prescriptive method. Each plumbing fixture and fitting shall not exceed the maximum flow rate at greater than or equal to 30-percent reduction as specified in Table A5.303.2.1, or A5.303.2.3.1.
2. Performance method. 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.

**TABLE A5.303.2.2  
WATER USE BASELINE<sup>3</sup>**

FIXTURE TYPE	BASELINE FLOW RATE	DURATION	DAILY USES	OCCUPANTS <sup>2</sup>
Showerheads	2.0 gpm @ 80 psi	5 min.	1	X <sup>2a</sup>
Lavatory faucets nonresidential	.5 gpm @ 60 psi	.25 min.	3	X
Kitchen faucets	2.6 gpm @ 60 psi	4 min.	1	X <sup>2b</sup>
Replacement aerators	2.6 gpm @ 60 psi			X
Wash fountains	2.2 [rim space (in.)/20 gpm @ 60 psi]			X
Metering faucets	0.25 gallons/cycle	.25 min.	3	X
Metering faucets for wash fountains	.25 [rim space (in.)/20 gpm @ 60 psi]	.25 min.	1 male <sup>1</sup> 3 female	X
Gravity tank type water closets	1.28 gallons/flush	1 flush	1 male <sup>1</sup> 3 female	X
Flushometer tank water closets	1.28 gallons/flush	1 flush	1 male <sup>1</sup> 3 female	X
Flushometer valve water closets	1.28 gallons/flush	1 flush	1 male <sup>1</sup> 3 female	X
Electromechanical hydraulic water closets	1.28 gallons/flush	1 flush	1 male <sup>1</sup> 3 female	X
Urinals	0.5 gallons/flush	1 flush	2 male	X

1. The daily use number shall be increased to three if urinals are not installed in the room.
2. Refer to Table A, Chapter 4, 2013 *California Plumbing Code*, for occupant load factors.
  - a. Shower use by occupants depends on the type of use of a building or portion of a building, e.g., total occupant load for a health club, but only a fraction of the occupants in an office building as determined by the anticipated number of users.
  - b. Nonresidential kitchen faucet use is determined by the occupant load of the area served by the fixture.
3. Use worksheet WS-1 to calculate baseline water use.

**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.

**A5.303.2.3.4 Nonpotable water systems for indoor use.** Utilizing nonpotable water systems (such as captured rainwater, treated graywater and recycled water) intended to supply water closets, urinals, and other allowed uses, may be used in the calculations demonstrating the 30-, 35- or 40-percent reduction. The nonpotable water systems shall comply with the current edition of the *California Plumbing Code*.

**A5.303.3 Appliances and fixtures for commercial application.** Appliances and fixtures shall meet the following:

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—ENERGY STAR.
    - i. Standard Dishwashers – 4.25 gallons per cycle.
    - ii. Compact Dishwashers – 3.5 gallons per cycle.
  - b. Commercial—refer to Table A5.303.3.
3. Ice makers shall be air cooled.
4. Food steamers shall be connectionless or boilerless.
5. [BSC] The use and installation of water softeners that discharge to the community sewer system may be limited or prohibited by local agencies if certain conditions are met.

6. Combination ovens shall not consume more than 10 gph (38 L/h) in the full operational mode.
7. Commercial pre-rinse spray valves manufactured on or after January 1, 2006 shall function at equal to or less than 1.6 gpm (0.10 L/s) at 60 psi (414 kPa) and
  - a. Be capable of cleaning 60 plates in an average time of not more than 30 seconds per plate.
  - b. Be equipped with an integral automatic shutoff.
  - c. Operate at static pressure of at least 30 psi (207 kPa) when designed for a flow rate of 1.3 gpm (0.08 L/s) or less.

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

TYPE	HIGH-TEMPERATURE— MAXIMUM GALLONS PER RACK	CHEMICAL—MAXIMUM GALLONS PER RACK
Conveyer	0.70 (2.6 L)	0.62 (4.4 L)
Door	0.95 (3.6 L)	1.16 (2.6 L) [BSC] 2.26 (8.6 L) [DSA-SS]
Undercounter	0.90 (3.4 L)	0.98 (3.7 L)

**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.

**SECTION A5.304  
OUTDOOR WATER USE**

**A5.304.1.1 Reserved.**

**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

**TABLE A5.303.2.3.1  
FIXTURE FLOW RATES**

FIXTURE TYPE	BASELINE FLOW-RATE <sup>2</sup>	MAXIMUM FLOW RATE AT 30 PERCENT REDUCTION
Showerheads	2.0 gpm @ 80 psi	1.8 gpm @ 80 psi
Lavatory faucets nonresidential	0.5 gpm @ 60 psi	0.35 gpm @ 60 psi
Kitchen faucets	2.2 gpm @ 60 psi	1.6 gpm @ 60 psi
Wash fountains	2.2 [rim space(in.)/20 gpm @ 60 psi]	1.6 [rim space(in.)/20 gpm @ 60 psi]
Metering faucets	0.25 gallon/cycle	0.18 gallons/cycle
Metering faucets for wash fountains	0.25 [rim space(in.)/20 gpm @ 60 psi]	0.18 [rim space(in.)/20 gpm @ 60 psi]
Gravity tank type water closets	1.28 gallons/flush	1.12 gallons/flush <sup>1</sup>
Flushometer tank water closets	1.28 gallons/flush	1.12 gallons/flush <sup>1</sup>
Flushometer valve water closets	1.28 gallons/flush	1.12 gallons/flush <sup>1</sup>
Electromechanical hydraulic water closets	1.28 gallons/flush	1.12 gallons/flush <sup>1</sup>
Urinals	0.5 gallons/flush	0.5 gallons/flush

1. Includes water closets with an effective flush rate of 1.12 gallons or less when tested per ASME A 112.19.2 and ASME A 112.19.14.

2. See Table 5.503.2.3 for additional notes and references.

3. Where complying faucets are unavailable, aerators rated at 0.35 gpm or other means may be used to achieve reduction.



percent of nonhazardous construction and demolition waste generated at the site.

**A5.408.3.1.2 Verification of compliance.** A copy of the completed waste management report or documentation of certification of the waste management company utilized shall be provided.

**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.
3. Demolition waste meeting local ordinance or calculated in consideration of local recycling facilities and markets.

## SECTION A5.409 LIFE CYCLE ASSESSMENT

**A5.409.1 General.** Life cycle assessment shall be ISO 14044 compliant. The service life of the building and materials assemblies shall not be less than 60 years unless designated in the construction documents as having a shorter service life as approved by the enforcing agency.

**A5.409.2 Whole building life cycle assessment.** Conduct a whole building life assessment, including operating energy, showing that the building project achieves at least a 10 percent improvement for at least three of the impacts listed in Section A5.409.2.2, one of which shall be climate change, compared to a reference building of similar size, function, complexity and operating energy performance, and meeting the 2013 *California Energy Code* at a minimum.

**A5.409.2.1 Building components.** The building envelope, structural elements, including footings and foundations, interior ceilings, walls, and floors; and exterior finishes shall be considered in the assessment.

**Exceptions:**

1. Plumbing, mechanical and electrical systems and controls; fire and smoke detection and alarm systems and controls; and conveying systems.
2. Interior finishes are not required to be included.

**Notes:**

1. Software for calculating whole building life cycle assessments includes those found at the Athena Institute website (Impact Estimator software), the PE International website (GaBi software), and the PRe Consultants website (SimaPro software).
2. Interior finishes, if included, may be assessed using the NIST BEES tool.

**A5.409.2.2 Impacts to be considered.** Select from the following impacts in the assessment:

1. Climate change (greenhouse gases).
2. Fossil fuel depletion.

3. Stratospheric ozone depletion.
4. Acidification of land and water sources.
5. Eutrophication.
6. Photochemical oxidants (smog).

**A5.409.3 Materials and system assemblies.** If whole building analysis of the project is not elected, select a minimum of 50 percent of materials or assemblies based on life cycle assessment of at least three of the impacts listed in Section A5.409.2.2, one of which shall be climate change.

**Note:** Software for calculating life cycle assessments for assemblies and materials may be found at the Athena Institute web site and the NIST BEES web site.

**A5.409.4 Substitution for prescriptive standards.** Performance of a life cycle assessment completed in accordance with Section A5.409.2 may be substituted for other prescriptive Material Conservation and Resource Efficiency provisions of Division A5.4, including those made mandatory through local adoption of Tier 1 or Tier 2 in Division A5.6.

**A5.409.5 Verification of compliance.** Documentation of compliance shall be provided as follows:

1. The assessment is performed in accordance with ISO 14044.
2. The project meets the requirements of other parts of Title 24.
3. A copy of the analysis shall be made available to the enforcement authority.
4. A copy of the analysis and any maintenance or training recommendations shall be included in the operation and maintenance manual.

## SECTION A5.410 BUILDING MAINTENANCE AND OPERATION

**A5.410.3 Commissioning [DSA-SS].** 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 or owner representative's project requirements.
2. Basis of design.
3. Commissioning measures shown in the construction documents.
4. Commissioning plan.
5. Functional performance testing.
6. Documentation and training.
7. Commissioning report.

**Exceptions:**

1. Dry storage warehouses of any size.

## NONRESIDENTIAL VOLUNTARY MEASURES

2. Areas under 10,000 square feet used for offices or other conditioned accessory spaces within dry storage warehouses.
3. Tenant improvements under 10,000 square feet as described in Section 303.1.1.

All building operating systems 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.

**A5.410.3.1 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 operation and maintenance O&M personnel expectations.

**A5.410.3.2 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. 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.

**A5.410.3.3 Commissioning plan.** Prior to permit issuance a commissioning plan shall be completed to document how the project will be commissioned. 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 shall be included.

**A5.410.3.4 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.

**A5.410.3.5 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.

**A5.410.3.5.1 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. The systems manual shall include the following:

1. Site information, including facility description, history and current requirements.
2. Site contact information.
3. Basic operations and 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, if applicable.

**A5.410.3.5.2 Systems operations training.** A program for training of the appropriate maintenance staff for each equipment type and/or system shall be developed and documented in the commissioning report and shall include the following:

1. System/equipment overview (what it is, what it does and 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.

**A5.410.3.6 Commissioning report.** A report of commissioning process activities undertaken through the design and construction phases of the building project shall be completed and provided to the owner or representative.

**A5.410.4 Testing and adjusting [DSA-SS].** Testing and adjusting of systems shall be required for buildings less than 10,000 square feet.

**A5.410.4.1 Reserved.**

## APPENDIX A5

# NONRESIDENTIAL VOLUNTARY MEASURES

### *Division A5.5 – ENVIRONMENTAL QUALITY*

#### **SECTION A5.501 GENERAL**

**A5.501.1 Scope.** The provisions of this chapter shall outline means of reducing the quantity of air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of a building's installers, occupants and neighbors.

#### **SECTION A5.502 DEFINITIONS**

**A5.502.1 Definitions.** The following terms are defined in Chapter 2.

**INTERIOR, BUILDING.**

**MERV. [BSC]**

**MULTI-OCCUPANT SPACES.**

**NO ADDED FORMALDEHYDE (NAF) BASED RESINS.**

**SINGLE OCCUPANT SPACES.**

**ULTRA-LOW EMITTING FORMALDEHYDE (ULEF) RESINS.**

#### **SECTION A5.504 POLLUTANT CONTROL**

**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. 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.
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 effi-

ciency of 30 percent based on ASHRAE 52.1- 1992. Replace all filters immediately prior to occupancy.

4. During dust-producing operations, protect supply and return HVAC system openings from dust.

**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.

**A5.504.2 IAQ postconstruction.** 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 percent. 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 (the target air volume) shall be calculated by multiplying the maximum feasible air flow rate (in ft<sup>3</sup>/m) by 14 days (20,160 minutes). The air volumes for each period of ventilation are then calculated and summed and the flush-out continues until the total equals the target air volume.

**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 States Environmental Protection Agency (U.S. 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 to 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 Noncomplying 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:** U.S. EPA-recognized testing protocols may be found on the Air Resources Board web site.

**A5.504.4.5.1 No added formaldehyde [Tier 1].** Use composite wood products approved by the California Air Resources Board (ARB) as no-added formaldehyde (NAF) based resins or ultra-low emitting formaldehyde (ULEF) resins.

**Notes:**

1. See Title 17, Section 93120.3(c) and (d), respectively.
2. Documentation must be provided verifying that materials are certified to meet the pollutant

emission limits. A list of manufacturers and their NAF and ULEF certified materials is provided at: [http://www.arb.ca.gov/toxics/compwood/naf\\_ulef/listofnaf\\_ulef.htm](http://www.arb.ca.gov/toxics/compwood/naf_ulef/listofnaf_ulef.htm).

**A5.504.4.7 Resilient flooring systems, Tier 1. [BSC]** For 90 percent of floor area receiving resilient flooring, install resilient flooring that is:

1. Certified under the Resilient Floor Covering Institute (RFCI) FloorScore program;
2. Compliant with the VOC-emission limits and testing requirements specified in the California Department of Public Health's 2010 Standard Method for the Testing and Evaluation Chambers, Version 1.1, February 2010;
3. Defined in the 2009 Collaborative for High Performance Schools (CHPS) criteria and listed on its High Performance Database; or
4. Compliant with CDPH criteria as certified under the Greenguard Children's & Schools Program.

**A5.504.4.7.1 Resilient flooring systems, Tier 2 [BSC].** | |

For 100 percent of floor area receiving resilient flooring, install resilient flooring that is:

1. Certified under the Resilient Floor Covering Institute (RFCI) FloorScore program;
2. Compliant with the VOC-emission limits and testing requirements specified in the California Department of Public Health's 2010 Standard Method for the Testing and Evaluation Chambers, Version 1.1, February 2010;
3. Defined in the 2009 Collaborative for High Performance Schools (CHPS) criteria and listed on its High Performance Database; or
4. Compliant with CDPH criteria as certified under the Greenguard Children's & Schools Program.

**Exception:** Allowance may be permitted in Tier 2 for up to 5-percent specialty purpose flooring.

**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. [BSC]** Comply with the following standards:

1. Chapters 12-13 (Standards for Insulating Material) in Title 24, Part 12, the *California Referenced Standards Code*,
2. The VOC-emission limits defined in 2009 CHPS criteria and listed on its High Performance Products Database.
3. California Department of Public Health 2010 Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, February 2010 (also known as Specification 01350.)

# CALIFORNIA GREEN BUILDING STANDARDS CODE – MATRIX ADOPTION TABLE

## APPENDIX A6.1 – VOLUNTARY STANDARDS FOR HEALTH FACILITIES [OSHPD 1, 2 & 4]

The following sections are relocated from the voluntary appendices into one appendix to assist code users in the planning, design and construction of environmentally sustainable medical facilities under the authority of the Office of Statewide Health Planning and Development specified in Chapter 1 of this code.

Adopting agency	BSC	SFM	HCD			DSA		OSHPD				BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
			1	2	1-AC	AC	SS	1	2	3	4								
Adopt entire CA chapter																			
Adopt entire chapter as amended (amended sections listed below)								X	X		X								
Adopt only those sections that are listed below																			
Chapter/Section																			
A5.106.9								X	X		X								
A5.203								X											
A5.505.4.5.1								X	X		X								

## APPENDIX A6.1 – VOLUNTARY STANDARDS FOR HEALTH FACILITIES [OSHPD 1, 2 & 4]

### Division A5.1 – SITE PLANNING AND DESIGN

#### SECTION A5.106 SITE DEVELOPMENT

**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.

### Division A5.2 – ENERGY EFFICIENCY

#### SECTION A5.202 DEFINITIONS

**A5.202.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**ENERGY STAR.** A joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy. ENERGY STAR is a voluntary program designed to identify and promote energy-efficient products and practices.

#### SECTION A5.203 PERFORMANCE APPROACH

**A5.203.2 Energy performance.** It is the intent of this code to encourage green buildings to achieve exemplary performance in the area of energy efficiency.

**A5.203.2.1 CALGreen Tier 1. [OSHPD 1]** To achieve CALGreen Tier 1, buildings must comply with the latest edition of “Savings By Design, Healthcare Modeling Procedures” found online at <http://www.energysoft.com/ep/2007SBDHProcedures.pdf>.

**A5.203.2.2 CALGreen Tier 2. [OSHPD 1]** To achieve CALGreen Tier 2, buildings must exceed the latest edition of “Savings By Design, Healthcare Modeling Procedures” by a minimum of 15 percent.

#### 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.

**A5.204.4 Commissioning. [OSHPD 1 & 4]** Building commissioning shall be included in the design and construction processes of the building project to verify that the building’s energy related systems are installed, calibrated and perform according to the owner’s project requirements, basis of design and construction documents.

The owner and designer shall designate an individual as the Commissioning Authority (CxA) to lead, review and oversee the



completion of the commissioning process activities. The owner shall document the Owner's Project Requirements (OPR). The design team shall develop the Basis of Design (BOD). The CxA shall review these documents for clarity and completeness. The owner and design team shall be responsible for updates to their respective documents, develop and incorporate commissioning requirements into the construction documents and develop and implement a commissioning plan. The CxA shall verify the installation and performance of the systems to be commissioned, verify that training and operation and maintenance documentation have been provided to the owner's operations staff and complete a commissioning report.

Commissioning process activities shall be completed for the following energy-related systems, at a minimum:

1. Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems (mechanical and passive) and associated controls.
2. Lighting and daylighting controls.
3. Domestic hot water systems.
4. Renewable energy systems (wind, solar, etc.).
5. Building envelope systems.

**A5.204.4.1 Owner's Project Requirements (OPR).** The expectations and requirements of the building shall be documented by the owner and the designer before the design phase of the project begins. This shall be reviewed by the CxA. At a minimum, this documentation shall include the following:

1. Environmental and sustainability goals.
2. Energy efficiency goals.
3. Indoor environmental quality requirements.
4. Equipment and systems expectations.
5. Building occupant and O&M personnel expectations.

**A5.204.4.2 Basis of Design (BOD).** A written explanation of how the design of the building systems meets the Owner's Project Requirements shall be completed at the design phase of the building project and updated as necessary during the design and construction phases. This shall be reviewed by the CxA. At a minimum, 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.

**A5.204.4.3 Commissioning plan.** A commissioning plan shall be completed to document the approach to how the project will be commissioned and shall be started during the design phase of the building project. This shall be reviewed by the CxA. The Commissioning Plan shall include the following at a minimum:

1. General project information.
2. Commissioning goals.

3. Systems to be commissioned. Plans to test systems and components shall include at a minimum:
  - a. A detailed 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; and
  - 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 Sections A5.204.4.4 through A5.204.4.6 shall be included.

**A5.204.4.4 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. This shall be reviewed and verified by the CxA.

**A5.204.4.5 Postconstruction documentation and training.** A systems manual and systems operations training are required.

**A5.204.4.5.1 Systems manual.** Documentation of the operational aspects of the building shall be completed within the systems manual and delivered to the building owner and facilities operator. This shall be reviewed by the CxA. At a minimum, the systems manual shall include the following:

1. Site information, including facility description, history and current requirements.
2. Site contact information.
3. Basic operations and 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. Other resources and documentation.

**A5.204.4.5.2 Systems operations training.** The CxA shall oversee the training of the appropriate maintenance staff for each equipment type and/or system. The training shall include, as a minimum, the following:

1. System/equipment overview (what it is, what it does and what other systems and/or equipment it interfaces with).
2. Review of the information in the systems manual.

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# HISTORY NOTE APPENDIX CALIFORNIA GREEN BUILDING STANDARDS CODE

(Title 24, Part 11, California Code of Regulations)

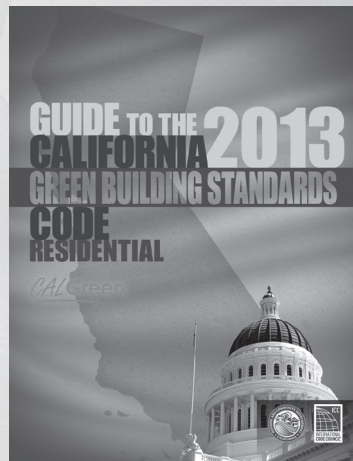
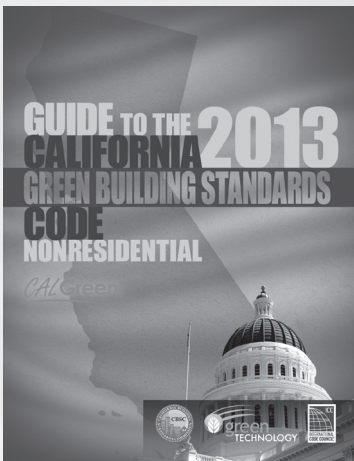
For prior history, see the History Note Appendix to the *California Green Building Standards Code*, 2010 Edition, effective January 1, 2011.

1. (BSC 07/12, HCD 04/12, DSA-SS 06/12, CEC 01/12) Repeal, amend and add provisions in the 2013 *California Green Building Standards Code* for residential, nonresidential and public school buildings. Effective on January 1, 2014.
2. Errata to correct editorial errors within the preface, Chapters 4 and 5, Appendices A5 and A6.1 and the Index of this code. Effective January 1, 2014.



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