

# SUPPLEMENT UPDATE GUIDE

To the 2022 California Green Building  
Standards Code (CALGreen)-Nonresidential



Effective  
July 1, 2024



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BUILDING STANDARDS COMMISSION

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Acting Executive Director, Kevin Day

Project Lead: Enrique M. Rodriguez, Associate Construction Analyst

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2525 Natomas Park Drive, Suite 130  
Sacramento, CA 95833

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# Supplement Update Guide to the 2022 California Green Building Standards Code – Nonresidential

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**Effective July 1, 2024**

## PURPOSE:

The purpose of this Supplement Update to the *Guide to the 2022 California Green Building Standards Code (CALGreen)-Nonresidential* is to provide information about regulatory changes that occurred during the 2022 Intervening Code Adoption Cycle which were approved by the California Building Standards Commission (CBSC) August 2, 2023 ([Rulemaking File #BSC 04/22](#)). The regulations in the 2022 CALGreen Code Supplement edition become effective July 1, 2024.

Updates to the *Residential* requirements or updates promulgated by the Division of the State Architect (DSA) are not included in this guide.

This guide is nonregulatory and is not a substitute for using or studying the CALGreen code itself; it is intended to be used in conjunction with the 2022 CALGreen code and the 2022 CALGreen Code Supplements that should have been received and inserted into your code binders. Electronic versions of CALGreen are automatically updated by the publisher.

**Note:** An electronic version of the entire CALGreen Code including the 2022 CALGreen Code Supplement is available through the [California Building Standards Commission website](#): [dgs.ca.gov/BSC/CALGreen](https://dgs.ca.gov/BSC/CALGreen), as well a link to the *Guide to the 2022 California Green Building Standards Code – Nonresidential*.

## **LEGEND for the Supplement Update to the Guide to the 2022 California Green Building Standards Code – Nonresidential**

Amendments to the 2022 CALGreen regulatory language within this guide are introduced with a note to the code user using ***bold, italicized*** text.

**Note to code user:** *Bold, italicized text included within code section language shown in **green text** indicates notes to the code user.*

2022 CALGreen CODE page numbers in notes refer to the SUPPLEMENT page numbers. 2022 GUIDE page numbers refer to those in the ORIGINALLY PUBLISHED 2022 GUIDE. Only modified and new code sections are explained in this 2022 CALGreen Supplement Guide; however, some related code sections are shown for context. Note that explanations for new sections can only be found in this Supplement Guide.

Supplements (blue pages) to the 2022 CALGreen have symbols used in the page margins to indicate changes from the first printing:

- || This symbol in the margin of the 2022 edition of CALGreen indicates that a change has been made.
- > This symbol in the margin of the 2022 edition of CALGreen indicates deletion of language.

The Supplement Guide explains the regulatory changes and provides examples in sections printed in black font and titled: **Change for 2022 Intervening Cycle Supplement, INTENT, EXAMPLES**, and others.

## CHAPTER 2 DEFINITIONS

*Chapter 2, Section 202 Definitions – Begins on page 2-1 of the 2022 CALGreen code supplements (blue pages) (CALGreen) and on page 7 of the Guide to the 2022 California Green Building Standards Code – Nonresidential (2022 Guide).*

...

*New definitions added or amended to support the new Electric Vehicle (EV), Bird-friendly Design and Embodied Carbon regulations are as follows:*

### 2 X 2 RULE

ADHESIVE MARKER.

BUY CLEAN CALIFORNIA ACT.

CRADLE-TO-GATE.

CRADLE-TO-GRAVE.

ELECTRIC VEHICLE (EV) CHARGER. *BSC co-adopted existing HCD definition.*

ELECTRIC VEHICLE CHARGING STATION (EVCS). *Amended and adopted by BSC.*

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). *Amended.*

FILM.

GLASS, ACID ETCHED.

GLASS, FRITTED.

GLASS SURFACE.

LEVEL 2 ELECTRIC VEHICLE (EV) CHARGER.

LEVEL 2 ELECTRIC VEHICLE SUPPLY EQUIPMENT. *BSC co-adopted existing HCD definition.*

LOW POWER LEVEL 2 ELECTRIC VEHICLE (EV) CHARGING RECEPTACLE. *Amended and adopted by BSC.*

MATURE TREE CANOPY.

REFERENCE STUDY PERIOD.

TYPE III ENVIRONMENTAL PRODUCT DECLARATION (EPD).

FACTORY-SPECIFIC EPD.

PRODUCT-SPECIFIC EPD.

INDUSTRY-WIDE EPD (IW-EPD).

ULTRAVIOLET (UV).

VISUAL MARKER.

## CHAPTER 5 NONRESIDENTIAL MANDATORY MEASURES

### *DIVISION 5.1- PLANNING AND DESIGN*

...

*Division 5.1, Section 5.105 – Begins on page 5-1 of CALGreen*

### SECTION 5.105 DECONSTRUCTION AND REUSE OF EXISTING STRUCTURES

***New code language and sections added to the formally reserved section.***

**5.105.1 Scope. [BSC-CG]** Effective July 1, 2024, alteration(s) to existing building(s) where the combined altered floor area is 100,000 square feet or greater shall comply with either Section 5.105.2, 5.409.2, or 5.409.3. Addition(s) to existing building(s) where the total floor area combined with the existing building(s) is 100,000 square feet or greater shall comply with either Section 5.105.2, Section 5.409.2, or Section 5.409.3. Effective January 1, 2026, the combined floor area shall be 50,000 square feet or greater.

**Exception:** Combined addition(s) to existing building(s) of two times the area or more of the existing building(s) is not eligible to meet compliance with Section 5.105.2.

#### **INTENT:**

The intent of Section 5.105 is to add new mandatory regulations for the reuse of existing structures to help incentivize reuse of existing building infrastructure. Studies have shown building reuse is associated with significant reductions in embodied carbon emissions when compared with new construction. Building reuse cuts down on the continual consumption of natural resources, energy and water-intensive industrial processes, and greenhouse gas emissions.

At this time, these regulations do not apply to commercial buildings that are adapted (modernized and repurposed) to be used for residential purposes, as these types of projects are outside the scope of the Building Standards Commission's (BSC) authority. BSC promulgates *CALGreen* standards for nonresidential occupancies where no other agency has authority to adopt green building standards, state buildings, and University of California and California State University buildings. For example, OSHPD has jurisdiction over hospitals and other health facilities.

School projects are subject to an area threshold that depends upon which authority the project falls under. For school projects subject to DSA authority, the area threshold for applicability of these provisions for new, renovation, and addition projects is 50,000 square feet. For school projects that fall under BSC authority, the area threshold for applicability of these provisions is 100,000 square feet until December 31, 2025, after which the area threshold will drop to 50,000 square feet.

The new scoping section requires additions and alterations with specified floor area (project aggregate area) to comply with one of the three compliance options for the reduction of embodied carbon: reuse of existing building covered in Section 5.105.2, Whole Building Life Cycle Assessment (WBLCA) covered in Section 5.409.2, or product GWP compliance covered in Section 5.409.3.

## EXAMPLES:

1. A building of 300,000 square feet contains several suites occupied by different tenants. There is a project to alter two suites, one suite of 50,000 square feet and the other of 60,000 square feet, with the rest of the building, containing several more suites, being unaltered. The combined altered floor area equals 110,000 square feet (50,000 square feet plus 60,000 square feet) which is over 100,000 square feet. Therefore, the work in both suites being altered has to comply with either Section 5.105.2 (building reuse), Section 5.409.2 (WBLCA), or Section 5.409.3 (product GWP compliance).
2. An addition of 5,000 square feet is proposed to be added to existing building of 95,000 square feet. The total floor area of the addition combined with the existing building area is 100,000 square feet. Therefore, the project has to comply with either Section 5.105.2, Section 5.409.2, or Section 5.409.3.

**Note:** The entirety of the existing building can be considered in calculating the required percentage for the compliance with Section 5.105.2 (building reuse compliance option).

3. A commercial building of 30,000 square feet is proposed to have two additions: one of 25,000 square feet and the other of 35,000 square feet. The total area of the additions plus the area of the existing building is 90,000 square feet, which is less than the 100,000 square feet threshold. This project is not required to comply with either Section 5.105.2, Section 5.409.2, or Section 5.409.3.
4. A retail building of 200,000 square feet is proposed to have 80,000 square feet of area undergo alterations. The altered area is less than 100,000 square feet, so this project is not required to comply with either Section 5.105.2, Section 5.409.2, or Section 5.409.3.

**5.105.2 Reuse of existing building.** An alteration or addition to an existing building shall maintain at a minimum 45 percent combined of the existing building's primary structural elements (foundations; columns, beams, walls, and floors; and lateral elements) and existing building enclosure (roof framing, wall framing and exterior finishes). Window assemblies, insulation, portions of buildings deemed structurally unsound or hazardous, and hazardous materials that are remediated as part of the project shall not be included in the calculation.

**5.105.2.1 Verification of compliance.** Documentation shall be provided in the construction documents to demonstrate compliance with Section 5.105.2.

**Note:** Sample Worksheet WS-3 in Chapter 8 may be used to assist in documenting compliance with this section.

## 5.105.3 Deconstruction (Reserved)

### INTENT:

The intent of these mandatory requirements is to encourage reuse of existing buildings and components, as well as provide guidance on what building components to be included in calculations, and to minimize potential landfill deposits. The regulations do not require reuse of an existing building, but require, if an addition or alteration to an existing building occurs (i.e., the building is being reused), a minimum 45 percent of the existing building primary structural elements and enclosure to be maintained. This is the first, and in many cases the most direct and simple, pathway available to comply with the embodied carbon reduction regulations.

Most building reuse (alteration and addition) projects will meet the 45 percent requirement. If this cannot be achieved (project does not meet the 45 percent requirement or addition area is more than double the existing building area), there are two other compliance pathways (WBLCA and product GWP compliance) available. Studies have shown building reuse almost always offers environmental savings over demolition and new construction, when comparing buildings of equivalent size and function. There is also an economic factor to be considered. There is an established value to reusing existing structures and materials.

New reserved Section 5.105.3 about deconstruction is added as a placeholder for future use to address the deconstruction portion of the main section.

### **COMPLIANCE METHOD:**

Maintain the existing building primary structure (foundations, columns, beams, walls (only those which contribute to structural stability of the building), floors (including floor and roof decking) and enclosure (exterior skin and framing, excluding window assemblies and insulation). Structurally unsound or hazardous portions of buildings, and hazardous materials may be excluded, but clear and specific documentation should be provided to use this exclusion.

Determine and identify on the construction documents the compliance option used to comply with the embodied carbon reduction requirements. Identify elements of the existing building that can be reused and determine the percentage of existing elements that are retained. Provide calculations demonstrating a minimum 45 percent of the existing building primary structural elements and enclosure are maintained. Show on a demolition, site or building plan.

### **RECOMMENDATION:**

For many projects a simple area analysis will be sufficient to demonstrate that percentages exceed the required 45 percent. For cases where significant alterations include changes in walls and portions of the structural system, or in situations where the percentages are not clearly compliant without additional detail, it will be necessary to prepare a spreadsheet listing all primary structural and enclosure elements within the existing building prior to construction or renovation; and areas where members that are part of the primary structural system are being removed or altered.

An alternate method which allows even greater detail, when necessary, may use the “projected areas” (in elevation for vertical structural members and building enclosure, and in plans for horizontal structural members) of individual structural elements and building enclosure, evaluated in a spreadsheet so as to show existing areas, and areas of the proposed final configuration. The percentage in any of the above methods will be determined by dividing the square footage of the total retained materials area by the square footage of the total existing materials area. The building official can request additional detail, in any case where the percentage area being retained is not clear.

**Note:** The reuse calculations can be based on gross affected areas; or the surface areas of building primary structural and enclosure elements with measurements taken as if preparing a bid for construction of a building.

The design professional would indicate the method they are using to demonstrate compliance, and fill out and include Worksheet WS-3, which is added to *CALGreen* Chapter 8, in the construction documents to demonstrate compliance. Use of the Worksheet is not mandatory, as the compliance may be shown by other means.

However, use of the worksheet can help design professionals in showing compliance and assist local jurisdictions with enforcement.

## **EXAMPLES:**

### **1. An office building of 50,000 square feet** is planned for the following scope of work:

- a. Alterations to 35,000 square feet that do not affect the building primary structural elements.
- b. Additions of 10,000 square feet and 90,000 square feet.

#### **Step 1:** Section 5.105.1 Scope.

The total of the addition area, plus the existing building area, equals 150,000 square feet, so this project is required to comply with either Section 5.105.2 (building reuse), Section 5.409.2 (WBLCA), or Section 5.409.3 (product GWP compliance).

#### **Step 2:** Exception to Section 5.105.1 Scope.

The total addition area of 100,000 square feet, is two times the area of the existing building, so this project is not eligible to comply with Section 5.105.2 and must comply with either Section 5.409.2 or Section 5.409.3.

### **2. An office building of 50,000 square feet** is planned for the following scope of work:

- a. Alterations to 35,000 square feet that do not affect the building primary structural elements. Existing building enclosure is mostly maintained but existing window assemblies and insulation are being replaced.
- b. Additions of 10,000 square feet and 80,000 square feet.
- c. Demolition of 15,000 square feet of the existing structure to result in a 'u' shape to be able to provide more natural light.

#### **Step 1:** Section 5.105.1 Scope.

The total of the additions area combined with the existing building area, equals 140,000 square feet, so this project is required to comply with either (building reuse), Section 5.409.2 (WBLCA), or Section 5.409.3 (product GWP compliance).

#### **Step 2:** Exception to Section 5.105.1 Scope.

The total additions area of 90,000 square feet, is less than two times the area of the existing building, so the project is eligible to use Section 5.105.2 for compliance.

#### **Step 3:** Calculations for Section 5.105.2 Reuse of existing building.

The project maintains 70 percent of the existing building floor area. Projects where anticipated reused floor area exceeds the minimum compliance threshold of 45 percent by a comfortable margin (projects where anticipated reused floor area exceeds roughly 60 percent) may be able to demonstrate compliance through a simplified calculation based on existing, demolished, and retained floor area only. Since 70 percent exceeds the minimum compliance threshold of 45 percent by a comfortable margin, this project can demonstrate compliance by providing either the sample Worksheet WS-3, or a floor area analysis supplemented with a graphic area diagram. A compliance calculation summary is provided below for this example:

## DOCUMENTATION OF COMPLIANCE OF EXISTING BUILDING REUSE:

Area of Existing Building 50,000 SF

Area of Aggregate Additions 90,000 SF

	Existing Total Area (A)	Retained Total Area (B)	% of Retained Structure (B)/(A)
Gross floor area of Existing Building	50,000 SF	35,000 SF	70%

Total % Reuse of Required Elements = 70%

### 3. An office building of 50,000 square feet is planned for the following scope of work:

- Alterations to 25,000 square feet that do not affect the building primary structural elements.
- Additions of 10,000 square feet and 40,000 square feet.
- Demolition of 25,000 square feet.

#### Step 1: Section 5.105.1 Scope.

The total of the additions area combined with the existing building area, equals 100,000 square feet (50,000 square feet plus 10,000 square feet plus 40,000 square feet), so this project is required to comply with either Section 5.105.2 (building reuse), Section 5.409.2 (WBLCA), or Section 5.409.3 (product GWP compliance).

#### Step 2: Exception to Section 5.105.1 Scope.

Combined additions area equals 50,000 square feet, which is not greater than double the area of the existing building, so the project is eligible to use Section 5.105.2 for compliance.

#### Step 3: Calculations for Section 5.105.2 Reuse of existing building.

The demolition proposed is 50 percent of the existing building. Since 50 percent does not exceed the minimum compliance threshold of 45 percent by a comfortable margin, it is recommended that the project team completes Worksheet WS-3 to provide a more detailed component-based calculation. The results of the component-based calculation are provided below for this example, along with guidance for calculating the area of key structural components.

Component	Guidance for area calculations
Foundations	Surface area
Slabs	Gross floor area
Lateral Elements	Surface area of longitudinal face
Columns	Surface area of longitudinal column face
Structural Walls	Surface area (one side)
Cladding / Envelope	Surface area (one side)

## DOCUMENTATION OF COMPLIANCE OF EXISTING BUILDING REUSE:

Area of Existing Building                      50,000 SF  
Area of Aggregate Additions                50,000 SF

	Existing Total Area (A)	Retained Total Area (B)	% of Retained Structure (B)/(A)
<b>Primary Structural Elements of Existing Building(s)</b> (foundations; columns, beams, walls, and floors; and lateral elements)	57,000 SF	29,000 SF	51%
<b>Building Enclosure of Existing Building(s)</b> (roof framing, wall framing and exterior finishes only)	40,000 SF	17,000 SF	43%

Total % Reuse of Required Elements = 47%

Note: If the demolition in this example was due to structural conditions that were deemed hazardous—for example, removal of unreinforced hollow clay tile bearing walls—the calculation could show a greater percentage of building reuse.

**4. A warehouse building of 150,000 square feet** is planned for the following scope of work:

Alterations to 100,000 square feet of the building to demolish the existing roof structure and columns to allow for construction of a new roof system, supported by new columns with a higher interior ceiling height than exists in the current building geometry.

**Step 1:** Section 5.105.1 Scope.

The total combined altered floor area is 100,000 square feet, so this project is required to comply with either Section 5.105.2 (building reuse), Section 5.409.2 (WBLCA), or Section 5.409.3 (product GWP compliance).

**Step 2:** Exception to Section 5.105.1 Scope.

No additions are planned, so the project is eligible to use Section 5.105.2 for compliance.

**Step 3:** Calculations for Section 5.105.2 Reuse of existing building.

It is not possible to use simple gross floor area calculations in this example as large portion of the existing building is altered including primary structural elements and existing building enclosure, it is recommended that the project team completes Worksheet WS-3 in a similar manner as shown in Example 3 above.

## **ENFORCEMENT:**

**Plan review:** The plan reviewer should confirm that the pathway used to comply with Section 5.105.2 requirements for building reuse is identified on the construction documents and should review the plans and calculations that show the required percentages of the retained building primary structural elements and enclosure. Use of the Worksheet WS-3 is not mandatory, as the compliance may be shown by other means. However, use of the Worksheet can help design professionals in showing compliance and assist local jurisdictions with enforcement.

**On-site enforcement:** The inspector should review the permit set of plans and verify on-site that the existing primary structural elements and enclosure are maintained as shown in the approved set of construction documents.

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## **SECTION 5.106 SITE DEVELOPMENT**

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**Section 5.106.5.3 – Begins on page 5-3 of CALGreen and on page 23 of the 2022 Guide.**

***Amended code language.***

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**5.106.5.3 Electric vehicle (EV) charging. [N] [BSC-CG]** Construction to provide electric vehicle infrastructure and facilitate electric vehicle charging shall comply with Section 5.106.5.3.1 EV capable spaces, Section 5.106.5.3.2 Electric vehicle charging stations and associated Table 5.106.5.3.1, or Section 5.106.5.3.6 Electric vehicle charging stations (EVCS)-Power allocation method and associated Table 5.106.5.3.6 and shall be provided in accordance with regulations in the *California Building Code* and the *California Electrical Code*.

**Exceptions: ... 5.106.5.3.1 EV capable spaces. [N] ...**

***Amended code language.***

**5.106.5.3.2 Electric vehicle charging stations (EVCS).** EV capable spaces shall be provided with electric vehicle supply equipment (EVSE) to create EVCS in the number indicated in Table 5.106.5.3.1. The EVCS required by Table 5.106.5.3. shall be provided with Level 2 EVSE or DCFC as permitted in Section 5.106.5.3.2.1. At least one Level 2 EVSE shall be provided.

One EV charger with multiple connectors capable of charging multiple EVs simultaneously shall be permitted if the electrical load capacity required by Section 5.106.5.3.1 for each EV capable space is accumulatively supplied to the EV charger.

***New code sections and language added.***

**5.106.5.3.2.1** The installation of each DCFC EVSE shall be permitted to reduce the minimum number of required EV capable spaces without EVSE or EVCS with Level 2 EVSE by five and reduce proportionally the required electrical load capacity to the service panel or subpanel.

**5.106.5.3.2.2** The installation of two Low Power Level 2 EV charging receptacles shall be permitted to reduce the minimum number of required EV capable spaces without EVSE in Table 5.106.5.3.1 by one.

**5.106.5.3.3 Use of automatic load management systems (ALMS)...**

**5.106.5.3.4 Accessible electric vehicle charging station (EVCS).** When EVSE is installed, accessible EVCS shall be provided in accordance with the California Building Code Chapter 11B, Section 11B-228.3.

**Note:** *Note is stricken and added as a new code requirement in Section 5.106.5.3.5 below.*

**New code language.**

**5.106.5.3.5 Electric vehicle charging station signage.** Electric vehicle charging stations shall be identified by signage or pavement markings in compliance with Caltrans Traffic Operations Policy Directive 13-01 (Zero Emission Vehicle Signs and Pavement Markings) or its successor(s).

**Amended Table (footnote 3 added)**

**TABLE 5.106.5.3.1**

TOTAL NUMBER OF ACTUAL PARKING SPACES	NUMBER OF REQUIRED EV CAPABLE SPACES	NUMBER OF EVCS (EV CAPABLE SPACES PROVIDED WITH EVSE) <sup>2 &amp; 3</sup>
0-9	0	0
10-25	4	0
26-50	8	2
51-75	13	3
76-100	17	4
101-150	25	6
151-200	35	9
201 and over	20 percent of actual parking spaces <sup>1</sup>	25 percent of EV capable spaces <sup>1</sup>

1. Calculation for spaces shall be rounded up to the nearest whole number.
2. The number of required EVCS (EV capable spaces provided with EVSE) in column 3 count toward the total number of required EV capable spaces shown in column 2.
3. At least one Level 2 EVSE shall be provided.

**New code language (Power allocation method).**

**5.106.5.3.6 Electric vehicle charging stations (EVCS)-Power allocation method.** The Power allocation method may be used as an alternative to the requirements in Section 5.106.5.3.1, Section 5.106.5.3.2 and associated Table 5.106.5.3.1. Use Table 5.106.5.3.6 to determine the total power in kVA required based on the total number of actual parking spaces.

Power allocation method shall include the following:

1. Use any kVA combination of EV capable spaces, Low Power Level 2, Level 2 or DCFC EVSEs.
2. At least one Level 2 EVSE shall be provided.

***New Table (Power allocation method)***

**TABLE 5.106.5.3.6**

TOTAL NUMBER OF ACTUAL PARKING SPACES	MINIMUM TOTAL kVA @ 6.6 kVA	TOTAL kVA REQUIRED IN ANY COMBINATION OF EV CAPABLE <sup>3,4</sup> , LOW POWER LEVEL 2, LEVEL 2 <sup>1, 2</sup> , OR DCFC
0-9	0	0
10-25	26.4	26.4
26-50	52.8	52.8
51-75	85.8	85.8
76-100	112.2	112.2
101-150	165	165
151-200	231	231
201 and over	20 percent of actual parking spaces x 6.6	Total required kVA = P x .20 x 6.6 Where P=Parking spaces in facility

1. Level 2 EVSE @ 6.6 kVA minimum.
2. At least one Level 2 EVSE shall be provided.
3. Maximum allowed kVA to be utilized for EV capable spaces is 75 percent.
4. If EV capable spaces are utilized, they shall meet the requirements of Section 5.106.5.3.1 EV capable spaces.

**INTENT**

Some changes have been made to expand the compliance methods to further the installation of electric vehicle charging stations (EVCS).

**Note:** For newly added regulations applicable to additions and alterations refer to the new code Section 5.106.5.4 Additions or alterations to existing buildings or parking facilities.

**Change for 2022 Intervening Cycle Supplement:** BSC made several amendments as follows:

- Amended Section 5.106.5.3 Electric vehicle (EV) charging to clarify that compliance with EV charging regulations can be achieved using the requirements in Section 5.106.5.3.1 EV capable, Section 5.106.5.3.2 EVCS and associated Table 5.106.5.3.1, or Section 5.106.5.3.6 Electric vehicle charging stations (EVCS)-Power allocation method and associated Table 5.106.5.3.6.

- Amended Section 5.106.5.3.2 to allow the use of one DCFC to be substituted for five Level 2 EVSE. Currently one DCFC is allowed to be substituted for five EV capable spaces without EVSE. BSC added a new code Section 5.106.5.3.2.1 to allow for DCFCs to be substituted on a 1-to-5 ratio for both EV capable spaces (already allowed) or independently Level 2 EVSEs. Additional changes include adding a new code Section 5.106.5.3.2.2 to allow the use of Low Power Level 2 receptacles to be substituted for EV capable spaces without EVSE. The specific amendment allows for two Low Power Level 2 charging receptacles to be permitted to reduce the minimum number of required EV capable spaces without EVSE by one.
- A new code Section 5.106.5.3.5 Electric vehicle charging station signage has been added to replace the “Note” for EVCS signs previously under Section 5.106.5.3.4.
- Some edits were made to Table 5.106.5.3.1 column 2 and footnote 3 has been added.
- Lastly, BSC added a new code Section 5.106.5.3.6 Electric vehicle charging stations (EVCS)-Power allocation method and associated new Table 5.106.5.3.6 with footnotes. The table is solely based on power in kVA and is meant to be used in lieu of the EV charging requirements in Section 5.106.5.3.1 and associated Table 5.106.5.3.1. This proposed alternative was crafted using the required power allocation in amps for the EV capable spaces from Table 5.106.5.3.1 so the two tables are meant to be equals; using either table would achieve the same amount of power allotment.

### **SUGGESTION:**

Where EV charging stations are installed, anticipate accessibility requirements per the California Building Code, Part 2, Chapter 11B, Section 11B-228.3. Locate the charging stations and EV capable spaces near the entrance to the building, and in a parking area that can easily accommodate compliance with accessibility regulations for the installed chargers and future EVSE installations. Properly locating the EV capable spaces or EV charging stations can reduce potential accessibility issues.

### **COMPLIANCE METHOD:**

Include on the construction documents the proposed location of the listed suitable cabinet(s), box(es), enclosure(s) or equivalent required for future EV equipment connections. Indicate on the plans the required service panel capacity with raceway to the approximate location of the future EV charging connections as required in Section 5.106.5.3 and related Table 5.105.5.3.1 or independently Section 5.106.5.3.6 and related Table 5.106.5.3.6 when using the power allocation method. Refer to the previously mentioned code sections to determine the required number of EV capable spaces and the required number of EVCS. Lastly, for EV capable spaces, ensure that the service panel(s) or subpanel(s) circuit directory is properly identified as being “EV CAPABLE” and that the raceway termination location is permanently and visibly marked as “EV CAPABLE.”

### **RECOMMENDATION:**

The construction documents should reflect the EV electrical load capacity needed to accommodate the total number of required EV capable spaces and EVCS as required per Table 5.106.5.3.1 or independently Table 5.106.5.3.6 when using the power allocation method. Refer to Section 5.106.5.3.2.1 for DCFC ratio allowance as

a method of compliance with EV capable spaces and EVCS installations, and Section 5.106.5.3.3 for the permitted use of an ALMS for compliance with EVCS installations. Refer to new Section 5.106.5.3.2.2 for the permitted use of Low Power Level 2 EV charging receptacles. Include all parking spaces in the calculation when determining the required EV capacity.

## EXAMPLES:

1. **Assume 55 total actual parking spaces using Table 5.106.5.3.1 or Table 5.105.5.3.6:** The scenarios 1 and 2 below use the allowed compliance methods. Based on Table 5.106.5.3.1, provide capacity for 13 EV capable spaces with three of those spaces equipped with EVSE. The net result is ten EV capable and three EVSE (which can be either Level 2 or DCFC). The use of DCFCs may reduce the number of required EV capable spaces or independently EVCS as per Section 5.106.5.3.2.1. Also, the installation of Low Power Level 2 EV charging receptacles per new Section 5.106.5.3.2.2 is permitted to reduce the minimum number of required EV capable spaces. Additionally, ALMS can be used to reduce the electrical load as per Section 5.106.5.3.3.

**Scenario 1 for 55 spaces using Table 5.106.5.3.1:** If two DCFCs are installed, using DCFC allowance for both EV capable spaces and independently EVCS, those two installed DCFCs can be used to comply with ten EV capable spaces and independently five EVCS. This would eliminate the requirement for EV capable spaces in column 2 and complies with the three required EVCS in column 3. Due to the table added footnote 3, at least one Level 2 EVSE is still required. The result for compliance using this scenario is the installation of two DCFCs and one Level 2 EVSE.

**Note:** There are other possible combinations for compliance with the EV Table 5.106.5.3.1 and new Table 5.106.5.3.6.

**Scenario 2 for 55 spaces using new Table 5.106.5.3.6 (Power allocation method):** Looking at row 3 (51-75 spaces) the total power needed is set at 85.8 kVA. Looking at column 3 for the total required kVA, any combination of EV capable, Low Power Level 2, Level 2, or DCFC can be used for compliance.

Use the formula for Kilovolt-amps (kVA) to Kilowatts (kW) which is:

$$\text{Apparent power (kVA)} \times \text{power factor (pf)} = \text{actual power (kW)}$$

to determine the kW needed for the chargers.

The required 85.8 kVA is multiplied by 0.8 (pf) = 68.64 kW actual power.

To meet the kVA power requirement, provide one DCFC rated at 60kW and one Level 2 EVSE rated at 9kW or greater. The new table footnote 2 requires that at least one Level 2 be installed. The result for compliance using this scenario and the power allocation method is the installation of one DCFC and one Level 2 EVSE.

**Note:** There are other possible combinations for compliance with the EV Table 5.106.5.3.1 and new Table 5.106.5.3.6. One additional option when using Table 5.106.5.3.6 based on footnote 3, the maximum allowed kVA to be utilized for EV capable spaces is 75 percent.

2. **Assume 240 total actual parking spaces using Table 5.106.5.3.1 or Table 5.105.5.3.6:** The scenarios 1 and 2 below use the allowed compliance methods. Based on Table 5.106.5.3.1, provide capacity for 48 EV capable spaces with 12 of those spaces equipped with EVSE. The net result is 36 EV capable and 12 EVSE (which can be either Level 2 or DCFC). The use of DCFCs may reduce the number of required EV capable spaces or independently EVCS as per Section 5.106.5.3.2.1. Also, the installation of Low Power Level 2 EV charging receptacles per new Section 5.106.5.3.2.2 is permitted to reduce the minimum number of required EV capable spaces. Additionally, ALMS can be used to reduce the electrical load as per Section 5.106.5.3.3.

**Scenario 1 for 240 spaces using Table 5.106.5.3.1:** If seven DCFCs are installed, using DCFC allowance for both EV capable spaces and independently EVCS, those seven installed DCFCs can be used to comply with 35 EV capable spaces and independently 12 EVCS. This would reduce the requirement for EV capable spaces in column 2 from net 36 to 35 and complies with the 12 required EVCS in column 3. Due to table footnote 3, at least one Level 2 EVSE is still required. The result for compliance using this scenario is the installation of seven DCFCs, one EV capable and one Level 2 EVSE.

**Note:** There are other possible combinations for compliance with the EV Table 5.106.5.3.1 and new Table 5.106.5.3.6.

**Scenario 2 for 240 spaces using new Table 5.106.5.3.6 (Power allocation method):** Looking at row 8 (201 and over spaces) the total power needed is  $240 \times 20 \text{ percent} \times 6.6 \text{ kVA} = 316.8 \text{ kVA}$ . Looking at column 3 for the total required kVA, any combination of EV capable, Low Power Level 2, Level 2, or DCFC can be used for compliance.

Use the formula for Kilovolt-amps (kVA) to Kilowatts (kW) which is:

$$\text{Apparent power (kVA)} \times \text{power factor (pf)} = \text{actual power (kW)}$$

to determine the kW needed for the chargers.

The required 316.8 kVA is multiplied by 0.8 (pf) = 253.44 kW actual power.

To meet the kVA power requirement of 253.44kVA, provide four DCFC rated at 60kW = 240kW and two Level 2 EVSE rated at 9kW or greater = 18kVA; therefore  $240\text{kVA} + 18\text{kVA} = 258\text{kVA}$ —which is greater than 253.44kVA—complies. The new table footnote 2 requires that at least one Level 2 be installed. The result for compliance using this scenario and the power allocation method is the installation of four DCFC and two Level 2 EVSE.

**Note:** There are other possible combinations for compliance with the EV Table 5.106.5.3.1 and new Table 5.106.5.3.6. One additional option when using Table 5.106.5.3.6 based on footnote 3, the maximum allowed kVA to be utilized for EV capable spaces is 75 percent.

## **ENFORCEMENT:**

**Plan review:** The plan reviewer should confirm that the construction documents are compliant with Section 5.106.5.3 and related Table 5.106.5.3.1 or independently Section 5.106.5.3.6 and related Table 5.106.5.3.6 when using the power allocation

method. Also, confirm that the necessary electrical load capacity for EV connections to the required number of EV capable spaces and EVCS per Table 5.106.5.3.1 or Table 5.106.5.3.6 has been provided. Confirm proper identification for EV capable spaces at the service panel(s) or subpanel(s) and that the raceway termination location is permanently and visibly marked as “EV CAPABLE.”

**On-site enforcement:** The inspector should verify on-site that the service panel and raceway with proper termination have been installed for EV capable spaces per the approved set of construction documents. For installed EVSE, the inspector should verify that installed EV equipment complies with the construction plans and specifications.

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***Section 5.106.5.4 – Begins on page 5-4 of CALGreen and on page 27 of the 2022 Guide.***

***New code language.***

**5.106.5.4 Additions or Alterations to existing buildings or parking facilities [A].**

**[BSC-CG]** Existing buildings or parking facilities being modified by one of the following, shall comply with Section 5.106.5.4.1 or 5.106.5.4.2. When EVSE is installed, accessible EVCS shall be provided in accordance with the California Building Code, Chapter 11B, Section 11B-228.3.

1. When the scope of construction work includes an increase in power supply to an electric service panel as part of a parking facility addition or alteration.
2. When a new photovoltaic system is installed covering existing parking spaces.
3. When additions or alterations to existing buildings are triggered pursuant to code Section 301.3 and the scope of work includes an increase in power supply to an electric service panel.

**Exceptions:**

1. On a case-by-case basis where the local enforcing agency has determined compliance with this section is not feasible based upon one of the following conditions:
  - a. Where there is no local utility power supply.
  - b. Where the local utility is unable to supply adequate power.
  - c. Where there is evidence suitable to the local enforcement agency substantiating that additional local utility infrastructure design requirements, directly related to the implementation of Section 5.106.5.3, may adversely impact the construction cost of the project.
  - d. Where demonstrated as impracticable excluding local utility service or utility infrastructure issues.
2. Remote parking facilities that do not have access to the building service panel.
3. Parking area lighting upgrades where no trenching is part of the scope of work.
4. Emergency repairs including but not limited to, water line break in parking facilities, natural disaster repairs, etc.

**5.106.5.4.1 Existing buildings or parking areas without previously installed EV capable infrastructure [A].** When EV capable infrastructure does not exist at an existing parking facility or building, and the parking facility or building undergoes an addition or alteration listed in Section 5.106.5.4, construction shall include electric vehicle charging in compliance with either Section 5.106.5.3 and associated Table 5.106.5.3.1, or Section 5.106.5.3.6 and associated Table 5.106.5.3.6 for the total number of actual parking spaces being added or altered.

**5.106.5.4.2 Existing buildings or parking areas with previously installed EV capable infrastructure [A].** When EV capable infrastructure is available at an existing parking facility or building, and the parking facility or building is undergoing an addition or alteration listed in Section 5.106.5.4, construction shall include electric vehicle charging in compliance with either Section 5.106.5.3 and associated Table 5.106.5.3.1, or Section 5.106.5.3.6 and associated Table 5.106.5.3.6 utilizing the existing EV capable allocated power and infrastructure for the total number of actual parking spaces being added or altered. If the area being added or altered exceeds the existing EV capable capacity, allocated power and infrastructure, provide additional EV charging as needed to comply with this section.

## **INTENT:**

The intent of this new mandatory code section is to expand the EV requirements for qualifying additions and alterations. These new code changes will support the implementation of the governor's Executive Orders B-16-2012, B-48-2018 and N-79-20 to achieve a benchmark for having over 1.5 million zero-emission vehicles (ZEVs) on California roadways by 2025, 5 million ZEVs on California roadways by 2030, and 100 percent sales of electric vehicles by 2035, respectively.

**Changes for 2022 Intervening Cycle Supplement:** BSC added a new code Section 5.106.5.4 Additions or alterations to existing buildings or parking facilities.

This code section requires the installation of EV charging for qualifying additions and alterations for a property owner or manager to meet EV charging requirements similar to those required for new construction. In essence there are two compliance methods for the new proposed code change: either comply with Section 5.106.5.4.1 or 5.106.5.4.2, as applicable.

**5.106.5.4.1.** This code section is triggered when existing buildings or parking areas without previously installed EV capable infrastructure undergo a qualifying addition or alteration as listed in Section 5.106.5.4 and is only applicable when parking spaces are being added or altered.

**5.106.5.4.2.** This code section is triggered when existing buildings or parking areas with previously installed EV capable infrastructure undergo a qualifying addition or alteration as listed in Section 5.106.5.4 and is only applicable when parking spaces are being added or altered.

## **SUGGESTION:**

Refer to the accessibility requirements found in the California Building Code, Chapter 11B, Section 11B-228.3 when locating the EV capable spaces or EV charging stations. Properly locating the EV capable spaces or EV charging stations can reduce potential accessibility issues.

**COMPLIANCE METHOD:**

When there is a qualifying addition or alteration and when the existing buildings or parking areas do not have previously installed EV capable infrastructure; include on the construction documents the proposed location of the listed suitable cabinet(s), box(es), enclosure(s) or equivalent required for future EV equipment connections. Indicate on the plans the required service panel capacity with raceway to the approximate location of the future EV charging connections as required in Section 5.106.5.3 and related Table 5.105.5.3.1 or independently Section 5.106.5.3.6 and related Table 5.106.5.3.6 when using the power allocation method. Refer to the previously mentioned code sections and tables to determine the required number of EV capable spaces and the required number of EVCS.

When there is a qualifying addition or alteration and the existing buildings or parking areas have previously installed EV capable infrastructure; include on the construction documents the existing location of the listed suitable cabinet(s), box(es), enclosure(s) or equivalent required for EV equipment connections. Construction documents shall include electric vehicle charging in compliance with either Section 5.106.5.3 and associated Table 5.106.5.3.1, or Section 5.106.5.3.6 and associated Table 5.106.5.3.6, utilizing the existing EV capable allocated power and infrastructure for the total number of actual parking spaces being added or altered.

If the area being added or altered exceeds the existing EV capable capacity, allocated power, and infrastructure, provide additional EV charging as needed to comply with this section. Build out all existing EV capable spaces utilizing the existing EV capable allocated power and infrastructure for the total number of actual parking spaces being added or altered prior to adding any new EV capable spaces.

For EV capable spaces in both scenarios, ensure that the service panel or subpanel(s) circuit directory is properly identified as being “EV CAPABLE” and that the raceway termination location is permanently and visibly marked as “EV CAPABLE.”

**EXAMPLES:**

Refer to Section 5.106.5.3.2 above for examples using the various parking space numbers and calculation methods. Note that there are various compliance options.

**ENFORCEMENT:**

Refer to code Section 5.106.5.3.2 above for plan review and on-site enforcement methods.

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**Section 5.106.5.5 (former section 5.106.5.4) – Begins on page 5-4 of CALGreen and on page 27 of the 2022 Guide.**

**Amended and renumbered code language.**

**5.106.5.5 Electric vehicle (EV) charging: medium-duty and heavy-duty. [N] [BSC-CG]** Construction shall comply with Section 5.106.5.5.1 to facilitate future installation of electric vehicle supply equipment (EVSE). Construction for warehouses, grocery stores, retail stores, office buildings, and manufacturing facilities with planned off-street loading spaces shall also comply with Section 5.106.5.5.1 for future installation of medium- and heavy-duty EVSE.

**Exceptions:**

1. On a case-by-case basis where the local enforcing agency has determined compliance with this section is not feasible based upon one of the following conditions:
  - a. Where there is no local utility power supply.
  - b. Where the local utility is unable to supply adequate power.
  - c. Where there is evidence suitable to the local enforcing agency substantiating that additional local utility infrastructure design requirements, directly related to the implementation of Section 5.106.5.3, may adversely impact the construction cost of the project.

When EVSE(s) is/are installed, it shall be in accordance with the *California Building Code*, the *California Electrical Code* and as follows:

**Amended and renumbered code language.**

**5.106.5.5.1 Electric vehicle charging readiness requirements for warehouses, grocery stores and retail stores, office buildings, and manufacturing facilities with planned off-street loading spaces [N]**

In order to avoid future demolition when adding EV supply and distribution equipment, spare raceway(s) or busway(s) and adequate capacity for transformer(s), service panel(s) or subpanel(s) shall be installed at the time of construction in accordance with the *California Electrical Code*. Construction plans and specifications shall include, but are not limited to, the following:

1. The transformer, main service equipment and subpanels shall meet the minimum power requirement in Table 5.106.5.5.1 to accommodate the dedicated branch circuits for the future installation of EVSE.
2. The construction documents shall indicate one or more location(s) convenient to the planned off-street loading space(s) reserved for medium- and heavy-duty ZEV charging cabinets and charging dispensers, and a pathway reserved for routing of conduit from the termination of the raceway(s) or busway(s) to the charging cabinet(s) and dispenser(s), as shown in Table 5.106.5.5.1.
3. Raceway(s) or busway(s) originating at a main service panel or a subpanel(s) serving the area where potential future medium- and heavy-duty EVSE will be located and shall terminate in close proximity to the potential future location of the charging equipment for medium- and heavy-duty vehicles.
4. The raceway(s) or busway(s) shall be of sufficient size to carry the minimum additional system load to the future location of the charging for medium- and heavy-duty ZEVs as shown in Table 5.106.5.5.1.

***Amended and Renumbered Table***

**TABLE 5.106.5.5.1  
RACEWAY CONDUIT AND PANEL POWER  
REQUIREMENTS FOR MEDIUM-AND-HEAVY-DUTY EVSE [N]**

Building Type	Building Size (sq. ft.)	Number of Off-street loading spaces	Additional capacity Required (kVa) for Raceway & Busway and Transformer & Panel
Grocery	...	...	...
Retail	...	...	...
Warehouse	...	...	...
Manufacturing Facilities	10,000 to 50,000	1 or 2	200
	10,000 to 50,000	3 or Greater	400
	Greater than 50,000	1 or Greater	400
Office Buildings	10,000 to 135,000	1 or 2	200
	10,000 to 135,000	3 or Greater	400
	Greater than 135,000	1 or Greater	400

**INTENT:**

There were some changes made to expand the installation of electric vehicle charging stations (EVCS) for medium-duty and heavy-duty vehicle parking spaces to include manufacturing facilities and office buildings occupancy types, when applicable.

**Change for 2022 Intervening Cycle Supplement:** BSC, in coordination with CARB, introduced additional occupancies to meet the requirements for EV infrastructure for medium- and heavy-duty ZEVs.

**COMPLIANCE METHOD:**

No change to compliance method. Refer to the 2022 *CALGreen* Guide for specific information.

**ENFORCEMENT:**

No change to enforcement. Refer to the 2022 *CALGreen* Guide for specific information.

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

***Division 5.4, Section 5.401 – Begins on page 5-13 of CALGreen and on page 39 of the 2022 Guide.***

### **SECTION 5.401 GENERAL**

***Amended code language.***

**5.401.1 Scope.** The provisions of this chapter specify the requirements of achieving material conservation, resource efficiency, and greenhouse gas (GHG) emission reduction through protection of buildings from exterior moisture, construction waste diversion, employment of techniques to reduce pollution through recycling of materials, the installation of products with lower GHG emissions and building commissioning or testing and adjusting.

**Change for 2022 Intervening Cycle Supplement:** Section has been amended to include greenhouse gas (GHG) emission reduction and provide clarity.

### **SECTION 5.409 LIFE CYCLE ASSESSMENT**

***Section 5.409 – Begins on page 5-15 of CALGreen.***

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***New code language added to the formerly reserved section.***

**5.409.1 Scope.**

**[BSC-CG]** Effective July 1, 2024, projects consisting of newly constructed building(s) with a combined floor area of 100,000 square feet or greater shall comply with either Section 5.409.2, or Section 5.409.3. Alteration(s) to existing building(s) where the combined altered floor area is 100,000 square feet or greater shall comply with either 5.105.2, 5.409.2, or 5.409.3. Addition(s) to existing building(s) where the total floor area combined with the existing building(s) is 100,000 square feet or greater shall comply with either Section 5.105.2, Section 5.409.2, or Section 5.409.3. Effective January 1, 2026, the combined floor area shall be 50,000 square feet or greater.

#### **INTENT:**

The intent of Section 5.409 is to add new mandatory regulations for the Whole Building Life Cycle Assessment (WBLCA) and Product Global Warming Potential (GWP) compliance pathways, giving design professionals two additional methods to comply with embodied carbon reduction requirements.

At this time, these regulations do not apply to commercial buildings that are adapted (modernized and repurposed) to be used for residential purposes, as these types of projects are outside the scope of BSC's authority. BSC promulgates *CALGreen* standards for nonresidential occupancies where no other agency has authority to adopt green building standards, state buildings, and University of California and California State University buildings. For example, OSHPD has jurisdiction over hospitals and other health facilities.

School projects are subject to an area threshold that depends upon which authority the project falls under. For school projects subject to DSA authority, the area threshold for applicability of these provisions for new, renovation, and addition projects is 50,000 square feet. For school projects that fall under BSC authority, the area threshold for applicability of these provisions is 100,000 square feet until December 31, 2025, after which the area threshold will drop to 50,000 square feet.

The new scoping section requires a newly constructed buildings with specified floor area to comply with either of the two embodied carbon reduction pathways: WBLCA as described further in Section 5.409.2; or product GWP compliance as described further in Section 5.409.3. The applicant determines which of these two compliance pathways they will use. Alterations and additions with specified floor area (project aggregate area) are required to comply with either of the two pathways listed above or with an existing building reuse pathway.

### **SUGGESTION:**

It is suggested to review information provided on the Carbon Leadership Forum website <https://carbonleadershipforum.org/resource-library/> as it contains a lot of educational materials about WBLCA. Another source of educational materials may be the American Institute of Architects (AIA) website <https://www.aia.org/landing-pages/6456754-zero-carbon>.

BSC is coordinating with the Division of the State Architect (DSA) to make learning content addressing carbon reduction regulations available through DSA's Learning Management System which is used for the purpose of educational webinars available to the public. American Institute of Architects California (AIA-CA) is also working on the training materials about all the compliance pathways available.

### **RECOMMENDATION:**

Discuss and determine which one of the three compliance pathways to use during initial project decision-making: by reusing existing building resources, demonstrating a reduction in GWP through WBLCA or using products and materials with specified GWP values. Discussion may include questions like how much to build, what to save, and what materials to work with.

Note that compliance for projects which retain substantial portions of the existing building structure can be very simple to document. For these building reuse projects which comply based on percentage of building structure retained, an applicant can, if they wish, use the alternative paths in Section 5.409.2 or Section 5.409.3.

For projects that retain portions of an existing building less than the 45 percent threshold outlined in Section 5.109.2, the project must comply with either Section 5.409.2 or Section 5.409.3 to show conformance.

### **EXAMPLES:**

Refer to examples provided under Section 5.105.1 Scope.

**5.409.2 Whole building life cycle assessment.** Projects shall conduct a cradle-to-grave whole building life cycle assessment performed in accordance with ISO 14040 and ISO 14044, excluding operating energy, and demonstrating a minimum 10 percent reduction in global warming potential (GWP) as compared to a reference baseline building of similar size, function, complexity, type of construction, material specification, and location that meets the requirements of the *California Energy Code* currently in effect. Software used to conduct the whole building life cycle assessment, including reference baseline building, shall have a data set compliant with ISO 14044, and ISO 21930 or EN 15804, and the software shall conform to ISO 21931 and/or EN 15978. The software tools and datasets shall be the same for evaluation of both the baseline building and the proposed building.

**Notes:**

1. Software for calculating whole building life cycle assessment is available for free at Athena Sustainable Materials Institute (<https://calculatelca.com/software/impact-estimator/>) and OneClick LCA - Planetary ([www.oneclicklca.com/planetary](http://www.oneclicklca.com/planetary)). Paid versions include, but are not limited to, Sphera GaBi Solutions ([gabi.sphera.com](http://gabi.sphera.com)), SimaPro ([simapro.com](http://simapro.com)), OneClick LCA ([www.oneclicklca.com](http://www.oneclicklca.com)) and Tally for Revit ([apps.autodesk.com](http://apps.autodesk.com)).
2. ASTM E2921-22 “Standard Practice for Minimum Criteria for Comparing Whole Building Life Cycle Assessments for Use with Building Codes, Standards, and Rating Systems” may be consulted for the assessment.
3. In addition to the required documentation specified in Section 5.409.2.3, Worksheet WS-9 may be required by the enforcing entity to demonstrate compliance with the requirements.

**5.409.2.1 Building components.** Building enclosure components included in the assessment shall be limited to glazing assemblies, insulation, and exterior finishes. Primary and secondary structural members included in the assessment shall be limited to footings and foundations, and structural columns, beams, walls, roofs, and floors.

**5.409.2.2 Reference study period.** The reference study period of the proposed building shall be equal to the reference baseline building and shall be 60 years.

**5.409.2.3 Verification of compliance.** A summary of the GWP analysis produced by the software and Worksheet WS-4 signed by the design professional of record shall be provided in the construction documents as documentation of compliance. A copy of the whole building life cycle assessment which includes the GWP analysis produced by the software, in addition to maintenance and training information, shall be included in the operation and maintenance manual and shall be provided to the owner at the close of construction. The enforcing agency may require inspection and inspection reports in accordance with Sections 702.2 and 703.1 during and at completion of construction to demonstrate substantial conformance. Inspection shall be performed by the design professional of record or third party acceptable to the enforcing agency.

## **INTENT:**

The intent of these mandatory requirements is to reduce embodied carbon emissions through a holistic, performance-based approach that allows teams to optimize through design efficiency, alternative material selection, and procurement of low-carbon building products. Whole building lifecycle assessment (WBLCA) is a modeling methodology that allows architects and other building professionals to understand environmental impacts associated with the following life cycle phases of the building: raw material procurement, manufacturing, construction, use and decommissioning.

Using the WBLCA approach provides the project proponent with the maximum flexibility as it is a performance-based approach, where a low performing aspect of the project can be balanced or offset by a high performing aspect of the project. Because of the increased flexibility of this approach, it can be more time consuming and/or costly to implement than the other compliance pathways. As noted, the applicant determines what compliance pathway to utilize. The approach used for compliance should be clearly indicated in the construction documents, so verification during the plan review and during field inspection can be implemented appropriately.

The plan reviewer does not prescriptively determine compliant strategies for WBLCA pathway. In contrast, the applicant determines and models a set of design and procurement strategies to comply with the mandatory performance criteria.

Section 5.409.2 contains mandatory regulations for the WBLCA compliance pathway. This section requires a cradle-to-grave WBLCA be performed in accordance with ISO 14040 and ISO 14044 reference standards, excluding the operating energy, and demonstrate a 10 percent reduction in global warming potential (GWP) compared to a building similar in size, function, complexity, type of construction, material specification and location. ISO 14040 establishes the framework and definitions for lifecycle assessment. ISO 14044 describes key requirements and provides guidelines for conducting LCA.

**Clarification for mixed-use occupancies:** In the case that a mixed-use project contains non-residential floor area that is subject to this mandatory requirement, project teams may choose to conduct WBLCA and demonstrate compliance for the whole building floor area, including residential occupancies. However, project teams are only required to perform the WBLCA for the non-residential areas and may choose to demonstrate compliance through modeling only the non-residential portion of the project.

**Lifecycle scope boundaries:** A critical scope definition for the cradle-to-grave LCA boundary required under this regulation is to exclude operational energy use. Excluding operational energy from the calculation eliminates teams' ability to trade operational energy savings for embodied carbon. Further, Part 6 (California Energy Code) of Title 24 addresses requirements for operational energy. It is also important to note that Module D, beyond end-of-life, shall not be included in the WBLCA results.

**Baseline model guidance:** In order to demonstrate embodied carbon reductions in compliance with this regulation, project teams must develop a baseline model, intended to capture a comparable building design that has not be optimized. Section 5.409.2 provides guidance on acceptable assumptions for a baseline model for WBLCA. The following information is being provided to clarify the intent of the baseline modeling guidance.

1. Baseline models shall be project-specific; generic baseline WBLCA models or assumptions cannot be used for the purposes of complying with this pathway.
2. Project teams may capture the embodied carbon reductions associated with structural design optimizations from a conventional, baseline structural design for a functionally equivalent project design. Examples of acceptable optimizations to capture through WBLCA include:
  - a. Adjustments to structural grid spacing and dimensioning.
  - b. Reduction in steel rebar quantity through post-tensioning of slabs.
  - c. Reduction in foundation sizing as a result of lightweight structural systems.
3. Project teams shall not capture embodied carbon reductions associated with standard structural design refinement that occur through conventional project design development. For example, if a project team includes material contingencies or increased material quantities during early-stage design, standard refinement will conventionally occur during subsequent project design phases and thus the over-designed scenario should not be assumed as a baseline.
4. Project teams may capture the embodied carbon reductions associated with alternative low-carbon material selection. Building materials assumed in the baseline model should reflect conventional materials that would typically be used for a functionally equivalent building in the project location. In most cases, concrete, steel, or hybrid concrete/steel structures are assumed to be the conventional, baseline structural typology. As such, wood structural members may be considered as optimizations in the proposed design unless dimensional lumber is the conventional construction type (e.g. a 5-over-2 podium building where higher floors are conventionally built with dimensional lumber should not use an all-concrete building as a baseline).
5. Building envelope assemblies in the baseline model shall meet the current version of the California Energy Code. All insulation products included in baseline shall be in compliance with California HFC regulations (e.g. avoiding the use of legally prohibited insulation products cannot be claimed as an optimization).
6. Baseline models shall use regionally applicable industry-wide EPD benchmarks for A1-A3 embodied carbon impacts. Optimizations resulting from specification and procurement of low-carbon products may be captured if product-specific EPDs documenting assumed values are collected during construction administration.
7. Baseline models may use default assumptions provided in LCA software tools for A4 and A5, as well as C1-C4 embodied carbon impacts.

**Clarification on biogenic carbon storage:** Biogenic carbon storage associated with wood products shall be excluded or reported separately from embodied carbon reductions, as seen in the WBLCA Worksheet WS-9.

**Building components:** Section 5.409.2.1 clarifies which building components are included in the WBLCA. Model resolution shall be as high as possible within the selected LCA software.

**Study Period:** Section 5.409.2.2 specifies that 60 years is the assumed building lifespan and study period for the WBLCA assessment to fully account for maintenance and replacement.

The intent is to ensure consistency with established LCA protocols, tools, resources and metrics as US Green Building Council LEED references the same concepts, metrics and approaches.

**Note:** The regulations do not ban the use of any materials. While the GWP prescriptive pathway limits material choices to those that do not exceed the maximum GWP value specified in Table 5.409.3, even those poor performing materials could be used in a project under the WBLCA performance compliance pathway as the analysis allows balancing poor GWP performing materials with high GWP performing materials.

### **COMPLIANCE METHOD:**

Follow standard process associated with performing WBLCA. In general, the process can be broken down into following steps:

1. Collect information about materials and scenarios.
2. Perform calculations for impacts using reliable LCA assessment tools.
3. Understand and interpret results.
4. Document process and produce detailed assessment reports.

Ensure that the scope of the analysis is a cradle-to-grave assessment which includes environmental impacts associated with the life-cycle stages for the building structure and enclosure. The modules for a compliant WBLCA include:

- Product stage: Modules A1-A3
- Transportation to site: Module A4
- Construction installation: Module A5 (can be left blank if unknown)
- Use stage: B1-B5
- End of life stage: C1-C4

Identify which one of the three available pathways is used to comply with the embodied carbon reduction requirements and include the following in the construction documents to demonstrate 10 percent reduction in GWP:

- A summary of the GWP analysis produced by the software
- Worksheet WS-4 (added to *CALGreen* Chapter 8) signed by the design professional of record
- Worksheet WS-9 (added to *CALGreen* Chapter 8) is optional unless required by the enforcing agency

Include the following in the operation and maintenance manual provided to the owner at the close of construction:

- A copy of the whole building life cycle assessment which includes the GWP analysis produced by the software

The LCA software or tool used for the baseline and proposed design must be the same, with the same modules evaluated. This is because different software tools have unique databases and standard assumptions and can result in different results. Use of the same tool for both baseline and proposed project ensures that the specifics of the particular software or tool used are not key factors in the outcome. Available software examples to perform cradle-to-grave WBLCA in accordance with ISO 14040 and

ISO 14044 reference standards are provided in the footnote 1 to Section 5.409.2. It is expected that new tools may be developed, which can also be used provided they conform to the ISO standards noted.

**Note:** The design professional of record would be responsible to ensure that the software, data input, and the use of the tool are appropriate. The actual operation of the software may be done by consultants who specialize in this type of analysis; however, the design professional of record is still responsible for the resulting compliance. The design professional who uses consultants to perform the analysis should review the inputs and outputs to the software.

Including the GWP analysis in the project documents makes verification of compliance simpler and allows building owners to review the environmental impacts of their project material choices, leading to greater awareness of embodied carbon impacts throughout the design and construction industry. Designers must include the product selection considerations as identified from the WBLCA to ensure that the modeled products are included in the final building.

### **EXAMPLES:**

1. **A 150,000 square foot office building – design example.** The design team has studied two structural scenarios during the schematic design stage:

- A. Steel framing with concrete on metal deck
- B. Steel framing with concrete topping over CLT deck

The analysis finds an embodied carbon reduction of 20 percent for the structural system of Scenario B when compared to Scenario A. Industry average EPDs are used for all materials. Biogenic carbon is not included in the embodied carbon reduction. The owner decides to build Scenario B. Scenario A represents a conventional or business-as-usual approach, and is therefore appropriate to use as a baseline. Both scenarios are assumed to have the same facade with a contribution of 15 percent to the overall embodied carbon. In total, the 20 percent reduction in the structure contributes 17 percent overall reduction for the project and is found to be compliant.

2. **A 300,000 square foot mixed use concrete tower – procurement example.** During the construction documents stage, the design team has studied low-carbon concrete procurement with the general contractor and local ready-mix supplier. The baseline building and the design building are identical in their structural system, enclosure system, and material quantities. The baseline building uses the NRMCA regional benchmark concrete mixes in the WBLCA. The designed building uses low-carbon concrete mixes specified in collaboration with the ready-mix supplier in the WBLCA. GWP assumptions used in the baseline building model should be based on industry wide EPDs. In the baseline WBLCA model, concrete is found to represent 70 percent of the overall GWP of the building. In collaboration with the contractor, each mix design is optimized to the necessary structural and construction performance criteria. A reduction of 15 percent in concrete GWP is established, which reduces the overall building's GWP by 10 percent. Implementation of these designs is ensured by setting GWP limits that are noted in the project contract documents. To document that the GWP of the concrete mixes actually supplied on the project are equal to or less than the limits established in the WBLCA, the ready-mix supplier is required by the contract documents to provide a mix specific EPDs in their submittals.

## ENFORCEMENT:

**Plan review:** The plan reviewer should confirm that a summary of the GWP analysis produced by the software and Worksheet WS-4 signed by the design professional of record are included in the construction documents.

**On-site enforcement:** The enforcing agency may require inspection and inspection reports in accordance with Sections 702.2 and 703.1 during and at completion of construction to demonstrate substantial conformance. Inspection shall be performed by the design professional of record or third party acceptable to the enforcing agency.

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### ***New code language: sections and table.***

**5.409.3 Product GWP compliance – prescriptive path.** Each product that is permanently installed and listed in Table 5.409.3 shall have a Type III environmental product declaration (EPD), either product-specific or factory-specific.

**5.409.3.1** Products shall not exceed the maximum GWP value specified in Table 5.409.3.

**Exception:** Concrete may be considered one product category to meet compliance with this section. A weighted average of the maximum GWP for all concrete mixes installed in the project shall be less than the weighted average maximum GWP allowed per Table 5.409.3 using Exception Equation 5.409.3.1. Calculations shall be performed with consistent units of measurement for the material quantity and the GWP value. For the purposes of this exception, industry wide EPD's are acceptable.

#### **Exception EQUATION 5.409.3.1**

$$GWP_n < GWP_{allowed}$$

where

$$GWP_n = \sum (GWP_n)(v_n) \text{ and } GWP_{allowed} = \sum (GWP_{allowed})(v_n)$$

and

$n$  = each concrete mix installed in the project

$GWP_n$  = the GWP for concrete mix  $n$  per concrete mix EPD, in kg CO<sub>2e</sub> /m<sup>3</sup>

$GWP_{allowed}$  = the GWP potential allowed for concrete mix  $n$  per Table 5.409.3

$v_n$  = the volume of concrete mix  $n$  installed in the project, in m<sup>3</sup>

**5.409.3.2. Verification of compliance.** Calculations to demonstrate compliance, Type III EPDs for products required to comply if included in the project, and Worksheet WS-5 signed by the design professional of record shall be provided on the construction documents. Updated EPDs for products used in construction shall be provided to the owner at the close of construction and to the enforcement entity upon request. The enforcing agency may require inspection and inspection reports in accordance with Sections 702.2 and 703.1 during and at completion of construction to demonstrate substantial conformance. Inspection shall be performed by the design professional of record or third party acceptable to the enforcing agency.

**TABLE 5.409.3  
PRODUCT GWP LIMITS**

<b><u>Buy Clean California Materials Product Category <sup>1</sup></u></b>	<b><u>Maximum acceptable GWP value (unfabricated) (GWP<sub>allowed</sub>)</u></b>	<b><u>Unit of Measurement</u></b>
<u>Hot-rolled structural steel sections</u>	<u>1.77</u>	<u>MT CO<sub>2e</sub>/MT</u>
<u>Hollow structural sections</u>	<u>3.00</u>	<u>MT CO<sub>2e</sub>/MT</u>
<u>Steel plate</u>	<u>2.61</u>	<u>MT CO<sub>2e</sub>/MT</u>
<u>Concrete reinforcing steel</u>	<u>1.56</u>	<u>MT CO<sub>2e</sub>/MT</u>
<u>Flat glass</u>	<u>2.50</u>	<u>kg CO<sub>2e</sub>/MT</u>
<u>Light-density mineral wool board insulation</u>	<u>5.83</u>	<u>kg CO<sub>2e</sub>/1 m<sup>2</sup></u>
<u>Heavy-density mineral wool board insulation</u>	<u>14.28</u>	<u>kg CO<sub>2e</sub>/1 m<sup>2</sup></u>

**Concrete, Ready-Mixed <sup>2, 3</sup>**

<b><u>Concrete Product Category</u></b>	<b><u>Maximum GWP allowed value (GWP<sub>allowed</sub>)</u></b>	<b><u>Unit of Measurement</u></b>
<u>up to 2499 psi</u>	<u>450</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>2500-3499 psi</u>	<u>489</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>3500-4499 psi</u>	<u>566</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>4500-5499 psi</u>	<u>661</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>5500-6499 psi</u>	<u>701</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>6500 psi and greater</u>	<u>799</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>

**Concrete, Lightweight Ready-Mixed <sup>2</sup>**

<b><u>Concrete Product Category</u></b>	<b><u>Maximum GWP allowed value (GWP<sub>allowed</sub>)</u></b>	<b><u>Unit of Measurement</u></b>
<u>up to 2499 psi</u>	<u>875</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>2500-3499 psi</u>	<u>956</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>3500-4499 psi</u>	<u>1,039</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>

### Footnotes:

1. The GWP values of the products listed in Table 5.409.3 are based on 175 percent of Buy Clean California Act (BCCA) GWP values, except for concrete products which are not included in BCCA.
2. For concrete, 175 percent of the National Ready Mix Concrete Association (NRMCA) 2022 version 3 Pacific Southwest regional benchmark values are used for the GWP allowed, except for High Early strength.
3. Concrete High Early Strength ready-mixed shall be calculated at 130 percent of the Ready mixed concrete GWP allowed values for each product category.

### INTENT:

The intent of these mandatory requirements is to encourage the use of products and materials for which life-cycle information is available (in the form of EPD) and that have lower GWP impacts.

Section 5.409.3 contains mandatory regulations for the GWP compliance pathway (the third pathway available to comply with the embodied carbon reduction regulations). This pathway utilizes specific product categories and maximum acceptable GWP values listed in Table 5.409.3 and provides project teams a prescriptive option to specify lower carbon materials based on product purchasing and procurement during construction.

The materials required to comply are limited to **structural steel, flat glass, mineral wool board insulation and concrete** (materials included in Table 5.409.3) and have been based on a similar approach espoused by the Buy Clean California Act (BCCA) except that concrete products are not included in BCCA. The maximum acceptable GWP values specified in Table 5.409.3 represent 175 percent BCCA GWP values. The concrete ready mixed and lightweight ready-mixed values are based on 175 percent of the National Ready Mix Concrete Association (NRMCA) 2022 version 3 Pacific Southwest regional benchmark values.

**Note:** High-early strength concrete is not included in the benchmark values, and it should be calculated at 130 percent of the ready-mixed values in the table.

**Note:** Table 5.409.3 as printed contains a typo in the unit for flat glass. BSC intends to correct the units during 2025 Intervening Code Adoption Cycle from kg CO<sub>2</sub>e/MT to MT CO<sub>2</sub>e/MT. With the revised unit (MT CO<sub>2</sub>e/MT), reported GWP values will align with industry data as published in the CLF North American Material Baselines (2023).

Concrete, being a unique regional product, is allowed a weighted average calculation for all concrete mixes used on a project as various regions in California may not be able to comply with prescriptive maximum acceptable GWP values in Table 5.409.3.

Project teams can choose for each mix to comply with the GWP value in the table, or they can use exception equation 5.409.3.1 to illustrate that, collectively, the concrete mixes do not exceed the allowed GWP value. The weighted average approach also allows more flexibility by allowing projects the ability to trade-off concrete mixes: high performance/high GWP concrete can be offset with low GWP concrete (flatwork, for example).

### COMPLIANCE METHOD:

In general, the process can be broken down into following steps:

1. Find products with available Type III Environmental Product Declarations (EPD).

**Note:** EPD shall be either product-specific or factory-specific for all products required to comply except for concrete, where industry wide EPDs are acceptable.

2. Compare GWP listed in the EPD with the maximum GWP value specified in Table 5.409.3.

3. Specify products that are compliant with the GWP values specified in the table.

**Note:** The embodied carbon reduction regulations do not supersede other California Building Standards Code requirements, so the materials specified by the project teams are required to meet all code requirements including structural (Part 2 of Title 24) and energy efficiency (Part 6 of Title 24) performances.

4. Compile documentation that clearly indicates what materials have been evaluated, what the allowable limits for those materials are, and what the values are for the materials called out in the construction documents. Providing this road map will assist in a verification during the plan check process.
5. Identify which one of the three available pathways is used to comply with the embodied carbon reduction requirements and include the following in the construction documents to demonstrate compliance:
  - Calculations to demonstrate compliance (if Exception Equation 5.409.3.1 is used)
  - Type III EPDs for products required to comply if included in the project
  - Worksheet WS-5 (see *CALGreen* Chapter 8) signed by the design professional of record
6. Document that the products used in the project, as constructed, either match the originally specified materials or have been evaluated and documented as conforming to the requirements. This 'on-site' verification is the responsibility of the design professional of record, who can enlist other project team members in carrying out this verification, such as the general contractor, material suppliers, or personal visual confirmation on the project site.
7. Provide updated EPDs for products used in construction to the owner at the close of construction. The building official may require a third-party verification, as outlined in *CALGreen* Section 703.

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## EXAMPLES:

All the EPD snippets used in the examples below are from the Embodied Carbon in Construction Calculator (EC3) Tool <https://buildingtransparency.org/ec3/material-search>

### 1. Hot-rolled structural steel sections.

**Table 5.** Life Cycle Impact Assessment (LCIA) results for 1 metric ton of hot-rolled structural steel. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Impact Category	Life cycle stage			
	A1	A2	A3	Total (A1-A3)
GWP (kg CO <sub>2</sub> eq)	700	37.6	78.6	817
	86%	4.6%	9.6%	100%
AP (kg SO <sub>2</sub> eq)	1.75	0.143	0.224	2.12
	83%	6.8%	11%	100%
EP (kg (PO <sub>4</sub> ) <sup>3-</sup> eq)	1.12	3.33x10 <sup>-2</sup>	0.187	1.34
	84%	2.5%	14%	100%
POCP (kg C <sub>2</sub> H <sub>4</sub> eq)	0.140	4.76x10 <sup>-3</sup>	1.30x10 <sup>-2</sup>	0.157
	89%	3%	8.3%	100%
ODP (kg CFC-11 eq)	6.51x10 <sup>-5</sup>	6.86x10 <sup>-6</sup>	6.16x10 <sup>-6</sup>	7.81x10 <sup>-5</sup>
	83%	8.8%	7.9%	100%
ADPE (kg Sb eq)	5.70x10 <sup>-6</sup>	3.42x10 <sup>-7</sup>	1.58x10 <sup>-6</sup>	7.62x10 <sup>-6</sup>
	75%	4.5%	21%	100%
ADPF (MJ)	9,160	564	1,280	11,000
	83%	5.1%	12%	100%

Per EPD Table 5 above, GWP value for 1 metric ton of structural steel is **817 kg CO<sub>2</sub>e/MT**.

Per *CALGreen* Table 5.409.3, Maximum acceptable GWP value for hot-rolled structural steel sections is **1.77 MT CO<sub>2</sub>e/MT**.

Convert Unit of Measurement used in the EPD to the one used in Table 5.409.3:

$$817 \text{ kg CO}_2\text{e/MT} / 1000 = 0.817 \text{ MT CO}_2\text{e/MT}$$

Compare GWP listed in the EPD with the maximum GWP value in Table 5.409.3:

$$0.817 \text{ MT CO}_2\text{e/MT} < 1.77 \text{ MT CO}_2\text{e/MT}$$

The product is compliant with the requirements of Section 5.409.3.1.

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## 2. Ready-Mixed Concrete, 4500-5499 psi.

COMPRESSIVE STRENGTH:	5000 psi @ 28 days
DECLARED UNIT:	1 cubic yard (1 cubic meter) ready mix concrete produced at [redacted] plant.

CALCULATED RESULTS A1-A3 PER CUBIC YARD AND CUBIC METER				
Core Mandatory Impact Indicator			per yd <sup>3</sup>	per m <sup>3</sup>
Global warming potential	GWP	kg CO <sub>2</sub> e	248.14	324.56
Depletion potential of the stratospheric ozone layer	ODP	kg CFC11e	2.62E-06	3.42E-06
Acidification potential of soil and water sources	AP	kg SO <sub>2</sub> e	0.69	0.90
Eutrophication potential	EP	kg Ne	0.08	0.11
Formation potential of tropospheric ozone	SFP	kg O <sub>3</sub> e	14.72	19.25
Abiotic depletion potential for fossil resources	ADP <sub>f</sub>	MJ, NCV	1,744.10	2,281.28
Abiotic depletion potential for non-fossil mineral resources	ADP <sub>e</sub>	kg Sbe	2.10E-04	2.74E-04
Fossil fuel depletion	FFD	MJ Surplus	77.08	100.82

Per EPD snippet above, GWP value for 1 cubic meter of the ready-mix concrete is **324.56 kg CO<sub>2</sub>e/m<sup>3</sup>**.

Per Table 5.409.3, Maximum acceptable GWP value for ready-mixed concrete with 4500-5499 psi is **661 kg CO<sub>2</sub>e/m<sup>3</sup>**.

Compare GWP listed in the EPD with the maximum GWP value in Table 5.409.3:

$$324.56 \text{ kg CO}_2\text{e/m}^3 < 661 \text{ kg CO}_2\text{e/m}^3$$

The product is compliant with the requirements of Section 5.409.3.1.

### ENFORCEMENT:

**Plan review:** The plan reviewer should confirm that calculations demonstrating compliance, PDF copies or links to Type III EPDs for products required to comply if used in the project, and Worksheet WS-5 signed by the design professional of record are provided on the construction documents.

**On-site enforcement:** The enforcing agency may require inspection and inspection reports in accordance with Sections 702.2 and 703.1 during and at completion of construction to demonstrate substantial conformance. Inspection shall be performed by the design professional of record or third party acceptable to the enforcing agency.

**Note:** Enforcement agency may request updated EPDs that were substituted after the construction permit was issued.

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**Section 5.410 – Begins on page 5-16 of CALGreen and on page 45 of the 2022 Guide.**

## SECTION 5.410 BUILDING MAINTENANCE AND OPERATION

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### ***Amended Informational Note***

**5.410.2 Commissioning. [N] New buildings 10,000 square feet and over.** For new buildings 10,000 square feet ...

...

### **Informational Note:**

1. Functional performance testing for heating, ventilation, air conditioning systems and lighting controls must be performed in compliance with the *California Energy Code*.

**Change for 2022 Intervening Cycle Supplement:** Informational Note 1 deleted and Informational Note 2 renumbered to Note 1. This amendment was needed since International Accreditation Service (IAS) no longer supports AC 476 and therefore the deleted note is no longer applicable.

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## CHAPTER 6 REFERENCED ORGANIZATIONS AND STANDARDS

**Chapter 6 – Begins on page 6-1 of CALGreen, and on page 77 of the 2022 Guide.**

**Change for 2022 Intervening Cycle Supplement:** The second sentence in Section 601.1 is amended to correct the grammar. The amended table adds reference standards referenced in the amended or new regulations.

## SECTION 601 GENERAL

**601.1** This chapter lists the organizations and standards that are referenced in various sections of this document. The standards are listed according to the promulgating agency of the standard.

***Entire table is not shown. Only newly added reference standards are shown. Referenced standards names are added here for ease of use.***

ORGANIZATION	STANDARD	REFERENCED SECTION
ACI American Concrete Institute <a href="#">American Concrete Institute</a>		
	ACI CT-21 ACI Concrete Terminology	A5.405.5.2.1.1
ASTM ASTM International		

ORGANIZATION	STANDARD	REFERENCED SECTION
...	ASTM C31/C31M-19 Standard Practice for Making and Curing Concrete Test Specimens in the Field	A5.405.5.3.4
	ASTM C1798/C1798M-19 Standard Specification for Returned Fresh Concrete for Use in a New Batch of Ready-Mixed Concrete	A5.405.5.3.5
	ASTM C1866/C1866M-20 Standard Specification for Ground-Glass Pozzolan for Use in Concrete	A5.405.5.2
	ASTM D7612-2021 Standard Practice for Categorizing Wood and Wood-Based Products According to Their Fiber Sources	A5.405.2.1
	ASTM E2921-2022 Standard Practice for Minimum Criteria for Comparing Whole Building Life Cycle Assessments for Use with Building Codes, Standards, and Rating Systems	5.409.2, A5.409.2
<b>EN European Standards</b> <a href="https://www.en-standard.eu/">European and International standards online store – European Standards (en-standard.eu)</a>		
	EN 15804-2012 + A2:2019 Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products	5.409.2, A5.409.2.1, A5.409.2.2
	EN 15978-2011 Sustainability of construction works – Assessment of environmental performance of buildings – Calculation method	5.409.2, A5.409.2.1, A5.409.2.2
<b>ISO International Organization for Standardization</b> <a href="https://www.iso.org">https://www.iso.org</a> ISO Central Secretariat Chemin de Blandonnet 8 CP 401 – 1214 Vernier, Geneva, Switzerland		
	ISO 14040-2006+A1:2020 Environmental management — Life cycle assessment — Principles and framework	5.409.2, A5.409.2.1, A5.409.2.2

ORGANIZATION	STANDARD	REFERENCED SECTION
	ISO 14044:2006+A1:2020 Environmental management — Life cycle assessment — Requirements and guidelines	5.409.2, A5.409.2.1, A5.409.2.2
	ISO 21930-2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services	5.409.2, A5.409.2.1, A5.409.2.2
	ISO 21931-2017 Sustainability in buildings and civil engineering works — Framework for methods of assessment of the environmental, social and economic performance of construction works as a basis for sustainability assessment — Part 1: Buildings	5.409.2, A5.409.2.1, A5.409.2.2

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## CHAPTER 8 COMPLIANCE FORMS, WORKSHEETS AND REFERENCE MATERIAL

***Chapter 8 – Begins on page 8-1 of CALGreen Code and on page 83 of the 2022 Guide.***

***New Worksheets WS-3, WS-4, WS-5, WS-6, WS-7, WS-8 and WS-9 have been added to Chapter 8.***

Chapter 8 in *CALGreen* contains:

- Worksheets WS-1 and WS-2, sample forms for a Construction Waste Management (CWM) Plan, CWM Worksheet and CWM Acknowledgment, and commissioning referenced standards for non-energy systems and forms.
- Worksheets WS-3 through WS-9, forms to support verification of compliance for carbon reduction regulations in *CALGreen*. Refer to regulations in 2022 *CALGreen* to see if it is mandatory to use the form for compliance.

This Guide provides additional *CALGreen* forms, worksheets and reference materials for implementing nonresidential *CALGreen* measures. Use of these forms is not mandatory for compliance with *CALGreen*. These forms serve as templates or guides for code users and may be modified for your convenience. These forms can be used to assist in implementing the *CALGreen* regulations. It is CBSC's intent to maintain these nonregulatory forms on its website.

Verification Guidelines Checklists are available in this guide within Appendix A5, Nonresidential Voluntary Measures, Division A5.6, Verification Guidelines Checklists.

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**WORKSHEET (WS-3)**  
**5.105.2 BUILDING REUSE**

**DOCUMENTATION OF COMPLIANCE OF EXISTING BUILDING REUSE**

**Area of Existing Building(s)** \_\_\_\_\_ SF

**Area of Aggregate Addition(s) (if applicable)** \_\_\_\_\_ SF

	Existing Total Area (A)	Retained Total Area (B)	% of Retained Structure (B)/(A)
<b>Primary Structural Elements of Existing Building(s)</b> (foundations; columns, beams, walls, and floors; and lateral elements)	_____ SF	_____ SF	_____ %
<b>Building Enclosure of Existing Building(s)</b> (roof framing, wall framing and exterior finishes only)	_____ SF	_____ SF	_____ %

**Total % Reuse of Required Elements  $\geq$  45%** \_\_\_\_\_ %

**INTENT:**

Worksheet WS-3 is added to Chapter 8 to support verification of compliance for Section 5.105.2 Reuse of existing building. Use of the worksheet is not mandatory. However, use of the worksheet can help design professionals in showing compliance and assist local jurisdictions with enforcement. The worksheet includes the area of the existing building and area of aggregate addition if applicable to demonstrate the project is eligible to comply with Section 5.105.2, and various options for calculating structural and nonstructural elements to show a reuse of 45 percent minimum primary structural elements and existing building enclosure.

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**WORKSHEET (WS-4)**  
**SECTION 5.409.2 WHOLE BUILDING LIFE CYCLE ASSESSMENT**

Responsible Designer's Declaration Statement:

I attest that the Whole Building Life Cycle Analysis has been performed according to the requirements of Section 5.409.2 and has met the minimum 10 percent reduction in global warming potential as compared to a reference baseline building of similar size, function, complexity, type of construction, material specification, and location that meets the requirements of the California Energy Code currently in effect. Furthermore, I will ensure during construction that the material specifications will be reviewed for substantial conformance with the life cycle assessment indicated on the approved plans so at the close of construction the minimum 10 percent reduction in global warming potential is thereby secured.

Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:

**WORKSHEET (WS-5)**  
**SECTION 5.409.3 PRODUCT GWP COMPLIANCE - PRESCRIPTIVE PATH**

Responsible Designer's Declaration Statement:

I attest that prescriptive compliance has been performed according to the requirements of Section 5.409.3 and products have met the minimum 10 percent reduction in global warming potential as specified in Table 5.409.3. Furthermore, I will ensure during construction that the material specifications will be reviewed for substantial conformance with the global warming potential limits indicated on the approved plans so at the close of construction the minimum 10 percent reduction in global warming potential is thereby secured.

Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:

**INTENT:**

Worksheets WS-4 and WS-5 are added to support verification of compliance for Sections 5.409.2 Whole Building Life Cycle Assessment (WBLCA) and 5.409.3 Product Global Warming Potential (GWP) pathways to comply with mandatory embodied carbon reduction regulations. The worksheets are similar and require the design professional of record to attest that the work has been performed in accordance with the code requirements.

**Note:** Worksheet WS-5 as printed contains an inappropriate reference to a "10 percent reduction in GWP." BSC intends to delete this reference during the 2025 Intervening Code Adoption Cycle. The intent of the worksheet is to certify compliance with the maximum GWP values listed in Table 5.409.3.

## COMPLIANCE METHOD:

Include one of the signed worksheets in the construction documents pursuant to the verification of appropriate compliance section.

## ENFORCEMENT:

**Plan review:** The plan reviewer should confirm that the appropriate worksheet is included in the construction documents and is signed by the design professional of record.

**On-site enforcement:** The enforcing agency may require inspection and inspection reports in accordance with Sections 702.2 and 703.1 during and at completion of construction to demonstrate substantial conformance.

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### WORKSHEET (WS-6) [BSC-CG] SECTION A5.105.2 BUILDING REUSE TIER 1 AND TIER 2

#### DOCUMENTATION OF COMPLIANCE OF EXISTING BUILDING REUSE

Area of Existing Building \_\_\_\_\_ SF

	<u>Existing Total Area</u> <u>(A)</u>	<u>Retained Total Area</u> <u>(B)</u>	<u>% of Retained Structure</u> <u>(B)/(A)</u>
<b>Primary Structural Elements of Existing Building</b> (foundations; columns, beams, walls, and floors; and lateral elements)	_____ SF	_____ SF	_____ %
<b>Building Enclosure of Existing Building</b> (roof framing, wall framing and exterior finishes only)	_____ SF	_____ SF	_____ %
<b>Interior Nonstructural Elements</b> (interior walls, doors, floor coverings, ceiling systems applicable for voluntary Tier 2 compliance)	_____ SF	_____ SF	_____ %

**Total % Reuse of Required Elements** \_\_\_\_\_ %

## INTENT:

Worksheet WS-6 is added to Chapter 8 to support verification of compliance for Section A5.105.2 Reuse of existing building. Use of the worksheet is not mandatory; however, it is provided to assist in showing compliance with these voluntary regulations. The worksheet is useful in calculating specified minimum percentages of reused primary structural elements, existing building enclosure elements and interior nonstructural elements to demonstrate compliance as applicable in accordance with Sections A5.105.2.1 for Tier 1, and A5.105.2.2 for Tier 2.

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**WORKSHEET (WS-7) [BSC-CG]**  
**SECTION A5.409.2 WHOLE BUILDING LIFE CYCLE ASSESSMENT**

Responsible Designer's Declaration Statement:

I attest that the Whole Building Life Cycle Analysis has been performed according to the requirements of Section A5.409.2 and has met the minimum 15 percent (Tier 1) or 20 percent (Tier 2) reduction in global warming potential as compared to a reference baseline building of similar size, function, complexity, type of construction, material specification, and location that meets the requirements of the California Energy Code currently in effect. Furthermore, I will ensure during construction that the material specifications will be reviewed for substantial conformance with the life cycle assessment indicated on the approved plans so at the close of construction the minimum reduction in global warming potential is thereby secured.

Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:

Space Intentionally Blank

**WORKSHEET (WS-8) [BSC-CG]**  
**SECTION A5.409.3 PRODUCT GWP COMPLIANCE-PRESCRIPTIVE PATH**

Designer's Declaration Statement:

I attest that prescriptive compliance has been performed according to the requirements of Section A5.409.3 and products have met the maximum acceptable GWP value for the products listed in Table A5.409.3 for either Tier 1 or Tier 2. Furthermore, I will ensure during construction that any material specification substitution will be reviewed for substantial conformance with the requirements of Section A5.409.3 so at the close of construction the minimum 15 percent reduction in global warming potential is thereby secured.

Signature:	
Company:	Date:
Address:	License:
City/State/Zip:	Phone:

**INTENT:**

Worksheets WS-7 and WS-8 are added to support verification of compliance for Sections A5.409.2 Whole Building Life Cycle Assessment (WBLCA) and A5.409.3 Product Global Warming Potential (GWP) pathways to comply with voluntary embodied carbon reduction regulations. The worksheets are similar and require the design professional of record to attest that the work has been performed in accordance with the code requirements.

**Note:** Worksheet WS-8 as printed contains an inappropriate reference to a "15 percent reduction in GWP." BSC intends to delete this reference during the 2025 Intervening Code Adoption Cycle. The intent of the worksheet is to certify compliance with the maximum GWP values listed in Table A5.409.3.

**COMPLIANCE METHOD:**

Include one of the signed worksheets in the construction documents pursuant to the appropriate verification of compliance section.

**ENFORCEMENT:**

**Plan review:** The plan reviewer should confirm that the appropriate worksheet is included in the construction documents and is signed by the design professional of record.

**On-site enforcement:** The enforcing agency may require inspection and inspection reports in accordance with Sections 702.2 and 703.1 during and at completion of construction to demonstrate substantial conformance.

# **WORKSHEET (WS-9)** **SECTION 5.409.2 AND SECTION A5.409.2** **WHOLE BUILDING LIFE CYCLE ASSESSMENT**

CALGreen Whole Building LCA Reporting Template					
<b>LCA model run</b>	<i>User Input</i>	<i>Units</i>	<b>Overall scope included (select all that apply)</b>		
LCA Modeler (company) [private]			Structure (required)	<input type="checkbox"/>	00
Date of Model Run (mm/yyyy)			Enclosure (required)	<input type="checkbox"/>	00
Project Phase at Model Run			Interiors (optional)	<input type="checkbox"/>	00
Reference Study Period (years)			MEP (optional)	<input type="checkbox"/>	00
Software and Version Used*			Site/Landscaping (optional)	<input type="checkbox"/>	00
Biogenic Carbon Included* (y/n)			FFE (optional)	<input type="checkbox"/>	00
Model Floor Area		m2			

  

Mandatory Scope Items						
Please break out the following in per element emissions by life cycle in kgCO2e. Leave blank any sections that were not calculated separately from Whole Building GWP						
	Upfront Carbon			Use Phase	End of Life	Total
	A1-3	A4	A5	B1-5	C1-4	
Baseline Structure GWP (kgCO2e):						
Baseline Enclosure GWP (kgCO2e):						
Baseline Whole Building GWP (kgCO2e):						
Proposed Structure GWP (kgCO2e):						
Proposed Enclosure GWP (kgCO2e):						
Proposed Whole Building GWP (kgCO2e):						

  

<b>A1-A3*</b>	Percent Reduction
(A1) Raw Material Supply, (A2) Transport to Factory, and (A3) Manufacturing	
<b>A4*</b>	
(A4) Transportation to site	
<b>A5*</b>	Mandatory
(A5) Construction Installation or "on-site energy use". Leave blank if unknown	
<b>B1-B5*</b>	
(B1) Use, (B2) Maintenance, (B3) Repair, (B4) Replacement, (B5) Refurbishment	
<b>C1-C4*</b>	Tier 1
(C1) Deconstruction/Demolition, (C2) Transport to Waste Processing/Disposal, (C3) Waste Processing, (C4) Disposal of Waste	
<b>D*</b>	
(D) Reuse-Recovery & Recycling Potential	
<b>Tier 2</b>	

  

Optional Items - Proposed Design ONLY						
Please break out the following in per element emissions by life cycle in kgCO2e. Leave blank any sections that were not calculated separately from Whole Building GWP						
	Upfront Carbon			Use Phase	End of Life	Total
	A1-3	A4	A5	B1-5	C1-4	
Interiors GWP (kgCO2e):						
MEP GWP (kgCO2e):						
Site/Landscaping GWP (kgCO2e):						
FF&E GWP (kgCO2e):						

## INTENT:

Worksheet WS-9 is added for optional use by the design professionals, and for required use if invoked by the enforcement entity. Worksheet WS-9 has been developed to create consistency in documentation submitted to the enforcing entity to ease the review by their staff. If required by the enforcement entity, it shall be provided in addition to the required summary of the GWP analysis and Worksheet WS-4 or Worksheet WS-7 signed by the design professional of record as applicable.

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## APPENDIX A5 NONRESIDENTIAL VOLUNTARY MEASURES

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

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

**Appendix A5.105 – Begins on page A5-2 of CALGreen and on page 154 of the 2022 Guide.**

**A5.105.1 Section deleted.**

**A5.105.1.1 Existing building structure. Section deleted.**

**A5.105.1.2 Existing nonstructural elements. Section deleted.**

**A5.105.1.3 Salvage. Section deleted.**

***New code language and section.***

**A5.105.1 Scope.** Projects with the area limits specified shall comply with Section A5.105.2 to achieve Tier 1 or Tier 2 compliance.

1. Alteration(s) to existing building(s) where the combined altered floor area is 50,000 square feet or greater shall comply with either Section A5.105.2, Section A5.409.2, or Section A5.409.3.
2. Addition(s) to existing building(s) where the total floor area combined with the existing building(s) is 50,000 square feet or greater shall comply with either Section A5.105.2, Section A5.409.2, or Section A5.409.3

**Exception:** Combined addition(s) to existing building(s) of two times the area or more of the existing building(s) is not eligible to meet compliance with Section A5.105.2.

3. Alteration(s) to existing building(s) where the aggregate floor area is less than 50,000 square feet shall comply with either Section 5.105.2, Section 5.409.2 or Section 5.409.3 for Tier 1 compliance, and either Section A5.105.2.1, Section A5.409.2.1, or A5.409.3 Tier 1 requirements for Tier 2 compliance.

4. Addition(s) to an existing building where the total floor area combined with the existing building(s) is less than 50,000 square feet shall comply with either Section 5.105.2, Section 5.409.2 or Section 5.409.3 for Tier 1 compliance, and either Section A5.105.2.1, Section A5.409.2.1, or A5.409.3 Tier 1 requirements for Tier 2 compliance.

**Exception:** Combined addition(s) to existing building(s) of two times the area or more of the existing building(s) is not eligible to meet compliance with Section 5.105.2 or Section A5.105.2.

## **INTENT:**

Existing Sections A5.105.1 – A5.105.1.3 included voluntary requirement to maintain 75 percent of the existing building structure and at least 50 percent of the interior nonstructural elements. To align with the new mandatory requirements in Section 5.105.1 Scope, and Section 5.105.2 Reuse of existing building, the existing voluntary sections have been repealed and rewritten to include the scope and requirements for Tier 1 and Tier 2 Reuse of existing buildings.

Section A5.105.1 clarifies the Tier 1 and Tier 2 compliance paths for alterations and additions to buildings with a floor area of 50,000 square feet or greater and buildings with a floor area of 50,000 square feet or less. This section contains four different options outlining the various compliance scenarios.

1. Alteration to existing building with a combined altered floor area of 50,000 square feet or greater.
2. Additions to existing building where the total floor area combined with the existing building is 50,000 square feet or greater. This scenario has an exception for combined addition to existing building two times the area or more of the existing building.
3. Alterations to existing building where the aggregate floor area is less than 50,000 square feet.
4. Additions to existing building where the total floor area combined with the existing building is less than 50,000 square feet. This scenario also has an exception for combined addition to existing building two times the area or more of the existing building.

The intent is to not have a building area threshold for the voluntary tier's applicability. However, depending on the building area, the requirements are different.

### **Projects ≥ 50,000 square feet (more strict requirements to comply with):**

- **Tier 1** – Sections A5.105.2.1 (Tier 1 building reuse) or A5.409.2.1 (Tier 1 WBLCA) or A5.409.3 (GWP limits for Tier 1).
- **Tier 2** – Sections A5.105.2.2 (Tier 2 building reuse) or A5.409.2.2 (Tier 2 WBLCA) or A5.409.3 (GWP limits for Tier 2).

### **Projects < 50,000 square feet (less strict requirements to comply with):**

- **Tier 1** – Sections 5.105.2 (mandatory requirements for building reuse) or 5.409.2 (mandatory requirements for WBLCA) or 5.409.3 (GWP limits in mandatory requirements).
- **Tier 2** – Sections A5.105.2.1 (Tier 1 building reuse) or A5.409.2.1 (Tier 1 WBLCA) or A5.409.3 (GWP limits for Tier 1).

## EXAMPLES:

The concepts, descriptions and examples for the voluntary measures can be extrapolated from the mandatory measures Section 5.105.1 Scope. Although the square footage values used in the examples are different, the basic concepts and logic align.

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**A5.105.2 Reuse of existing building.** Projects that include the reuse of an existing building shall meet the minimum requirements of Section A5.105.2.

**A5.105.2.1 Tier 1:** An alteration or addition to an existing building shall maintain at least 75 percent combined of the existing building's primary structural elements (foundations; columns, beams, walls, and floors; and lateral elements) and existing building enclosure (roof framing, wall framing and exterior finishes). Window assemblies, insulation, portions of buildings deemed structurally unsound or hazardous, and hazardous materials that are remediated as part of the project shall not be included in the calculation.

**A5.105.2.2 Tier 2:** An alteration or addition to an existing building shall maintain at least 75 percent combined of the existing building's primary structural elements (foundations; columns, beams, walls, and floors; and lateral elements) and existing building enclosure (roof framing, wall framing and exterior finishes). In addition, an alteration to an existing building shall maintain 30% of existing interior nonstructural elements (interior walls, doors, floor coverings, ceiling systems). Window assemblies, insulation, portions of buildings deemed structurally unsound or hazardous, and hazardous materials that are remediated as part of the project shall not be included in the calculation.

**A5.105.2.3 Verification of compliance.** Documentation shall be provided in the construction documents to demonstrate compliance with Section A5.105.2.

**Note:** Sample Worksheet WS-6 in Chapter 8 may be used to assist in documenting compliance with this section.

## A5.105.3 Deconstruction (Reserved)

### INTENT:

Section A5.105.2 contains the specifics for the four options listed in the Scope section. As with the mandatory section requirements, these regulations do not require reuse of an existing building. But if this voluntary measure is used, and an addition or alteration to an existing building occurs (i.e., the building is being reused), certain percentages of specified building elements are required to be maintained.

Tier 1 requirements are similar to the requirements in the mandatory section, but instead of 45 percent minimum, it requires at least 75 percent of the combined existing building's primary structural elements and existing building enclosure to be maintained.

In the Tier 2 requirements, in addition to Tier 1 requirements to maintain 75 percent of the combined existing building's primary structural elements and enclosure, Tier 2 also requires maintaining 30 percent of the existing interior nonstructural elements.

## **COMPLIANCE METHOD:**

Maintain the existing building primary structure (foundations, columns, beams, walls (only those which contribute to structural stability of the building), floors (including floor and roof decking) and enclosure (exterior skin and framing, excluding window assemblies and insulation). Structurally unsound or hazardous portions of buildings, and hazardous materials may be excluded, but clear and specific documentation should be provided to use this exclusion.

Determine and identify on the construction documents the compliance tier and the pathway used to comply with the embodied carbon reduction requirements. Identify elements of the existing building that can be reused and determine the percentage of existing elements that are retained. Provide calculations demonstrating a minimum required percent of the existing building elements maintained as applicable. Show on a demolition, site or building plan.

## **RECOMMENDATION:**

For many projects, a simple area analysis will be sufficient to demonstrate that percentages exceed the required percentages. For projects with significant alterations, or in situations where the percentages are not clearly compliant without additional detail, it will be necessary to prepare a spreadsheet listing all primary structural, interior nonstructural and enclosure elements as applicable within the existing building prior to construction or renovation.

An alternate method which allows even greater detail, when necessary, may use the “projected areas” of individual building elements, evaluated in a spreadsheet so as to show existing areas, and areas of the proposed final configuration. The percentage in any of the above methods will be determined by dividing the square footage of the total retained materials area by the square footage of the total existing materials area. The building official can request additional detail in any case where the percentage area being retained is not clear.

**Note:** The reuse calculations can be based on gross affected areas; or the surface areas of building primary structural and enclosure elements with measurements taken as if preparing a bid for construction of a building.

The design professional would indicate the method they are using to demonstrate compliance, and fill out and include Worksheet WS-6, which is added to *CALGreen* Chapter 8, in the construction documents to demonstrate compliance. Use of the worksheet is not mandatory, as the compliance may be shown by other means. However, use of the worksheet can help design professionals in showing compliance and assist local jurisdictions with enforcement.

## **EXAMPLES:**

The concepts, descriptions and examples for the voluntary measures can be extrapolated from the mandatory measures. Refer to examples provided under the mandatory measures for Section 5.105.2 Reuse of existing building. Although the ‘numbers’ are different, the basic concepts and logic align.

## ENFORCEMENT:

**Plan review:** The plan reviewer should confirm that the pathway used to comply with the preceding requirements for building reuse is identified on the construction documents and should review the plans and calculations that show the required percentages of the retained building elements. Use of the Worksheet WS-6 is not mandatory, as the compliance may be shown by other means.

**On-site enforcement:** The inspector should review the permit set of plans and verify on-site that the existing building elements are maintained as shown in the approved set of construction documents.

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### SECTION A5.106 SITE DEVELOPMENT

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**Section A5.106.5.3 – Begins on page A5-3 of CALGreen and on page 160 of the 2022 Guide.**

**Amended code language.**

**A5.106.5.3 Electric vehicle (EV) charging. [N]** Construction shall comply with Section A5.106.5.3.1 Tier 1 or A5.106.5.3.3 Tier 2, and in accordance with regulations in the *California Building Code* and the *California Electrical Code*.

**A5.106.5.3.1 Tier 1.** Comply with Section 5.106.5.3.1 EV capable spaces, Section 5.106.5.3.2 Electric vehicle charging stations and associated Table A5.106.5.3.1 Tier 1, or comply with Section A5.106.5.3.2 Electric vehicle charging stations (EVCS)—Power allocation method and associated Table A5.106.5.3.2 Tier 1.

Refer to Section 5.106.5.3.2 for the permitted use of Level 2 or Direct Current Fast Charger (DCFC) to create EVCS. Refer to Section 5.106.3.2.1 for the allowed use of DCFC to comply with both EV capable spaces and Level 2 EVSE. Refer to Section 5.106.5.3.3 for the allowed use of Automatic Load Management System (ALMS).

**TABLE A5.106.5.3.1 Tier 1**

TOTAL NUMBER OF ACTUAL PARKING SPACES	TIER 1 NUMBER OF REQUIRED EV CAPABLE SPACES	TIER 1 NUMBER OF EVCS (EV CAPABLE SPACES PROVIDED WITH EVSE) <sup>2, 3</sup>
0-9	2	0
10-25	5	2
26-50	11	4
51-75	19	6
76-100	26	9
101-150	38	13
151-200	53	18
201 and over	30 percent of actual parking spaces <sup>1</sup>	33 percent of EV capable spaces <sup>1</sup>

1. Calculation for spaces shall be rounded up to the nearest whole number.
2. The number of required EVCS (EV capable spaces provided with EVSE) in column 3 count toward the total number of required EV capable spaces shown in column 2.
3. At least one Level 2 EVSE shall be provided.

**A5.106.5.3.2 Electric vehicle charging stations (EVCS)—Power allocation method.** The power allocation method may be used as an alternative to the requirements in Section 5.106.5.3.1, Section 5.106.5.3.2, and associated Table A5.106.5.3.1 Tier 1.

Use Table A5.106.5.3.2 Tier 1 to determine the total power in kVA required based on the total number of actual parking spaces. Power allocation method shall include the following:

1. Use any kVA combination of EV capable spaces, low power Level 2, Level 2 or DCFC EVSEs.
2. At least one Level 2 EVSE shall be provided.

**TABLE A5.106.5.3.2 Tier 1**

<b>TOTAL NUMBER OF ACTUAL PARKING SPACES</b>	<b>MINIMUM TOTAL kVA @ 6.6 kVA</b>	<b>TOTAL kVA REQUIRED IN ANY COMBINATION OF EV CAPABLE <sup>3,4</sup>, LOW POWER LEVEL 2, LEVEL 2 <sup>1, 2</sup>, OR DCFC</b>
0-9	13.2	13.2
10-25	33	33
26-50	72.6	72.6
51-75	125.4	125.4
76-100	171.6	171.6
101-150	250.8	250.8
151-200	349.8	349.8
201 and over	30 percent of actual parking spaces x 6.6	Total required kVA = P x .30 x 6.6 Where P=Parking spaces in facility

1. Level 2 EVSE @ 6.6 kVA minimum.
2. At least one Level 2 EVSE shall be provided.
3. Maximum allowed kVA to be utilized for EV capable spaces is 67 percent.
4. If EV capable spaces are utilized, they shall meet the requirements of Section 5.106.5.3.1 EV capable spaces.

**A5.106.5.3.3 Tier 2.** Comply with Section 5.106.5.3.1 EV capable spaces, Section 5.106.5.3.2 Electric vehicle charging stations and associated Table A5.106.5.3.3 Tier 2, or Section A5.106.5.3.4 Electric vehicle charging stations (EVCS)—Power allocation method and associated Table A5.106.5.3.4 Tier 2.

Refer to Section 5.106.5.3.2 for the permitted use of Level 2 or Direct Current Fast Charger (DCFC) to create EVCS. Refer to Section 5.106.3.2.1 for the allowed use of DCFC to comply with both EV capable spaces and Level 2 EVSE. Refer to Section 5.106.5.3.3 for the allowed use of Automatic Load Management System (ALMS).

**TABLE A5.106.5.3.3 Tier 2**

<b>TOTAL NUMBER OF ACTUAL PARKING SPACES</b>	<b>TIER 2 NUMBER OF REQUIRED EV CAPABLE SPACES</b>	<b>TIER 2 NUMBER OF EVCS (EV CAPABLE SPACES PROVIDED WITH EVSE) <sup>2, 3</sup></b>
0-9	3	0
10-25	8	3
26-50	17	6
51-75	28	9
76-100	40	13
101-150	57	19
151-200	79	26
201 and over	45 percent of actual parking spaces <sup>1</sup>	33 percent of EV capable spaces <sup>1</sup>

1. Calculation for spaces shall be rounded up to the nearest whole number.
2. The number of required EVCS (EV capable spaces provided with EVSE) in column 3 count toward the total number of required EV capable spaces shown in column 2.
3. At least one Level 2 EVSE shall be provided.

**A5.106.5.3.4 Electric vehicle charging stations (EVCS)-Power allocation method.** The Power allocation method may be used as an alternative to the requirements in Section 5.106.5.3.1, Section 5.106.5.3.2 and associated Table A5.106.5.3.3 Tier 2. Use Table A5.106.5.3.4 Tier 2 to determine the total power in kVA required based on the total number of actual parking spaces.

Power allocation method shall include the following:

1. Use any kVA combination of EV capable spaces, Low Power Level 2, Level 2 or DCFC EVSEs.
2. At least one Level 2 EVSE shall be provided.

**TABLE A5.106.5.3.4 Tier 2**

<b>TOTAL NUMBER OF ACTUAL PARKING SPACES</b>	<b>MINIMUM TOTAL kVA @ 6.6 kVA</b>	<b>TOTAL kVA REQUIRED IN ANY COMBINATION OF EV CAPABLE<sup>3,4</sup>, LOW POWER LEVEL 2, LEVEL 2 <sup>1,2</sup>, OR DCFC</b>
0-9	28.8	28.8
10-25	76.8	76.8
26-50	163.2	163.2
51-75	268.8	268.8
76-100	384	384
101-150	547.2	547.2
151-200	758.4	758.4
201 and over	45 percent of actual parking spaces x 6.6	Total required kVA = $P \times .45 \times P \times 6.6$ Where P=Parking spaces in facility

1. Level 2 EVSE @ 6.6 kVA minimum.
2. At least one Level 2 EVSE shall be provided.
3. Maximum allowed kVA to be utilized for EV capable spaces is ~~75~~ 67 percent. \*
4. If EV capable spaces are utilized, they shall meet the requirements of Section 5.106.5.3.1 EV capable spaces.

*\* 67 percent is the correct value. 75 percent was published in error and will be corrected via errata during the next code adoption cycle.*

**INTENT, SUGGESTIONS, COMPLIANCE METHODS, RECOMMENDATIONS, ENFORCEMENT:**

Refer to code Section 5.106.5.3.2 above for intent, suggestions, compliance methods, recommendations, enforcement. The intent and compliance methods are the same as mandatory with the only difference being increased values for the Tier 1 and Tier 2 tables for the EV capable parking space requirements or independently the increased power allocation kVA values for Tier 1 and Tier 2 tables.

Note that there are various compliance options.

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**Section A5.106.11 – Begins on page A5-5 of CALGreen and on page 164 of the 2022 Guide.**

**Amended code language.**

**A5.106.11 Reduction of heat island effect.** Reduce heat island by requiring Section A5.106.11.1 Hardscape alternatives, Section A5.106.11.2 Cool roofs, or Section A5.106.11.3 Shade trees.

**A5.106.11.1 Hardscape alternatives.** ...

**A5.106.11.2 Cool roof.** 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:**

...

**A5.106.11.2.4 Verification of compliance.** If no documentation is available, an inspection shall be conducted to ensure roofing materials meet cool roof aged solar reflectance and thermal emittance or SRI values.

**New code language.**

**A5.106.11.3 Shade trees. [BSC-CG]** In the absence of a local shade tree ordinance, comply with mandatory Section 5.106.12 Shade trees.

## **INTENT:**

This code section has been editorially amended to accommodate a new shade tree voluntary regulation and to clarify the difference between several different heat island effects.

A new voluntary measure for shade trees has been added in response to calls from a few local jurisdictions asking if *CALGreen* can be amended to include shade tree regulations that make use of the DSA mandatory regulations found in Section 5.106.12. Many jurisdictions have local ordinances, municipal or zoning code regulations for shade trees, but some do not, and they would benefit from the inclusion of these regulations in *CALGreen*.

Shade tree planting has been a practical means for reducing heat island effect.

## **COMPLIANCE METHOD:**

Indicate on the construction documents either one of the methods used to comply with the shade tree requirement:

1. Comply with the local shade tree ordinance.
2. In the absence of the local shade tree ordinance, include on the site/landscape plan location of the shade tree plantings, specify the container size and provide calculations showing compliance with the percentage of shaded areas requirement in the surface parking lots and landscape areas according to Section 5.106.12.

## ENFORCEMENT:

**Plan review:** The plan reviewer should confirm that the construction documents show container size and shaded area calculations for compliance with regulations in Section 5.106.12 or local shade trees provisions.

**On-site enforcement:** The inspector should verify that shade trees are planted as shown in the construction documentation.

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## SECTION A5.107 BIRD-FRIENDLY BUILDING DESIGN

**Section A5.107 – Begins on page A5-6 of CALGreen.**

***New code language.***

### **A5.107 Bird-friendly building design.**

A newly constructed building, or an alteration of an existing building that includes the addition or replacement of 50 percent or more of the exterior glazing shall comply with the bird-friendly building design elements and features in Sections A5.107.1 through A5.107.3 the California Energy Code, and the fire hazard severity zone regulations in Chapter 7A of the California Building Code.

**Exception:** Alteration to the glazing in historical buildings per the California Historical Building Code.

**A5.107.1 Required elevation treatment.** Building elevation treatment shall incorporate bird-friendly mitigation strategies. No less than 90 percent of a building elevation, measured from grade to a height of 40 feet (12 m) above grade, or from grade to the height of an adjacent mature tree canopy (whichever is greater), shall incorporate bird-friendly mitigation strategies. No less than 60 percent of building elevation, 40 feet (12 m) above grade to the top of the building elevation, shall incorporate bird-friendly mitigation strategies.

Strategies to minimize the risk of birds colliding with buildings:

#### **1. Glazing**

Glazing with visual markers shall include, but is not limited to, the following:

- a. Etched or fritted glass with patterns of elements on the exterior having minimum dimensions of 1/4" (.64 cm) diameter for dots or 1/8" (.32 cm) width for stripes in a density of 2 inches (5.1 cm) maximum horizontally and vertically (the "2 X 2 Rule").

**Note:** If the visual markers are on glass surface 2, they can be effective if visible behind an exterior surface with reflectivity of 15% or less.

- b. Interior or exterior glazing film with 2 X 2 visual markers.
- c. Laminated glass with 2 X 2 visual markers, patterned Ultraviolet (UV) coating or use of contrasting patterned UV-absorbing and UV-reflecting films.

**Note:** Low-e coatings shall be behind the visual markers

- d. Glass block or channel glass.
- e. Developed glazing technologies, documented to reduce bird strikes, as tested by an independent third party and approved by the authority having jurisdiction; or

## **2. Slats, Screens, Netting, Louvers**

Glazing protected by exterior features that create a visible barrier in front of the glazing, may include, but not be limited to:

- a. Horizontal or vertical slats of 1/8" (.32 cm) minimum face width with minimum 2" (5.1 cm) spacing that obscure 85% or more of glass when viewed from all feasible angles.
- b. Grilles, screens or 1/8" (.32 cm) dia. welded wire mesh with openings no more than 2" (5.1 cm) maximum horizontally and vertically installed parallel to and no more than 3 ¼ ft. (1 m) from the first surface of glass (glass surface 1).
- c. Netting with 1" (2.5 cm) maximum openings, installed taut at least 6" (15 cm) away from the first surface of glass; or
- d. Sunshades or louvers 9" (22.5 cm) deep vertically spaced a maximum 9" (22.5 cm) or 6" (15 cm) deep horizontally at maximum 6" (15 cm) spacing and parallel or angled to the glass surfaces.

**A5.107.2 Special conditions.** The following special conditions shall comply with the provisions in Section A5.107.1 (as appropriate)

- 1. Glass facades adjacent to vegetated roof.
- 2. Glass railings and guardrails.
- 3. Transparent corners that extend 5.5 feet (1.68 m) on either side of a building.
- 4. Glass passageways less than 5.5 feet (1.68 m) wide.
- 5. Auxiliary glass building such as a glass pavilion or atria exposed to the sky.
- 6. Auxiliary glass building such as a glass pavilion or atria exposed to a courtyard with a water feature or plants.
- 7. Stained glass windows insulated on the exterior with clear glazing.

**A5.107.3 Nighttime conditions.** Nighttime lighting at the top of the building, and in the interiors of all areas visible through exterior glazing, including lobby and atria, shall be controlled with time-switch control devices or occupancy sensors complying with the current *California Energy Code*. The control device shall be programmed so the lights are extinguished from 2 am to dawn.

**Exception:** Emergency lighting, lighting required for nighttime security and **aeronautical** beacon lighting required by the Federal Aviation Administration.

**A5.107.3.1 Systems or operation and maintenance manual.** Include written recommendations that lighting is extinguished pursuant to Section A5.107.3 and janitorial services to the building are scheduled between sunrise and sunset.

## **INTENT:**

The intent of this measure is to provide a uniform guideline for bird-friendly building standards for the planning and design of buildings that specifically reduce the negative impact of bird deaths caused by collisions with buildings.

This voluntary measure is intended to apply to newly constructed buildings and existing buildings that includes the addition or replacement of 50 percent or more of the exterior glazing, including structures such as, glass bridges, walkways, and outdoor railings, free-standing glass architectural elements, and building corners where glass walls or windows are perpendicular. These special conditions are dangerous because birds can see through them to sky or habitat on the other side.

### **COMPLIANCE METHOD:**

Use glass that have an image or pattern screened, printed, or applied to the glass surface. By using patterns of various sizes and densities, manufacturers can create any kind of image, translucent or opaque. Ceramic frit and acid-etched patterns are commonly used to achieve design objectives other than preventing bird collisions, including a reduction in the transmission of light and heat, privacy screening, or branding, but these images in the glass also project enough visual markers to be perceived by birds and to help them avoid collisions with the glass.

Use building-integrated structures, such as recessed windows, awnings, sunshades, exterior screens, shutters, grilles, decorative facades that wrap entire structures, and balconies or overhangs, which can help deter birds. Without completely obscuring vision, these building-integrated structures can reduce the amount of visible glass, obscure glass from view, mute reflections during certain times of the day, and provide visual cues for birds to avoid an area. They can be used in retrofits or be an integral part of an original design.

Consider the WUI parameters of the *California Building Code* for the fire hazard severity zone and energy efficiency standards of the *California Energy Code* for fenestration products used in the projects. Provide details and material specifications in the construction documents.

Use time-switch control device or occupancy sensor from 2 a.m. to dawn to minimize nighttime collisions by reducing illumination of buildings which creates a beacon effect for night migrating birds. When weather conditions are favorable, these birds tend to fly high (over 150 meters) and depend heavily on visual references to maintain their orientation. However, during inclement weather, they often descend to lower altitudes and are liable to be attracted to illuminated buildings or other tall, lighted structures.

### **ENFORCEMENT:**

**Plan review:** The plan reviewer should examine the construction documents to confirm compliance.

**On-site enforcement:** The inspector should review the permit set of plans and verify on-site that the strategy measures are installed as shown in the approved set of construction documents.

## ***DIVISION A5.4 – MATERIAL CONSERVATION AND RESOURCE EFFICIENCY***

### **SECTION A5.401 GENERAL**

***Division A5.4, Section 5.401 – Begins on page A5-17 of CALGreen.***

***Amended code language.***

**A5.401.1 Scope.** The provisions of this chapter specify the requirements of achieving enhanced compliance with material conservation, resource efficiency, and greenhouse gas (GHG) emissions reduction through reuse of existing building stock and materials; use of recycled, regional, rapidly renewable, and certified wood materials; and employment of techniques to reduce pollution through recycling of materials.

**Change for 2022 Intervening Cycle Supplement:** Section has been amended to include greenhouse gas (GHG) emission reduction and provide clarity.

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### **SECTION A5.405 MATERIAL SOURCES**

***Section A5.405 – Begins on page A5-18 of CALGreen and on page 183 of the 2022 Guide.***

...

***New code language.***

**A5.405.2.1 Certified Wood Components – Sustainability.** Provide wood products, for at least 50 percent of the project permanently installed products, that have been certified by independent third parties and labeled as having been produced in compliance with the accepted principles of sustainable forest management. The use of recycled and/or recovered wood products do not need to be certified. Comply with one or more of the following certifications of wood sustainability:

1. Sustainable Forestry Initiative (SFI).
2. Forest Stewardship Council (FSC)
3. Program for the Endorsement of Forest Certification (PEFC).
4. American Forest Foundation's American Tree Farm System® (ATFS).
5. Canadian Standards Association's Sustainable Forest Management System Standards (CSA Z809).
6. Manufacturer's fiber procurement system that has been audited by an approved agency as compliant with the provisions of ASTM D7612 as a responsible or certified source.

...

#### **INTENT:**

The intent of this new regulation is to promote responsible and certified wood sourcing which ensures that forests have been sustainably and responsibly managed and that the wood fiber come from legal, responsible and non-controversial sources. Adding these sustainable forestry wood standards will give local jurisdictions the ability to exceed the *CALGreen* code minimum standards and provide options for owners and builders to include certified wood building products in projects.

## COMPLIANCE METHOD:

Identify in the construction documents certified wood components intended to be used in the project amounting to at least 50 percent of the project's permanently installed wood products by volume or cost. Retain certification documentation accompanying certified wood components for verification by the enforcing agency.

Documents may come in the form of bills of lading, labels, supplier declarations and other documentation that the wood has been certified to standards that meet ASTM D7612's definition of responsible or certified sources. These include wood products certified to the SFI Fiber Sourcing, SFI Certified Sourcing, FSC Controlled wood standard or that originate from a certified forest as evidence by a certified content claim from SFI Chain of Custody standard, PEFC Chain of Custody standard, the FSC Chain of Custody standard, or through a manufacturer's fiber procurement system that is compliant with the provisions of ASTM D7612 as a responsible or certified source.

## ENFORCEMENT:

**Plan review:** The plan reviewer should confirm that certified wood components are specified, and the calculations of those component's percentage are included in the construction documents.

**On-site enforcement:** Verify, using documentation provided by the contractor, that at least 50 percent of the project's wood products meets the requirements of the certified wood components requirements. The enforcing agency may require inspection and inspection reports in accordance with Sections 702.2 and 703.1 during and at completion of construction to demonstrate substantial conformance. Inspection shall be performed by the design professional of record or third party acceptable to the enforcing agency.

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### *Amended code language.*

**A5.405.5 Cement and concrete.** Cement and concrete made with recycled products shall comply with A5.405.

#### **A5.405.5.1 Cement.** ...

**A5.405.5.2 Concrete.** Use concrete manufactured with cementitious materials in accordance with Section A5.405.2, as approved by the Engineer of Record.

**A5.405.5.2.1 Supplementary cementitious materials (SCM).** Use concrete made with one or more supplementary cementitious materials (SCM) conforming to the following standards:

1. Fly ash ...
2. Slag cement ...
3. Silica fume ...
4. Natural pozzolan ...
5. Blended supplementary cementitious materials conforming to ASTM C1697, Standard Specification for Blended Supplementary Cementitious Materials. The amount of each SCM in the blend will be used separately in calculating Equation A5.4-1. Class C fly ash if

used in the blend, will be considered *SL* for the purposes of satisfying the equation.

6. Ultra-fine fly ash ...
7. Metakaolin ...
8. Ground-Glass Pozzolan per ASTM C1866/C1866M.
9. Other materials with comparable or superior environmental benefits, as approved by the Engineer of Record.

**A5.405.5.2.1.1 Mix design equation.** Use any combination ...

**Exception:** Minimums in mix designs approved by the Engineer of Record may be lower where high early strength is needed for concrete products or to meet an accelerated project schedule. High early strength shall be defined as outlined in ACI CT.

$F/25 + SL/50 + UF/12 \geq 1$  (**Equation A5.4-14**) where:

*F* = Fly ash, natural pozzolan or other approved SCM, or blended SCM, as a percent of total cementitious material for concrete on the project.

*SL* = GGBFS, as a percent of total cementitious material for concrete on the project.

*UF* = Silica fume, metakaolin or UFFA, as a percent of total cementitious material for concrete on the project.

**INTENT:**

Item 8 was added in Section A5.405.5.2.1 in response to requests from the concrete industry. Extensive research has shown that several types of ground glass can perform well as a pozzolanic material in concrete. This code section and Section A5.405.5.2.1.1 have also been editorially amended to provide more clarity to some of the requirements.

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**A5.405.5.3 Additional means of compliance. Section removed.**

**A5.405.5.3.1 Cement. Section removed.**

**A5.405.5.3.1.1 Alternative fuels. Section removed.**

**A5.405.5.3.1.2 Alternative power. Section removed.**

***Amended and renumbered code language***

**A5.405.5.3 Concrete manufacture. Formerly A5.405.5.3.2 Concrete.** The following measures shall be permitted in the manufacture of concrete, as approved by the Engineer of Record.

**A5.405.5.3.2.1 Alternative energy. Section removed.**

**A5.405.5.3.1 Recycled aggregates.** Concrete made with one or more of the following materials:

1. Blast furnace slag as a lightweight aggregate in unreinforced concrete.
2. Recycled concrete aggregate (RCA) or crushed concrete aggregate (CCA) that meets grading requirements of ASTM C33, Standard Specification for Concrete Aggregates.
  - a. Recycled concrete aggregate (RCA) – created from existing concrete structures, including building foundations, parking areas, and sidewalks. It has been processed to create a recycled concrete aggregate, usable in many applications.
  - b. Crushed concrete aggregate (CCA) – created by taking concrete that was batched but not used in initial construction and is returned in the mixer truck to the concrete batch plant. As a recent mix and unplaced it is a clean product with known properties.
3. Other materials with comparable or superior environmental benefits.

**A5.405.5.3.2 Mixing water. ...**

**A5.405.5.3.3 High strength concrete.** Concrete elements designed to reduce their total size compared to standard 3,000 psi concrete, thereby reducing the total volume of cement, aggregate and water used on the project.

#### **INTENT:**

Some of these code sections have been editorially amended and/or renumbered to provide more clarity and accommodate new requirements added.

Sections A5.405.5.3 Additional means of compliance, A5.405.5.3.1 Cement, A5.405.5.3.1.1 Alternative fuels, A5.406.5.3.1.2 Alternative power, and A5.405.5.3.2.1 Alternate energy have been removed since these requirements are not within the control of the engineer of record or enforcing entity and do not affect concrete properties for performance. Encouraged use of renewable energy sources in the manufacture of materials is outside the regulatory scope of Title 24, thus the practice can be advocated and endorsed by state policy or other regulatory state agencies.

Section A5.405.5.3.1 Recycled aggregates is renumbered from A5.405.5.3.2.2. Item 2 is amended to include aggregate or crushed concrete aggregate as suggested by the Concrete Industry. Subsections a and b are added to Section item 2 to clarify the terms recycled concrete aggregate (RCA) and crushed concrete aggregate (CCA), the two main sources of recycled aggregate from concrete. Item 3 is amended to repeal the “as approved by the engineer and enforcement authority” since additional means of compliance is not within the control of the engineer of record or enforcing entity and does not affect concrete properties for performance.

***New code language.***

**A5.405.5.3.4 Later ages of maturity** – An increase in the age of maturity of testing for determining compressive strength for acceptance of concrete from the current 28 days to 42 or 56 days, in compliance with ASTM C31/C31M.

**A5.405.5.3.5 Returned fresh concrete** – The use of returned fresh concrete in compliance with ASTM C1798/C1798M or Caltrans Section 90-9.

...

**INTENT:**

**Section A5.405.5.3.4** Later ages of maturity is a new proposed voluntary section that permits longer age of maturity for concrete as long as it is in compliance with ASTM C 31 and 39. The standard 28 days for age of maturity encourages more cement use. By permitting longer ages of maturity, the amount of cement can be reduced while also allowing for more options to increase the use of supplementary cementitious materials (SCM), such as fly ash and natural pozzolans, in a mix and that can show improved later performance for the concrete. Certain applications, such as foundations, may be particularly applicable for longer maturity times since foundations will not experience the full structural loads for long periods of time.

**Section A5.405.5.3.5** Returned Fresh Concrete, is a new proposed voluntary section. Often a concrete pour does not use all the concrete mix in a mixer truck, and that mix can be incorporated into a new mix. Re-using returned fresh (also called plastic) concrete is one of the best ways to conserve natural resources and reduce carbon impacts. Re-using returned fresh concrete has the benefit of conserving the aggregates, water, and cementitious materials used in the original mix. Accepted practices and use of admixtures can extend the life of concrete and make it feasible to use the returned fresh concrete.

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## **SECTION A5.409 LIFE CYCLE ASSESSMENT**

**Section A5.409** – *Begins on page A5-21 of CALGreen and on page 194 of the 2022 Guide.*

**A5.409.1 General.** *Deleted.*

***New life cycle assessment voluntary measures.***

**A5.409.1 Scope.** Projects with the area limits specified shall comply with Section A5.409.1 to achieve Tier 1 or Tier 2 compliance. Projects of any size shall comply with A5.409.5 to achieve Tier 2 compliance.

1. Projects consisting of newly constructed building(s) with a combined floor area of 50,000 square feet or greater shall comply with either Section A5.409.2 or Section A5.409.3.
2. Alteration(s) to existing building(s) where the combined altered floor area is 50,000 square feet or greater shall comply with either Section A5.105.2, Section A5.409.2 or Section A5.409.3.

3. Addition(s) to existing building(s) where the total floor area combined with the existing building(s) is 50,000 square feet or greater shall comply with either Section A5.105.2, Section A5.409.2 or Section A5.409.3.

**Exception:** Combined addition(s) to existing building(s) of two times the area or more of the existing building(s) is not eligible to meet compliance with Section A5.105.2.

4. Projects consisting of newly constructed building(s) with a combined floor area of less than 50,000 square feet shall comply with either Section 5.409.2 or Section 5.409.3 for Tier 1 compliance, and either Section A5.409.2.1 or A5.409.3 Tier 1 requirements for Tier 2 compliance.
5. Alteration(s) to existing building(s) where the aggregate floor area is less than 50,000 square feet shall comply with either Section 5.105.2, Section 5.409.2, or Section 5.409.3 for Tier 1 compliance, and either Section A5.105.2.1, Section A5.409.2.1, or Section A5.409.3 Tier 1 requirements for Tier 2 compliance.
6. Addition(s) to an existing building where the total floor area combined with the existing building(s) is less than 50,000 square feet shall comply with either Section 5.105.2, Section 5.409.2, or Section 5.409.3 for Tier 1 compliance, and either Section A5.105.2.1, Section A5.409.2.1, or Section A5.409.3 Tier 1 requirements for Tier 2 compliance.

**Exception:** Combined addition(s) to existing building(s) of two times the area or more of the existing building(s) is not eligible to meet compliance with Section 5.105.2 or Section A5.105.2.

## **INTENT:**

Existing voluntary requirements in Section A5.409.1 are replaced with new Tier 1 and Tier 2 scoping provisions to align with the new mandatory requirements in Section 5.409.1 Scope. Section A5.409.1 with Items 1 through 4 is added to specify the Tier 1 and Tier 2 compliance pathways for new buildings, alterations and additions to existing buildings based on the project size: 50,000 square feet or greater and 50,000 square feet or less. This section contains six options to clarify the various scenarios.

1. New buildings with a combined floor area of 50,000 square feet or greater.
2. Alterations where the combined altered floor area is 50,000 square feet or greater.
3. Additions where a combined floor area is 50,000 square feet or greater. This scenario has an exception for combined addition to existing building two times the area or more of the existing building.
4. New buildings with a combined floor area of less than 50,000 square feet.
5. Alterations where the aggregate floor area is less than 50,000 square feet.
6. Additions where a combined floor area is less than 50,000 square feet. This scenario also has an exception for combined addition to existing building two times the area or more of the existing building.

The intent is to not have a building area threshold for the voluntary tier's applicability. However, depending on the building area, the requirements are different.

**Projects  $\geq$  50,000 square feet** (more strict requirements to comply with):

- **Tier 1** – Sections A5.105.2.1 (Tier 1 building reuse) or A5.409.2.1 (Tier 1 WBLCA) or A5.409.3 (GWP limits for Tier 1).

- **Tier 2** – Sections A5.105.2.2 (Tier 2 building reuse) or A5.409.2.2 (Tier 2 WBLCA) or A5.409.3 (GWP limits for Tier 2).

**Projects < 50,000 square feet** (less strict requirements to comply with):

- **Tier 1** – Sections 5.105.2 (mandatory requirements for building reuse) or 5.409.2 (mandatory requirements for WBLCA) or 5.409.3 (GWP limits in mandatory requirements).
- **Tier 2** – Sections A5.105.2.1 (Tier 1 building reuse) or A5.409.2.1 (Tier 1 WBLCA) or A5.409.3 (GWP limits for Tier 1).

### **EXAMPLES:**

The concepts, descriptions and examples for the voluntary measures can be extrapolated from the mandatory measures. Although the numbers are different, the basic concepts and logic align.

**A5.409.2 Whole building life cycle assessment. Amended and renumbered to A5.409.4 (see below).**

**A5.409.2.1 Building components. Deleted.**

**A5.409.2.2 Impacts to be considered. Renumbered to A5.409.4.1 (see below).**

### **INTENT:**

The code sections have been repealed or amended and renumbered to align with new voluntary and mandatory regulations.

**A5.409.2 Whole building life cycle assessment.** Projects shall meet the minimum requirements of Section A5.409.2 for Tier 1 or Tier 2 compliance.

**A5.409.2.1 Tier 1.** Projects shall conduct a cradle-to-grave whole building life cycle assessment meeting the requirements of Section 5.409.2 and performed in accordance with ISO14040 and 14044, excluding operating energy, demonstrating a minimum 15 percent reduction in global warming potential (GWP) as compared to a reference baseline building of similar size, function, complexity, type of construction, material specification, and location that meets the requirements of all parts of the *California Building Standards Code* currently in effect. Software used to conduct the whole building life cycle assessment, including reference baseline building, shall have a data set compliant with ISO-14044, and ISO 21930-2017 or EN 15804, and the software shall conform to ISO 21931 and/or EN 15978. The software tools and datasets shall be the same for evaluation of both the baseline building and the proposed building.

**Exception:** For projects that include building reuse, the reference baseline building shall exclude the reused elements. The percent reduction in GWP shall be achieved through the design and construction of new project elements.

**A5.409.2.2 Tier 2.** Projects shall conduct a cradle-to-grave whole building life cycle assessment meeting the requirements of Section 5.409.2 and performed in accordance with ISO14040 and ISO 14044, excluding operating energy, demonstrating a minimum 20 percent reduction in GWP as compared to a reference baseline building of similar size, function, complexity, type of construction, material specification, and location that meets the requirements of

all parts of the *California Building Standards Code* currently in effect. Software used to conduct the whole building life cycle assessment, including reference baseline building, shall have a data set compliant with ISO-14044, and ISO 21930 or EN 15804, and the software shall conform to ISO 21931 and/or EN 15978. The software tools and datasets shall be the same for evaluation of both the baseline building and the proposed building.

**Exception:** For projects that include building reuse, the reference baseline building shall not be of new construction and shall retain existing materials. The percent reduction in GWP shall be achieved through the design and construction of new project elements.

**A5.409.2.3 Verification of compliance.** A summary of the GWP analysis produced by the software and Worksheet WS-7 signed by the design professional of record shall be provided in the construction documents as documentation of compliance. A copy of the whole building life cycle assessment which includes the GWP analysis produced by the software, in addition to maintenance and training information, shall be included in the operation and maintenance manual and shall be provided to the owner at the close of construction. The enforcing agency may require inspection and inspection reports in accordance with Sections 702.2 and 703.1 during and at completion of construction to demonstrate substantial conformance. Inspection shall be performed by the design professional of record or third party acceptable to the enforcing agency.

#### **INTENT:**

**New section A5.409.2** with subsections contains the voluntary regulations for tier compliance for the WBLCA compliance pathway.

**Section A5.409.2.1** Tier 1 is consistent with mandatory Section 5.409.2 requiring a cradle-to-grave whole building life cycle assessment in accordance with ISO 14040 and ISO 14044. It similarly excludes operational energy, but requires demonstrating a 15 percent reduction in GWP verses the 10 percent required in the mandatory section. The exception clarifies that for building reuse projects, the baseline building shall exclude reused elements.

**Section A5.409.2.2** Tier 2 is consistent with mandatory Section 5.409.2 requiring a cradle-to-grave whole building life cycle assessment in accordance with ISO 14040 and ISO 14044. It similarly excludes operational energy, but requires demonstrating a 20 percent reduction in GWP verses the 10 percent required in the mandatory section. The exception clarifies that for building reuse projects, the baseline building shall exclude reused elements.

#### **COMPLIANCE METHOD, RECOMMENDATION, EXAMPLES & ENFORCEMENT:**

The concepts, descriptions and examples for the voluntary measures can be extrapolated from the mandatory measures in Section 5.409.2. Although the numbers are different, the basic concepts and logic align.

**A5.409.3 Materials and system assemblies. Deleted.**

**A5.409.4 Substitution for prescriptive standards. Deleted.**

**A5.409.5 Verification of compliance. Deleted.**

**INTENT:**

Sections A5.409.3 and A5.409.4 have been repealed because the new voluntary WBLCA mandatory and voluntary sections are amended to conduct a WBLCA in accordance with ISO 14044 rather than specifying specific building methods or products in *CALGreen*.

Section A5.409.5 has been repealed because the new voluntary WBLCA mandatory and voluntary sections contain verification of compliance sections.

**A5.409.3 Product GWP compliance – prescriptive path.** Each product that is permanently installed and listed in Table A5.409.3, shall have a Type III environmental product declaration (EPD), either product-specific or factory-specific.

**A5.409.3.1.** Products shall comply with the requirements for product GWP performance in accordance with Section A5.409.3 using for the maximum acceptable GWP value for the product category listed in Table A5.409.3 for Tier 1 or Tier 2 compliance for the verified reduction calculation resulting in a minimum 15 percent reduction in total GWP.

**Exception:** Concrete may be considered one product category to meet compliance with this section. A weighted average of the maximum GWP for all concrete mixes installed in the project shall be less than the weighted average maximum GWP allowed per Table A5.409.3 using Exception Equation A5.409.3.1. Calculations shall be performed with consistent units of measurement for the material quantity and the GWP value. For the purposes of this exception, industry wide EPD's are acceptable.

**Exception EQUATION A5.409.3.1**

$$GWP_n < GWP_{allowed}$$

where

$$GWP_n = \sum (GWP_n)(v_n) \text{ and } GWP_{allowed} = \sum (GWP_{allowed})(v_n)$$

and

$n$  = each concrete mix installed in the project

$GWP_n$  = the GWP for concrete mix  $n$  per concrete mix EPD, in kg CO<sub>2</sub>e /m<sup>3</sup>

$GWP_{allowed}$  = the GWP potential allowed for concrete mix  $n$  per Table 5.409.3

$v_n$  = the volume of concrete mix  $n$  installed in the project, in m<sup>3</sup>

**A5.409.3.2. Verification of compliance.** Calculations to demonstrate compliance, Type III EPDs for products required to comply if included in the project, and Worksheet WS-8 signed by the design professional of record shall be provided on the construction documents. Updated EPDs for products used in construction shall be provided to the owner at the close of construction and to the enforcement entity upon request. The enforcing agency may require inspection and inspection reports in accordance with Sections 702.2 and 703.1 during and at completion of construction to demonstrate substantial conformance. Inspection shall be performed by the design professional of record or third party acceptable to the enforcing agency.

**New Table**

**TABLE A5.409.3  
PRODUCT GWP LIMITS TIER 1 AND TIER 2**

<b><u>Buy Clean California Product Category</u></b> <sup>1</sup>	<b><u>Tier 1 Maximum acceptable GWP value (unfabricated)</u></b> <b><u>(GWP<sub>allowed</sub>)</u></b>	<b><u>Tier 2 Maximum acceptable GWP value (unfabricated)</u></b> <b><u>(GWP<sub>allowed</sub>)</u></b>	<b><u>Unit of Measurement</u></b>
<u>Hot-rolled structural steel sections</u>	<u>1.52</u>	<u>1.01</u>	<u>MT CO<sub>2e</sub>/MT</u>
<u>Hollow structural sections</u>	<u>2.57</u>	<u>1.71</u>	<u>MT CO<sub>2e</sub>/MT</u>
<u>Steel plate</u>	<u>2.24</u>	<u>1.49</u>	<u>MT CO<sub>2e</sub>/MT</u>
<u>Concrete reinforcing steel</u>	<u>1.34</u>	<u>0.89</u>	<u>MT CO<sub>2e</sub>/MT</u>
<u>Flat glass</u>	<u>2.15</u>	<u>1.43</u>	<u>kg CO<sub>2e</sub>/MT</u>
<u>Light-density mineral wool board insulation</u>	<u>5.00</u>	<u>3.33</u>	<u>kg CO<sub>2e</sub>/1 m<sup>2</sup></u>
<u>Heavy-density mineral wool board insulation</u>	<u>12.24</u>	<u>8.16</u>	<u>kg CO<sub>2e</sub>/1 m<sup>2</sup></u>

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### Concrete, Ready-Mixed <sup>2, 3</sup>

<u>Concrete Product Category</u>	<u>Tier 1 Maximum acceptable GWP value (unfabricated) (GWP <sub>allowed</sub>)</u>	<u>Tier 2 Maximum acceptable GWP value (unfabricated) (GWP <sub>allowed</sub>)</u>	<u>Unit of Measurement</u>
<u>up to 2499 psi</u>	<u>386</u>	<u>257</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>2500-3499 psi</u>	<u>419</u>	<u>279</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>3500-4499 psi</u>	<u>485</u>	<u>323</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>4500-5499 psi</u>	<u>567</u>	<u>378</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>5500-6499 psi</u>	<u>601</u>	<u>401</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>6500 psi and greater</u>	<u>685</u>	<u>456</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>

### Concrete, Lightweight Ready-Mixed <sup>2</sup>

<u>Concrete Product Category</u>	<u>Tier 1 Maximum acceptable GWP value (unfabricated) (GWP <sub>allowed</sub>)</u>	<u>Tier 2 Maximum acceptable GWP value (unfabricated) (GWP <sub>allowed</sub>)</u>	<u>Unit of Measurement</u>
<u>up to 2499 psi</u>	<u>750</u>	<u>500</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>2500-3499 psi</u>	<u>819</u>	<u>546</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>
<u>3500-4499 psi</u>	<u>891</u>	<u>594</u>	<u>kg CO<sub>2e</sub>/m<sup>3</sup></u>

#### **Footnotes:**

1. The GWP values of the products listed in Table A5.409.3 are based on 150% of Buy Clean California Act (BCCA) GWP values, except for concrete products which are not included in BCCA.
2. For concrete, Tier 1 is 150%, Tier 2 is 100% of the National Ready Mixed Concrete Association (NRMCA) 2022 version 3 Pacific Southwest regional benchmark values are used for the GWP allowed, except for High Early strength.
3. Concrete High Early Strength ready-mixed shall be calculated at 130% of the Ready mixed concrete GWP allowed values for each product category.

#### **INTENT:**

**New section A5.409.3** with subsections are consistent with mandatory Section 5.409.3 and contain the voluntary regulations for Tier compliance for the Product GWP compliance – prescriptive pathway.

**Section A5.409.3.1** with Exception and Equation is consistent with mandatory Section 5.409.3.1 requiring products to comply with the maximum acceptable GWP value listed in the compliance table and allowing to use a weighted average calculation for all concrete mixes used on a project as various regions in California may not be able to comply with prescriptive maximum acceptable GWP values in Table 5.409.3.

**Table A5.409.3** sets the maximum acceptable GWP limits for each Tier. Table footnotes are consistent with mandatory Table 5.409.3, however the GWP values in the voluntary table are based on 150 percent of the Buy Clean California Act, versus 175 percent in the mandatory table. The Concrete values are based on Industry-Wide Environmental Product Declaration (IW-EPD) regional concrete values and represents 130 percent of the ready-mix concrete GWP values. The Concrete ready mixed and lightweight ready-mixed Tier 1 values are based on 150 percent of the National Ready Mix Concrete Association (NRMCA) 2022 version 3 Pacific Southwest regional benchmark values. Tier 2 is based on 100 percent. Concrete high-early strength concrete is not included in the benchmark values it should be calculated at 130 percent of the ready-mixed values in the table.

**Note:** Table A5.409.3 as printed contains a typo in the unit for flat glass. BSC intends to correct the units during the 2025 Intervening Code Adoption Cycle from kg CO<sub>2</sub>e/MT to MT CO<sub>2</sub>e/MT. With the revised unit (MT CO<sub>2</sub>e/MT), reported GWP values will align with industry data as published in the CLF North American Material Baselines (2023).

**Section A5.409.3.2** is consistent with the mandatory section.

## **COMPLIANCE METHOD, RECOMMENDATION, EXAMPLES & ENFORCEMENT:**

The concepts, descriptions and examples for the voluntary measures can be extrapolated from the mandatory measures in Section 5.409.3. Although the numbers are different, the basic concepts and logic align.

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### ***Amended and renumbered code language.***

**A5.409.4 Whole building life cycle assessment of additional impacts.** Maintaining compliance with the requirements of Section 5.409.2, conduct a cradle-to-grave whole building life assessment performed in accordance with ISO 14044, including operating energy, and demonstrating a minimum 10 percent improvement for a minimum of two additional impacts listed in Section A5.409.4.1, as compared to a reference baseline building of similar size, function, complexity, type of construction, material specification, location and operating energy performance that meets the requirements of the *California Energy Code* currently in effect.

### ***Amended and renumbered code language.***

**A5.409.4.1 Impacts to be considered.** Select from the following impacts in the assessment:

1. Fossil fuel depletion.
2. Stratospheric ozone depletion.
3. Acidification of land and water sources.
4. Eutrophication.
5. Photochemical oxidants (smog).

...

**INTENT:**

**Section A5.409.4** is renumbered from A5.409.2 and amended to better align with new mandatory and voluntary requirements for WBLCA.

**Section A5.409.4.1** is renumbered from A5.409.2.2 and adjusted to align with new voluntary sections. Item 1, Climate change (greenhouse gas) has been repealed since the new voluntary sections include various options to mitigate greenhouse gas emissions through building reuse, WBLCA and product GWP compliance paths.

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