CALGreen Carbon Reduction Building Reuse, Life Cycle Assessment, Global Warming Potential, Environmental Product Declarations

DSA-SS	BSC
Public schools K-12	Nonresidential occupancies (CALGreen only)
Community Colleges	State buildings, UC's and CSU's
Enforcement	Enforcement delegated to local jurisdictions

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2022 Intervening Title 24 Code Adoption Cycle

- CALGreen Carbon Reduction Collaboration (CCRC)
- Joint effort: BSC and DSA
- Conducted four Workshops 2022-PreCycle (ca.gov)
- GREEN Code Advisory Committee meeting Feb. 8-10, 2023
  - Public Comment Period late-Spring 2023
  - Commission meeting Summer 2023
- Supplement (blue pages) to the 2022 edition of Title 24
  - Publish January 1, 2024
  - Effective July 2024

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Why Carbon Reduction Regulation?

Greenhouse Gas & Carbon Goals in Executive Action

Executive Orders

B-30-15

Sets interim target of greenhouse gas emissions 40% less than 1990 levels by 2030. Current California GHG Emission Inventory Data | California Air Resources Board

B-55-18

Achieve statewide carbon neutrality by 2045

N-19-19

Requires every aspect of state government to redouble its efforts to reduce greenhouse gas emissions and mitigate the impacts of climate change while building a sustainable, inclusive economy.

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GETTING TO ZERO OVER TIME DIVISION OF THE STATE ARCHITECT DEPARTMENT OF GENERAL SERVICES

Why Carbon Reduction Regulation?

Building materials make up about 10% of the total Global CO_2

EMBODIED CARBON refers to the greenhouse gas emissions from the manufacturing, transportation, installation, maintenance, and disposal of building materials

CALGreen addresses building materials

OPERATIONAL CARBON refers to the greenhouse gas emissions due to building energy consumption

The CA Energy Code addresses energy consumption

Of those emissions, building operations are responsible for 27 percent annually, while building materials and construction (typically referred to as embodied carbon) are responsible for an additional 20 percent.

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Why Carbon Reduction Regulation?

The majority of a building's total embodied carbon is released upfront in the product stage at the beginning of a building's life.

Resources found at https://carbonleadershipforum.org

Steel, concrete, flat glass, insulation, masonry and wood products contribute most greenhouse gas emissions.

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Why Carbon Reduction Regulation?

Why target larger buildings?

Resources found at Commercial Buildings Energy Consumption Survey

CBECS estimates that there were 5.9 million buildings and 96 billion square feet of total commercial floorspace in 2018.

The smallest buildings (1,001 sf to 5,000 sf) accounted for almost half of all commercial buildings, but they occupy only 9% of total commercial floorspace.

Building 50,000 sf and larger account for 6% of commercial buildings, but 50% of the commercial floorspace.

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Carbon Reduction Regulations currently in CALGreen

BUILDING REUSE - No mandatory section for deconstruction and reuse of existing structures. A voluntary measure that requires at least 75 percent of existing building structure including structural floor and roof decking) and envelope (exterior skin and framing) based on surface area be maintained.

LIFE CYCLE ASSESSMENT (LCA) – No mandatory LCA section. A voluntary measure that requires a whole building life cycle assessment (WBLCA) to be conducted that achieves at least a 10% improvement in environmental impact for specific building components. Per ISO 14040 + 14044

Voluntary regulations can be used by design professionals or adopted by local jurisdictions.

TERMS

<u>BUY CLEAN CALIFORNIA ACT:</u> DGS, in consultation with the California Air Resources Board (CARB), established the maximum acceptable Global Warming Potential (GWP) limit for four eligible materials.

1. Structural steel (hot-rolled sections, hollow structural sections, and plate),
2. Concrete reinforcing steel,
3. Flat glass, and
4. Mineral wool board insulation.

When used in public works projects, these eligible materials must have a GWP that does not exceed the limit set by DGS.

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TERMS – cont.

ENVIRONMENTAL PRODUCT DECLARATION (EPD): A third-party verified report that summarizes how a product impacts the environment. Type III EPDs can be either product-specific, factory-specific, or industry-wide EPDs . Per ISO 14025 (+14020) and ISO 21930

INDUSTRY WIDE EPD: A Type III EPD in which the environmental impacts are an average of the typical manufacturing impacts for a range of products within the same product category for a group of manufacturers.

PRODUCT SPECIFIC EPD: A Type III EPD in which the environmental impacts can be attributed to a product design and manufacturer across multiple facilities.

FACTORY SPECIFIC EPD: A product-specific Type III EPD in which the environmental impacts can be attributed to a single manufacturer and manufacturing facility.

TERMS – cont.

GLOBAL WARMING POTENTIAL (GWP): a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO_2). The larger the GWP, the more that a given gas warms the Earth. GWP allows policymakers to compare emissions reduction opportunities across sectors and gases.

CO2 EQUIVALENT ($C02_E$): The number of metric tons (MT) of CO2 emissions with the same global warming potential as one metric ton of another greenhouse gas.

Greenhouse Gas Equivalencies Calculator | US EPA

Proposed Carbon Reduction Regulations - **Mandatory**

BUILDING REUSE - When reusing a building, maintain 45% of the existing structure and enclosure.

WBLCA Performance Path- For new buildings, conduct a cradle-to-grave whole building life cycle assessment demonstrating at 10% reduction in global warming potential (GWP).

PRESCRIPTIVE PATH - For new buildings, products shall comply with GWP values, and environmental product declaration (EDP) shall be included on the construction documents. Based on 175% of IWEDP GWP values (Buy Clean California Act) and 130% of ready-mixed concrete GWP values.

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Building Reuse

50,000 sf and greater for DSA schools K-12,
100,000 sf and greater for BSC for nonresidential

REUSE - An alteration or addition to an existing building shall maintain 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 shall not be included in the calculation.

Verification of compliance. Documentation shall be provided in the construction documents to demonstrate compliance with Section 5.105.2. A worksheet is provided in Chapter 8.

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Whole Building Life Cycle Assessment - Performance

50,000 sf and greater for DSA schools K-12,
100,000 sf and greater for BSC for nonresidential

WBLCA - conduct a cradle-to-grave whole building life cycle assessment in accordance with ISO 14040 and ISO 14044, excluding operating energy, that demonstrates a minimum 10 percent reduction in global warming potential (GWP) against similar building. The reference study period is 60 years.

Software used shall be compliant with ISO-14044, and ISO 21930 or EN 15804, and the software shall conform to ISO 21931 and/or EN 15978. Free software is available.

Building enclosure components; glazing, insulation, and exterior finishes. Primary and secondary structural members; footings and foundations, and structural columns, beams, walls, roofs, and floors.

Verification of compliance. A copy of the whole building life cycle assessment which includes the GWP analysis, 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.

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Product GWP Compliance – Prescriptive Path

50,000 sf and greater for DSA schools K-12,
100,000 sf and greater for BSC for nonresidential

Product GWP compliance – prescriptive path. Each product installed and listed in Table 5.409, shall have a Type III environmental product declaration (EPD) and not exceed the max. GWP limits.

Exception. Concrete may be considered one product category and 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.

Equation: A weighted average Equation is provided.

Verification of compliance. Calculations demonstrating compliance, and Type III EPDs 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.

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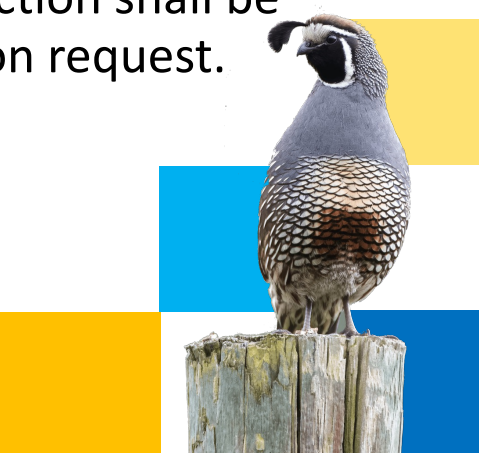

Product GWP Compliance – Prescriptive Path

Buy Clean California Materials Product Category [1]	Maximum acceptable GWP value (unfabricated) ($GWP_{allowed}$)	Unit of Measurement
Hot-rolled structural steel sections	1.77	MT CO_{2e}/MT
Hollow structural sections	3.00	MT CO_{2e}/MT
Steel plate	2.61	MT CO_{2e}/MT
Concrete reinforcing steel	1.56	MT CO_{2e}/MT
Flat glass	2.50	kg CO_{2e}/MT
Light-density mineral wool board insulation	5.83	kg CO_{2e}/1 m^2
Heavy-density mineral wool board insulation	14.28	kg CO_{2e}/1 m^2

Concrete, Ready Mixed [2, 3]		
Concrete Product Category	Maximum GWP allowed value ($GWP_{allowed}$)	Unit of Measurement
up to 2499 psi	450	kg CO_{2e}/m^3
2500-3499 psi	489	kg CO_{2e}/m^3
3500-4499 psi	566	kg CO_{2e}/m^3
4500-5499 psi	661	kg CO_{2e}/m^3
5500-6499 psi	701	kg CO_{2e}/m^3
6500 psi and greater	799	kg CO_{2e}/m^3

Concrete, Lightweight Ready Mixed [2]		
Concrete Product Category	Maximum GWP allowed value ($GWP_{allowed}$)	Unit of Measurement
up to 2499 psi	875	kg CO_{2e}/m^3
2500-3499 psi	956	kg CO_{2e}/m^3
3500-4499 psi	1,039	kg CO_{2e}/m^3

The GWP values are based on 175 percent of Buy Clean California Act (BCCA) except for concrete products.

For concrete, 175 percent of the National Ready Mix Concrete Association (NRMCA) 2021 version 3 Pacific Southwest regional benchmark values are used for the GWP allowed, except for High Early strength.

Concrete High Early Strength ready-mixed shall be calculated at 130 percent of the Ready mixed concrete GWP allowed values for each product category.

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Proposed Carbon Reduction Regulations - **Voluntary**

50,000 sf and greater for BSC

REUSE- Tier 1 - When reusing a building, maintain 75% of the existing structure and enclosure. Tier 2- plus 30% of the interior non-structural elements.

WBLCA Performance Path- Tier 1 - conduct a cradle-to-grave whole building life cycle assessment demonstrating at 15% reduction in GWP. Tier 2 – 20%

PRESCRIPTIVE PATH - Tier 1- For new buildings, products shall comply with GWP values and environmental product declaration (EDP) shall be included on the construction documents. Based on 150% of IWEDP GWP values and 130% of ready-mixed concrete GWP values. Tier 2- Comply with IWEDP GWP values.

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QUESTIONS

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