CALGreen Carbon Reduction Regulations

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

DSA

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BSC

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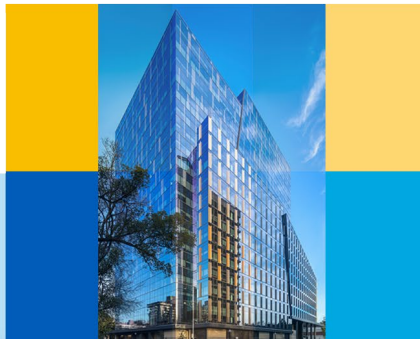
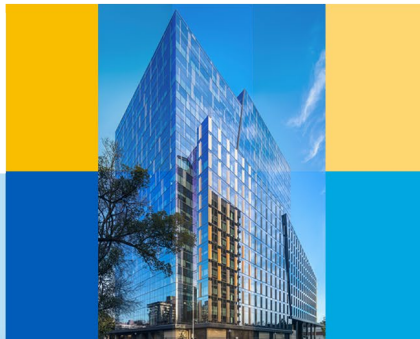


DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

Carbon Reduction Regulations Application

DSA-SS	BSC-CG
Public schools K-12	Nonresidential occupancies
Community Colleges	State buildings, UC's and CSU's
Enforcement	Enforcement delegated to local jurisdictions
50,000 sf and greater	100,000 sf and greater

New CALGreen Carbon Reduction regulations apply to new construction and renovation projects and take effect this July



History of CALGreen

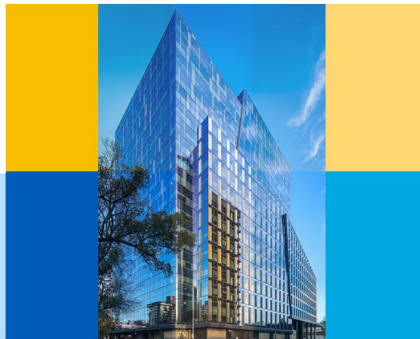
California Green Building Standards Code (CALGreen) is Part 11 of Title 24

The **first-in-the-nation** green building standards code – **published in 2008**

AB 32 (statutes of 2006) and **SB 1473** (statutes of 2008)

In response to these legislative mandates, CBSC worked with other state agencies to **create CALGreen, with the goals of**:

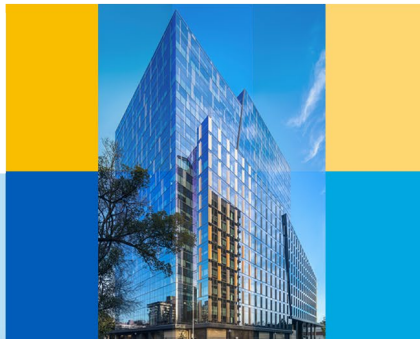
- Reducing greenhouse gas emissions from buildings
- Promoting environmentally responsible, cost-effective, healthier places to live and work
- Reducing energy and water consumption
- Responding to the environmental directives of the administration



History of CALGreen

- **2008 CALGreen** – The first edition of CALGreen with voluntary measures only – effective August 2009.
- **2010 CALGreen** – Many of the original voluntary green building standards became mandatory – effective January 2011.
- **2013 CALGreen** – Inclusion of triggers for additions and alterations to existing buildings – effective January 2014.
- **2016 – 2022 CALGreen** – Updates to address recycling, water conservation and other regulations. Increases in EV infrastructure percentages and adding EV infrastructure for medium/heavy-duty zero emissions vehicles.

On **July 11, 2018**, the California Air Resources Board announced that "**greenhouse gas pollution in California fell below 1990 levels** for the first time since emissions peaked in 2004 – an achievement roughly equal to taking 12 million cars off the road or saving 6 billion gallons of gasoline a year."



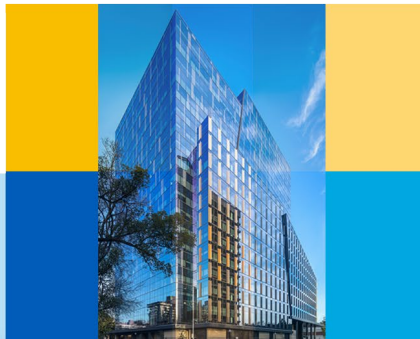
Why Carbon Reduction Regulations?

CALGreen first published in 2008 and included several greenhouse gas and embodied carbon reduction topics that were not updated until now:

- Building reuse
- Material sources and their recycled content
- Life cycle assessment

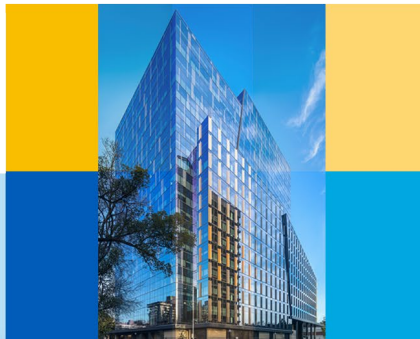
Updates to CALGreen over past years have been in response to enacted Legislation and Executive Orders focusing on stormwater pollution prevention, bicycle parking, electric vehicle charging, and other areas.

Carbon reduction topics had less attention in those years.



Former CALGreen Carbon Reduction Regulations

- **Building Reuse** – No mandatory section for deconstruction and reuse of existing structures. A voluntary measure required at least 75% of an existing building structure (including structural, floor and roof decking) and envelope (exterior skin and framing) be maintained
- **Life Cycle Assessment (LCA)** – No mandatory LCA section. A voluntary measure required 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



Why Carbon Reduction Regulations?

Greenhouse Gas & Carbon Goals in Executive Action

Executive Orders

B-30-15

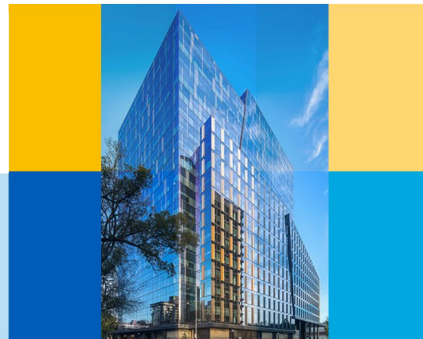
Sets interim target of greenhouse gas emissions 40% less than 1990 levels by 2030 Current California GHG Emission Inventory Data | California Air Resources Board

B-55-18

Achieve statewide carbon neutrality by 2045

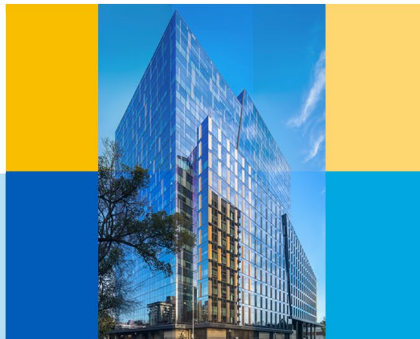
N-19-19

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



Why Embodied Carbon Reduction Regulations?

- Buy Clean California Act (BCCA)
  - Public Contract Code Sections 3500-3505
  - Applicable to Public Works projects, UC and CSU
  - Effective 2018
- Bill Text - SB-596 Greenhouse gases: cement sector: net-zero emissions strategy. (ca.gov)
  - Approved Sept 23, 2021, added to Health and Safety Code Section 38561.2
  - Requires Air Resources Board to develop a strategy, by July 1, 2023, for the cement industry to achieve net zero-emissions no later than December 31st 2045.
  - Coordinate and consult with other state agencies, evaluate market demand, financial incentives and other actions to establish interim targets for reductions in GHG to 40% of 2019 GHG levels by 2035.



Why Embodied Carbon Reduction Regulations?

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

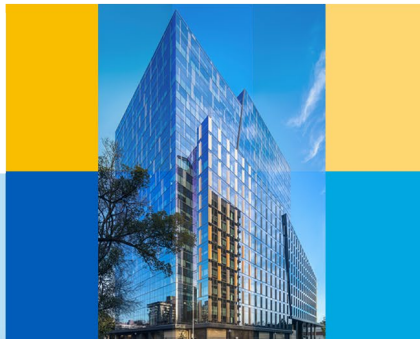
EMBODIED CARBON
refers to the greenhouse gas emissions from the manufacturing, transportation, installation, maintenance, and disposal of building materials

CALGreen addresses building materials

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

CA Energy Code addresses energy consumption

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

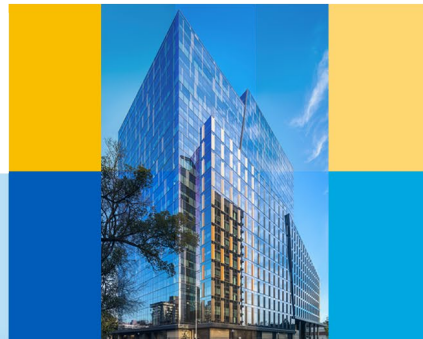


Why Embodied Carbon Reduction Regulations?

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

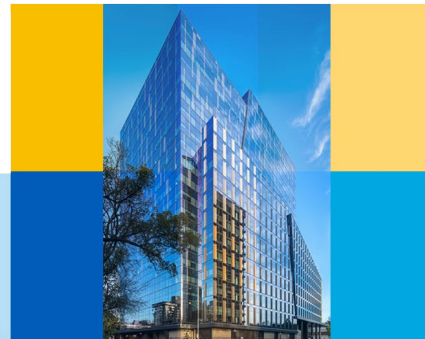


How the Regulations were Conceived

- American Institute of Architects California Outreach
- DGS CALIFORNIA DEPARTMENT OF GENERAL SERVICES Strategic Goals: BSC and DSA Partnership

 Consultative  Collaborative  Sustainable  Effective

- CALGreen Carbon Reduction Collaborative (CCRC)
  - Established success with the collaborative model on DSA initiatives
  - Outreach to entities to encourage representative participation
  - Launched the CCRC on April 4, 2022
  - Conducted four pre-cycle workshops [2022-PreCycle (ca.gov)]

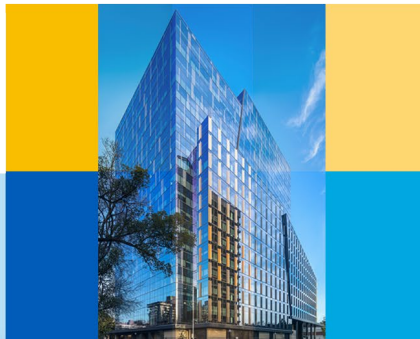


CALGreen Carbon Reduction Collaborative

Professional, Non-profit, Industry and State Agency Stakeholders

American Institute of Architects California (AIACA)
Collaborative for High Performance Schools (CHPS)
Construction Management Association of America (CMAA)
Building Owners & Managers Assoc. International (BOMA)
Concrete Masonry Assn. of California and Nevada (CMACN)
CA Construction & Industrial Materials Assn. (CalCIMA)
National Ready Mixed Concrete Association (NRMCA)
California Nevada Cement Association (CNCA)
American Concrete Institute (ACI)
Portland Cement Association (PCA)
California Building Industry Association (CBIA)
California Building Officials (CALBO)
California Energy Commission (CEC)
Department of General Services (DGS)
State Fire Marshal (SFM)
(HCAI) Dept. of Healthcare Access and Information
(HCD) Dept. of Housing and Community Development

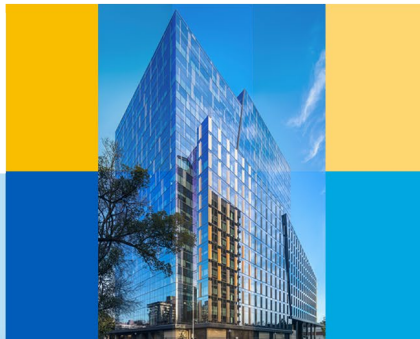
(SEAOC) Structural Engineers Association of California
(NBI) New Buildings Institute
(RMI) Rocky Mountain Institute
(CLF) Carbon Leadership Forum
(USGBC) U.S. Green Building Council
(AISC) American Institute of Steel Construction
(CSPTC) California State Pipe Trades Council
(CRSI)Concrete Reinforcing Steel Institute
(CFSEI) Cold-Formed Steel Engineers Institute
(ICC) Institute International Code Council
(SDI) Steel Deck Institute
(STI) Steel Tube Institute
(CARB) California Air Resources Board
(CNRA) California Natural Resources Agency
(CDPH) California Department of Public Health
CA Dept. of Recycling (CALRecycle)
CA Dept. of Transportation (CALTrans)



CALGreen Carbon Reduction Collaborative Charter

All +150 participants informed the CCRC Charter and agreed to the following:

- Review existing voluntary carbon reduction CALGreen regulations and suggest improvement.
- Provide input and feedback for improvements to CALGreen to support of California's Climate Action Goals.
- Plan for carbon reduction mandatory measures to address embodied carbon.
- Plan for incremental increases in mandatory measures over time.
- Provide input to support the rulemaking process such as documents relied upon, cost/benefit, cost to business, jobs, etc.
- DSA and BSC retain decision-making authority.
- Solicit support for the regulations through the rulemaking process.

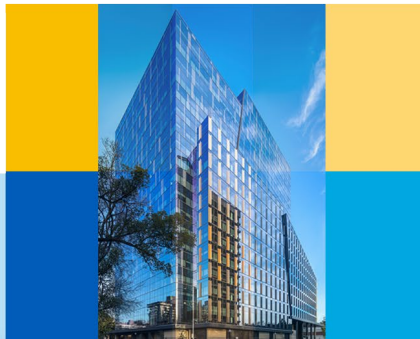


Stakeholder Engagement

GREEN Code Advisory Committee (CAC) meeting February 8-10, 2023

GREEN CAC recommended most of the proposed Carbon Reduction proposals for approval with some modifications to scoping sections affecting application of **Deconstruction and reuse of existing structures** and **Life cycle assessment** regulations for projects withing **BSC-CG authority**:

- Raised the area limit to reduce the number of projects subject to these regulations
  - **100,000 square feet** effective July 1, 2024 (50,000 square feet for DSA)
  - **50,000 square feet** effective January 1, 2026
- Based upon comments received from California Building Officials (CALBO) representatives



Stakeholder Engagement

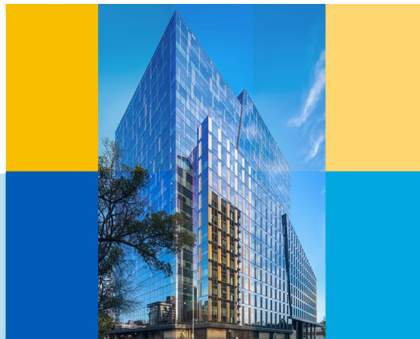
45-Day public comment period: March 31 – May 15, 2023

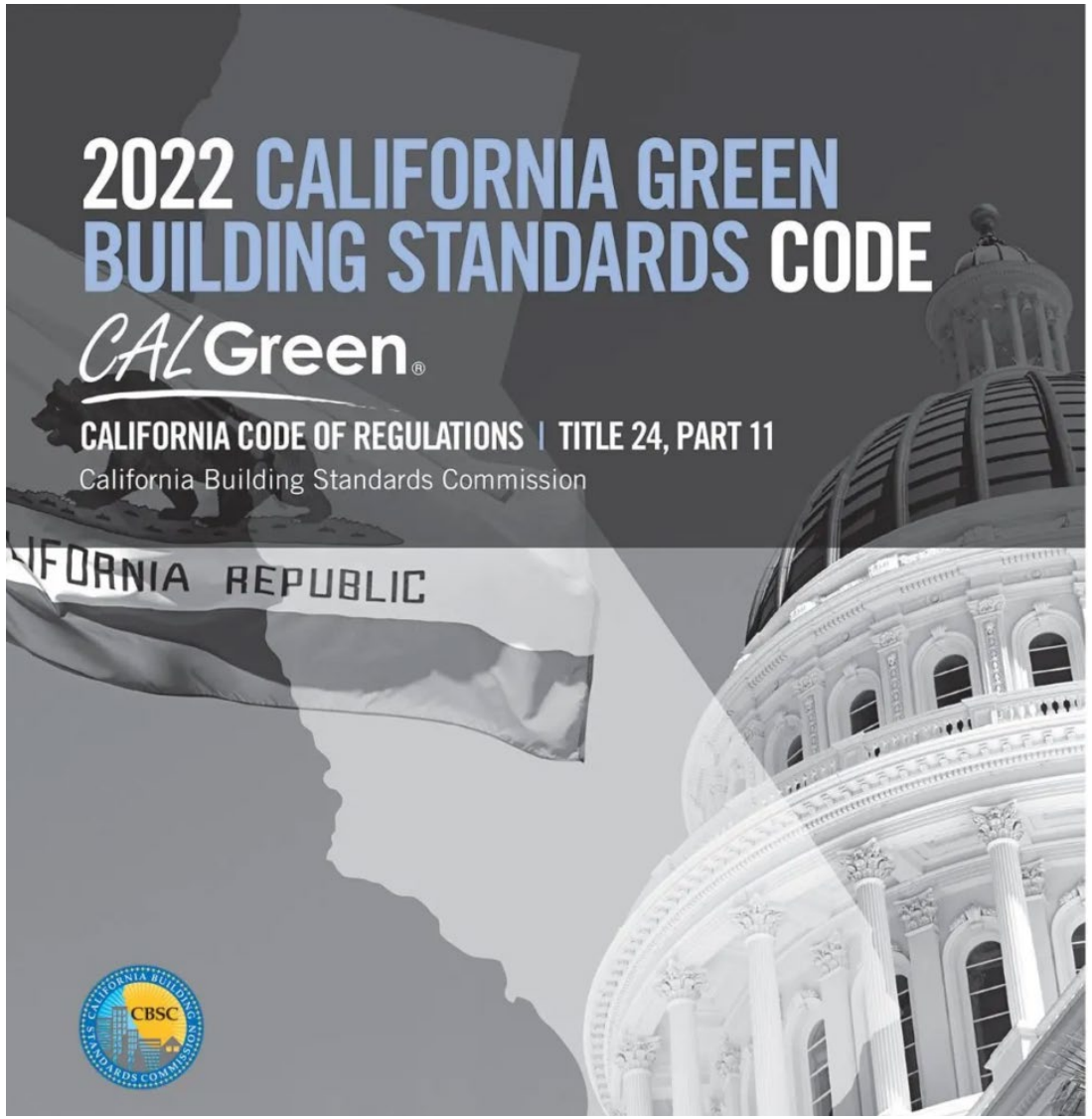
15-Day public comment period: May 25 – June 9, 2023

- Added required worksheets making verification of compliance the responsibility of the design professional of record
- Provided references to existing CALGreen sections which authorize the enforcing agency to invoke the special inspection and verification requirements.

Approved at Commission meeting August 1-3, 2023

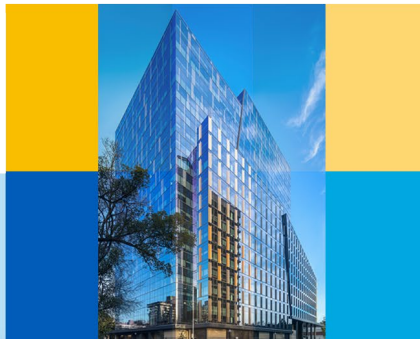
- Supplement (blue pages) to the 2022 edition of CALGreen
- **Publish January 1, 2024**
- **Effective July 1, 2024**





2022 CALGreen

Supplements effective July 1, 2024



New Carbon Reduction Regulations

Mandatory and Voluntary regulations – three compliance pathways

Mandatory regulations initially 100,000 sf and greater for BSC for nonresidential
50,000 sf and greater for schools

- **BUILDING REUSE**

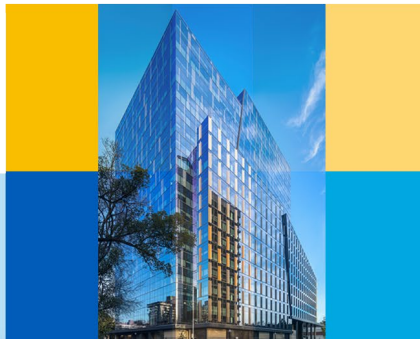
Maintain certain percentage of the existing structure and enclosure if reusing a building: **mandatory** – maintain 45%

- **WBLCA PERFORMANCE PATH**

Conduct cradle-to-grave Whole Building Life Cycle Assessment (WBLCA) demonstrating reduction in Global Warming Potential (GWP): **mandatory** – demonstrate 10% reduction in GWP

- **PRODUCT GWP PRESCRIPTIVE PATH**

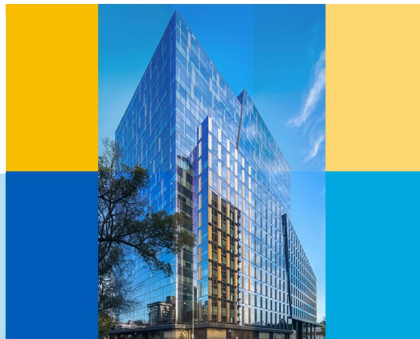
Comply with specified product GWP limits and provide Environmental Product Declaration (EPD) withing construction documentation



Voluntary Tiers: Carbon Reduction Regulations

Projects 50,000 sf or greater

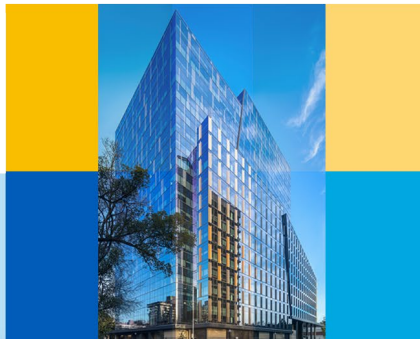
- **TIER 1**
  - **REUSE** – maintain 75% of the existing structure and enclosure
  - **WBLCA** – demonstrate 15% reduction in GWP
  - **PRODUCT GWP** – Comply with product GWP limits specified in Table A5.409.3 (GWP limits for Tier 1)
- **TIER 2**
  - **REUSE** – maintain 75% of the existing structure and enclosure, plus 30% of the interior non-structural elements
  - **WBLCA** – demonstrate 20% reduction in GWP
  - **PRODUCT GWP** – Comply with product GWP limits specified in Table A5.409.3 (GWP limits for Tier 2)



Voluntary Tiers: Carbon Reduction regulations

Projects less than 50,000 sf

- **TIER 1**
  - **REUSE** – maintain 45% of the existing structure and enclosure
  - **WBLCA** – demonstrate 10% reduction in GWP
  - **PRODUCT GWP** – Comply with product GWP limits specified in Table 5.409.3 (GWP limits for mandatory compliance)
- **TIER 2**
  - **REUSE** – maintain 75% of the existing structure and enclosure
  - **WBLCA** – demonstrate 15% reduction in GWP
  - **PRODUCT GWP** – Comply with product GWP limits specified in Table A5.409.3 (GWP limits for Tier 1)



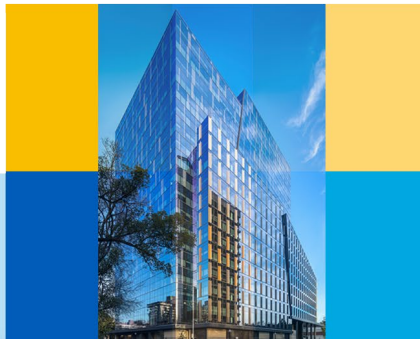
Why target larger buildings?

The Commercial Buildings Energy Consumption Survey estimates that in 2018:

- 5.9 million buildings and 96 billion square feet of total commercial floorspace exists.
- 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.

To introduce carbon reduction regulations, the CCRC determined a proposal targeting larger buildings would provide:

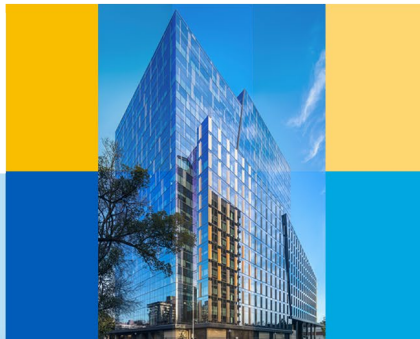
- Greater acceptance and less resistance by stakeholders
- For projects consisting of larger buildings cost of analysis is nominal
- Design teams of larger buildings have capacity to learn or contract for analysis
- Product manufacturers can take advantage of federal funds through Inflation Reduction Act (IRA) to address GWP limits



Carbon Reduction Mandatory Measures
based on BUY CLEAN CALIFORNIA ACT (BCCA):

The Department of General Services (DGS) and the California Air Resources Board (CARB) established the maximum acceptable global warming potential (GWP) limit for four eligible materials used in public works projects:

- Collected EPDs between 2018 and 2022 on listed material categories.
- Structural steel: hot-rolled and hollow structural sections, and plate steel
- Concrete reinforcing steel
- Flat glass
- 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



Definitions

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

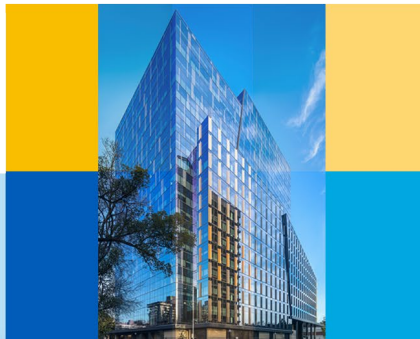
A Type III EPD in which the environmental impacts are an average of the typical manufacturing impacts for a range of products within the same product category for a group of manufacturers.

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.



Definitions

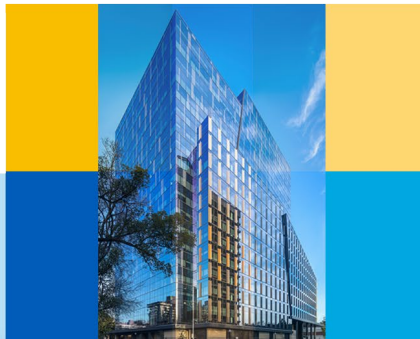
GLOBAL WARMING POTENTIAL (GWP)

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.

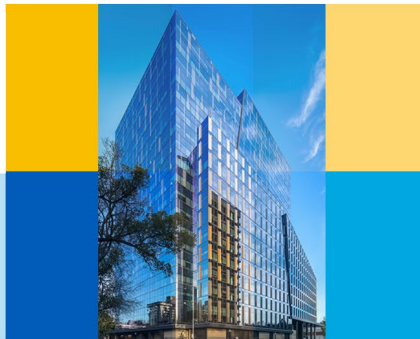
Greenhouse Gas Equivalencies Calculator | US EPA



Option 1: Existing Building Reuse

50,000 sf and greater – DSA for schools K-12
100,000 sf and greater – BSC for nonresidential (50,000 sf in January 2026)

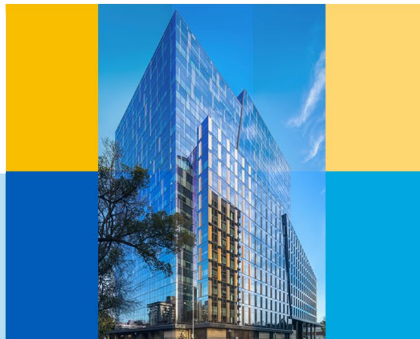
- **Reuse** – An alteration or addition shall maintain a minimum 45% combined of the existing building's primary structural elements (foundations, columns, beams, walls, floors, lateral elements) and enclosure (roof framing, wall framing, exterior finishes).
  - Window assemblies, insulation, and other portions of a building 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.



Option 2: WBLCA – Performance Path

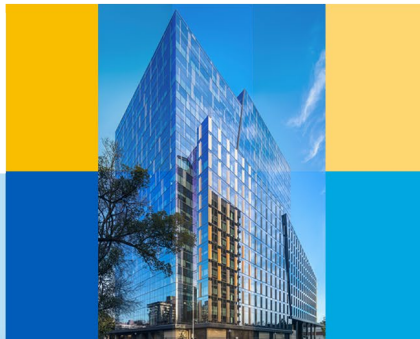
50,000 sf and greater – DSA for schools K-12
100,000 sf and greater – BSC for nonresidential (50,000 sf in January 2026)

- **WBLCA** – conduct a cradle-to-grave WBLCA to demonstrate a minimum 10% reduction in GWP as compared to a baseline building (operational energy is excluded). The reference study period is 60 years.
- **Software** – 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.



Option 2: WBLCA – Performance Path

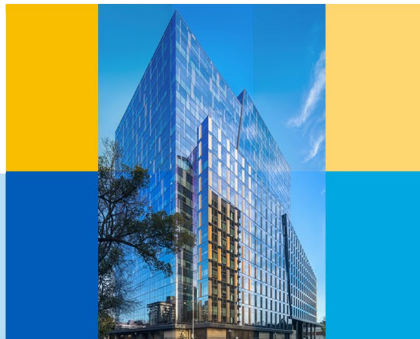
- **Building components** – Glazing assemblies, insulation and exterior finishes. Primary and secondary structural members: footings and foundations, and structural columns, beams, walls, roofs and floors.
- **Verification of compliance** – A copy of the WBLCA that includes the GWP analysis and Worksheet 4 signed by the design professional of record shall be provided in the construction documents as documentation of compliance.



Option 3: Product GWP Compliance – Prescriptive Path

50,000 sf and greater – DSA for schools K-12
100,000 sf and greater – BSC for nonresidential (50,000 sf in January 2026)

- **Product GWP compliance** – Each product installed and listed in Table 5.409.3 shall have a Type III environmental product declaration (EPD), either product-specific or factory-specific, and shall not exceed the maximum GWP limits.
  - **Exception** – Concrete may be considered one product category. 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
- **Verification of compliance** – Calculations, 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.



Option 3: 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

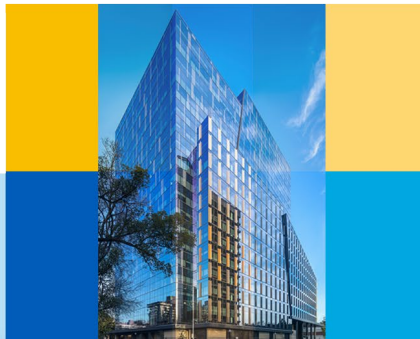
Not part of the BCCA

Included in CALGreen

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

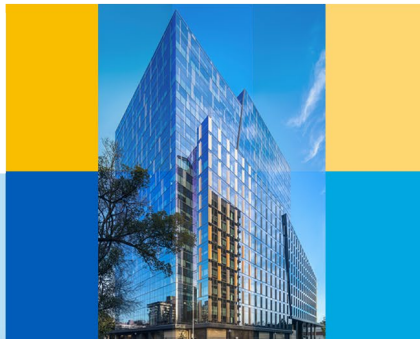
For concrete, 175% of the National Ready Mix Concrete Association (NRMCA) 2022 version 3 Pacific Southwest regional benchmark values are used for the GWP allowed, except for High Early Strength.

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



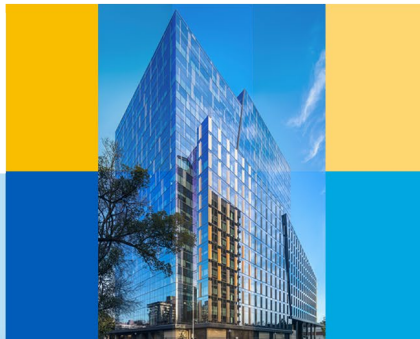
Future CALGreen Amendments

- **How these pathways will facilitate the mainstreaming of increasingly rigorous decarbonization standards in the future**
  - **SB 596 – requires concrete to lower to NZE, by 2045 and 40% of 2019 levels by 2035**
  - **Non-residential scoping already scheduled to reduce to 50k sq.ft., Jan 1 2026**
  - **Promote HCD to consider Residential occupancies**
  - **Current levels are well above BCCA and NRMCA (175%) thresholds for CA.**
  - **Voluntary Tiers allow for a transition to Mandatory requirements both for triggers, performance limits and prescriptive limits.**
  - **Additional prescriptive materials**



Embodied Carbon Regulations – Education and Outreach

- Updates to **2022 CALGreen Guide** – soon to be published
  - This guide assists code users and local enforcement authorities with nonresidential applications in CALGreen. It explains the intent of each code section and provides examples, compliance and enforcement recommendations.
- **CCRC Education & Outreach workgroup**
  - Key members of the CCRC discuss coordinated development of an educational materials to provide education, best practices, etc. Publication TBD with the target of Spring/Summer 2024.
- **DSA Learning Management System**
- **CBSC YouTube channel**



QUESTIONS