CALGreen Carbon Reduction Regulations

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

DSA

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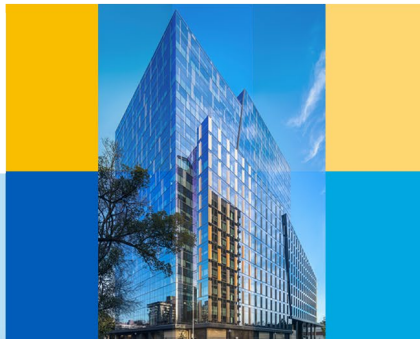
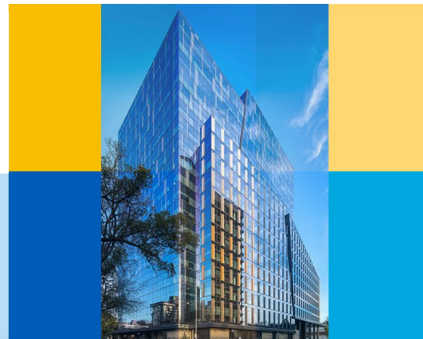


DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

Carbon Reduction Regulations Application

DSA-SS	BSC-CG
Public schools K-12	Nonresidential occupancies
Community colleges	State buildings, UCs and CSUs
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

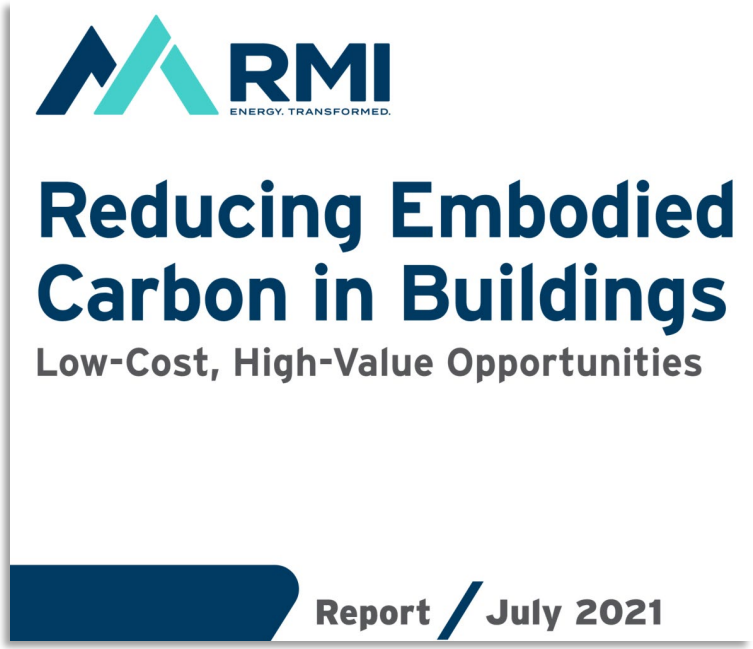


Why Carbon Reduction Regulations?

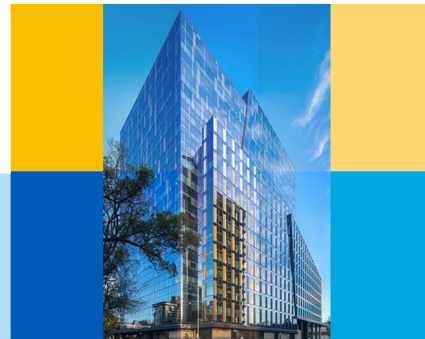
RMI REPORT | 2021

Reducing Embodied Carbon in Buildings

"Buildings account for at least 39 percent of energy-related global carbon emissions on an annual basis. At least one-quarter of these emissions result from embodied carbon, or the greenhouse gas (GHG) emissions associated with manufacturing, transportation, installation, maintenance, and disposal of building materials."



[Reducing Embodied Carbon in Buildings - RMI]



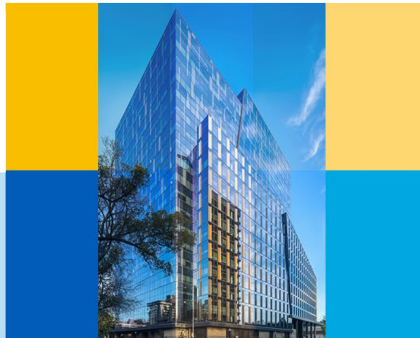
Why Carbon Reduction Regulations?

First edition of CALGreen included greenhouse gas and embodied carbon reduction:

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

Updates to CALGreen over past years in response to enacted legislation and executive orders focused on stormwater pollution prevention, bicycle parking, electric vehicle charging, and other measures

Carbon reduction topics had less attention in those years



Former CALGreen Carbon Reduction Regulations

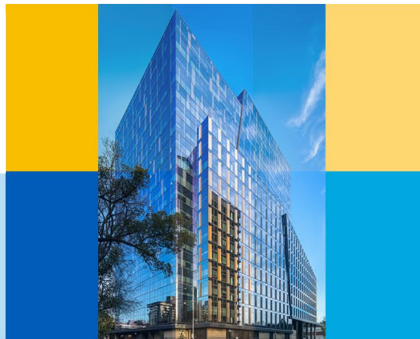
Building Reuse

- No mandatory section for deconstruction and reuse
- Voluntary – maintain at least 75% of existing building structure (including structural, floor and roof decking) and envelope (exterior skin and framing)

Life Cycle Assessment (LCA)

- No mandatory section
- Voluntary – conduct WBLCA and demonstrate at least 10% improvement in environmental impact for specific building components.

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



Greenhouse Gas and Carbon Goals in Executive Action

Executive Orders

B-30-15

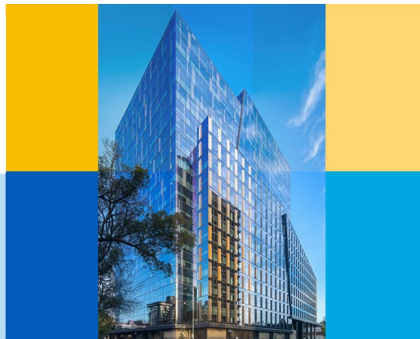
Sets interim target of greenhouse gas emissions 40% less than 1990 levels by 2030 Current California GHG Emission Inventory Data | CARB

B-55-18

Achieve statewide carbon neutrality by 2045

N-19-19

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



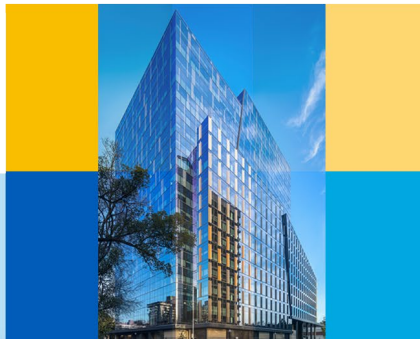
Legislative Mandates

Buy Clean California Act (BCCA)

- Public Contract Code Sections 3500-3505
- Applicable to public works projects, UC and CSU
- Effective 2018

SB 596 Greenhouse gases: cement sector: net-zero emissions strategy

- Approved Sept 23, 2021, Health and Safety Code Section 38561.2
- CARB to develop strategy by July 1, 2023, for cement industry to achieve net zero-emissions by Dec 31, 2045
- Coordinate and consult with other state agencies, evaluate market demand, financial incentives and other actions
- Establish interim targets for reductions in GHG to 40% of 2019 levels by 2035



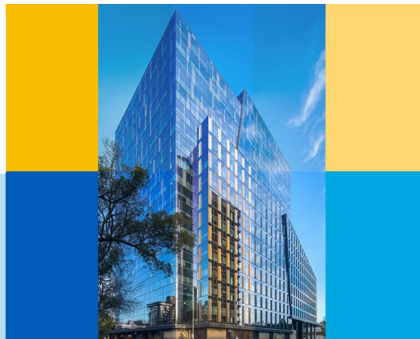
Buy Clean California Act (BCCA)

DGS and CARB established the maximum acceptable global warming potential (GWP) 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, 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

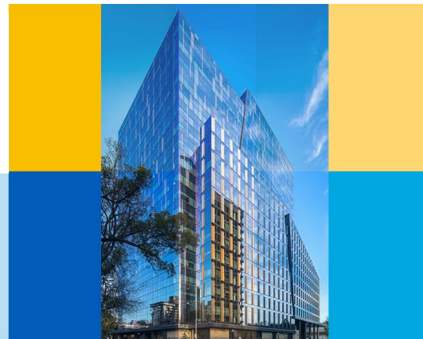


How the New Regulations Were Conceived

- **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 encourage representative participation
  - Launched April 4, 2022
  - Conducted four pre-cycle workshops 2022-PreCycle

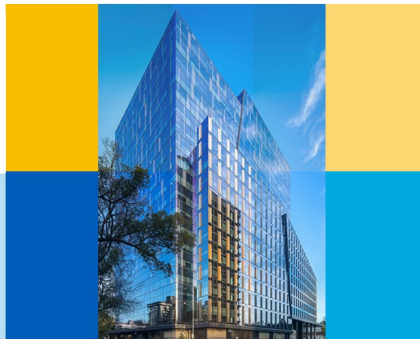


CALGreen Carbon Reduction Collaborative

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 Association International (BOMA)
Concrete Masonry Association of California and Nevada (CMACN)
CA Construction & Industrial Materials Association (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)
CA Department of Healthcare Access and Information (HCAI)
CA Department of Housing and Community Development (HCD)

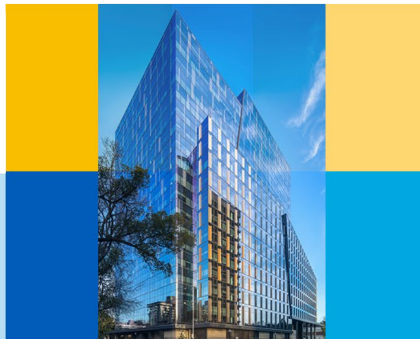
(SEAOC) Structural Engineers Association of California
(NBI) New Buildings Institute
(RMI) Rocky Mountain Institute
(CLF) Carbon Leadership Forum
(USGBC) U.S. Green Building Council
(AISC) American Institute of Steel Construction
(CSPTC) California State Pipe Trades Council
(CRSI) Concrete Reinforcing Steel Institute
(CFSEI) Cold-Formed Steel Engineers Institute
(ICC) 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
(CALRecycle) CA Department of Recycling
(CALTrans) CA Department of Transportation



CALGreen Carbon Reduction Collaborative Charter

All 150+ CCRC Charter participants agreed to the following:

- Review existing voluntary regulations and suggest improvement
- Provide input for updates to support climate action goals
- Develop mandatory measures to address embodied carbon
- Plan incremental increases in mandatory measures over time
- Provide studies, cost/benefit analysis, cost to business, jobs, etc.
- BSC and DSA have decision-making authority
- Solicit support for regulations through rulemaking process



Stakeholder Engagement

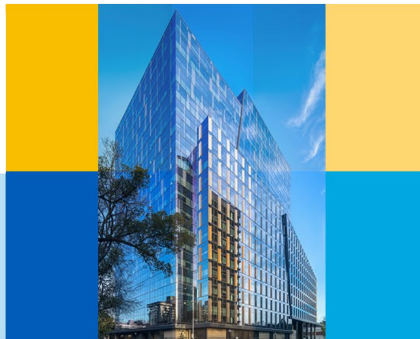
GREEN Code Advisory Committee (CAC) meeting – Feb 8-10, 2023

Recommended “approve” for most of the proposals

Modified scoping to raise the area limit for **deconstruction and reuse of existing structures** and **life cycle assessment** for projects within **BSC-CG authority**

- **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

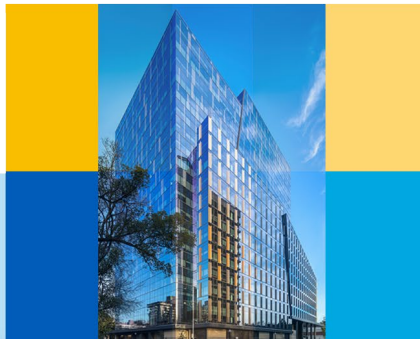


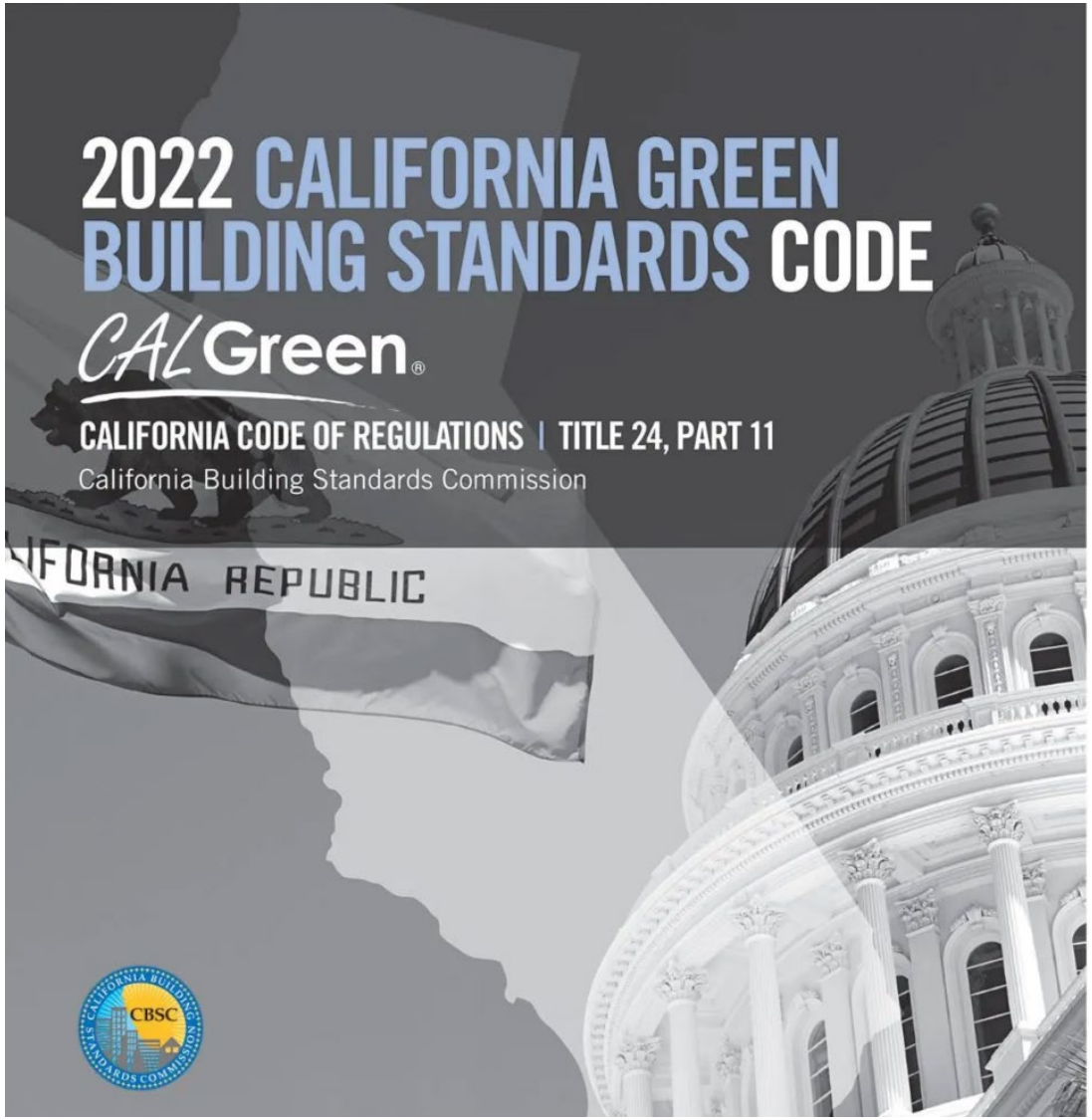
Public Comment Periods

45-Day public comment period: Mar 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



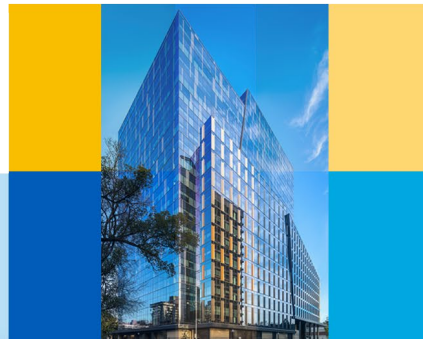


2022 CALGreen

Supplement effective July 1, 2024

Approved at August 2023 Commission Meeting

- Supplement (blue pages) to the 2022 edition of CALGreen
- Published Jan 1, 2024

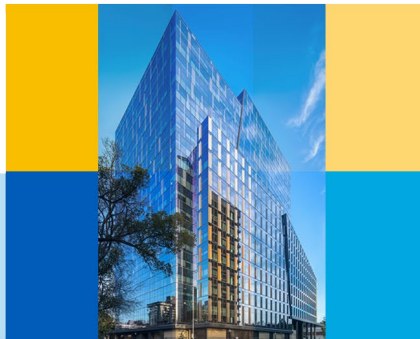


New Carbon Reduction Regulations

Mandatory and Voluntary – Three Compliance Pathways

Mandatory regulations initially 100,000 sf and greater – nonresidential (BSC)
50,000 sf and greater – schools (DSA)

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 WBLCA demonstrating reduction in GWP: **mandatory** – demonstrate 10% reduction
PRODUCT GWP PRESCRIPTIVE PATH	Comply with specified product GWP limits and provide EPD with construction documentation



CBSC CALIFORNIA BUILDING STANDARDS COMMISSION

DSA DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

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

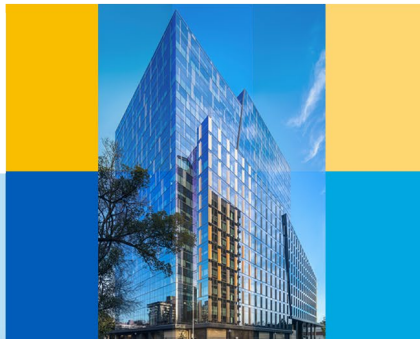
PRODUCT GWP – Comply with product GWP limits specified in Table A5.409.3 (GWP limits for Tier 1)

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

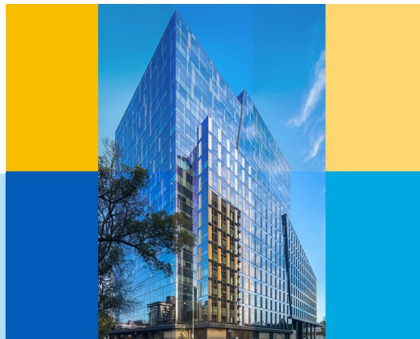
PRODUCT GWP – Comply with product GWP limits specified in Table 5.409.3 (GWP limits for mandatory compliance)

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)



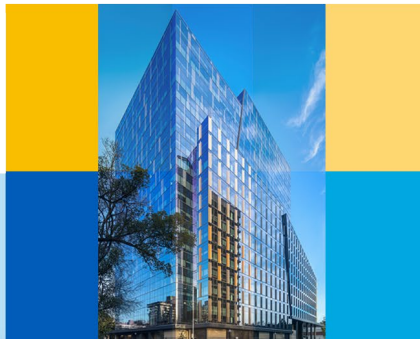
Why Target Larger Buildings?

The 2018 Commercial Buildings Energy Consumption Survey estimates:

- 5.9 million buildings and 96 billion square feet of total commercial floorspace
- The smallest buildings (1,001 sf to 5,000 sf) account for almost half of all commercial buildings but occupy only 9% of total commercial floorspace
- Buildings 50,000 sf and larger account for 6% of commercial buildings but 50% of commercial floorspace.

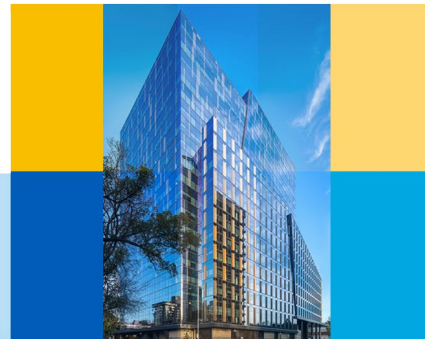
CCRC determined a proposal targeting larger buildings would provide:

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



Will regulations apply?

Measures Not Applicable	Apply Mandatory Measures
Non-residential Projects < 100,000 sf (< 50,000 sf effective January 1, 2026)	Non-residential Projects ≥ 100,000 sf (≥ 50,000 sf effective January 1, 2026) Industrial, Commercial Office, Retail, Lab, Private School (K-12), University Academic (Public & Private), Institutional/Civic, etc.
Public school (K-12) and community college (projects < 50,000 sf)	Public school (K-12) and community college (projects ≥ 50,000 sf)
Projects under OSHPD authority Hospitals, Skilled Nursing Facilities, etc.	
Residential Projects under HCD authority Single Family, Multifamily, Hotel, Motel, etc.	



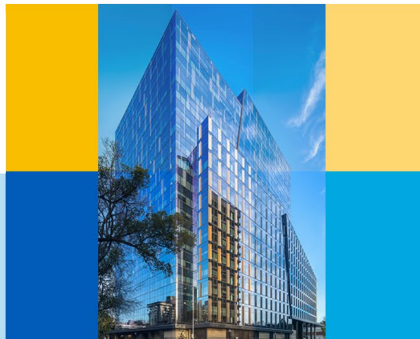
Pathway 1: Building Reuse Scope

50,000 sf and greater – Schools K-12 (DSA)
100,000 sf and greater (50,000 sf in Jan 2026) – Nonresidential (BSC)

SECTION 5.105
DECONSTRUCTION AND REUSE OF EXISTING STRUCTURES

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.



Will regulations apply? Example #1

A building of 300,000 square feet contains several suites occupied by different tenants. The project is to:

- Alter one suite of 50,000 square feet
- Alter another suite of 60,000 square feet
- Keep all other suites in the building not altered

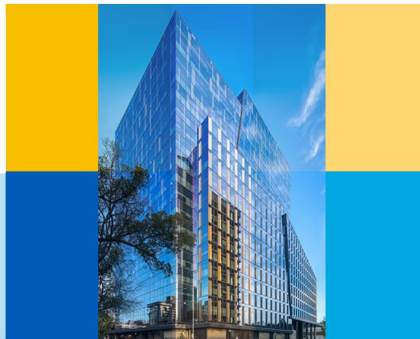
Calculations:

50,000 sf + 60,000 sf = 110,000 sf

110,000 sf > 100,000 sf

Result:

The work in both suites must comply with either building reuse, WBLCA, or product GWP compliance regulations



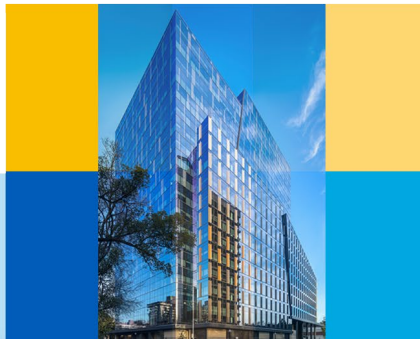
Will regulations apply? Example #2

An existing commercial building of 30,000 square feet is proposed to have two additions:

- 25,000 square feet
- 35,000 square feet

Calculations:
30,000 sf + 25,000 sf + 35,000 sf = 90,000 sf
90,000 sf < 100,000 sf

Result:
This project is not required to comply with either building reuse, WBLCA, or product GWP compliance regulations



Will regulations apply? Example #3

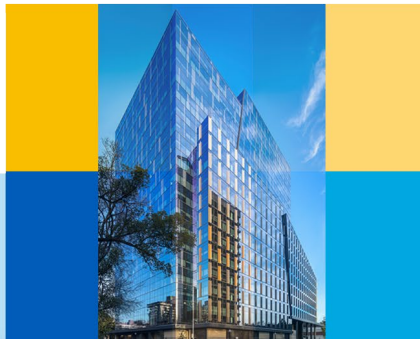
An existing building of 95,000 square feet is proposed to have one addition:

- 5,000 square feet

Calculations:
95,000 sf + 5,000 sf = 100,000 sf
100,000 sf = 100,000 sf

Result:
This project must comply with either building reuse, WBLCA, or product GWP compliance regulations

> **Note:** The entire existing building can be considered in calculating the required percentage for compliance with building reuse regulations



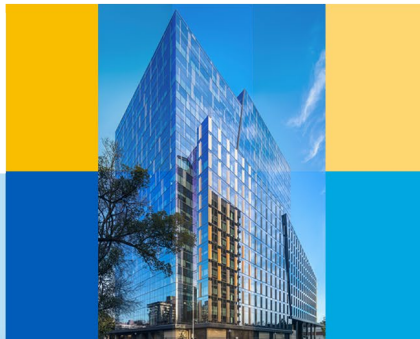
Will regulations apply? Example #4

An existing retail building of 200,000 square feet is proposed for alterations. The project is to:

- Alter 80,000 square feet of the building area

Calculations:
80,000 sf < 100,000 sf

Result:
This project is not required to comply with either building reuse, WBLCA, or product GWP compliance regulations

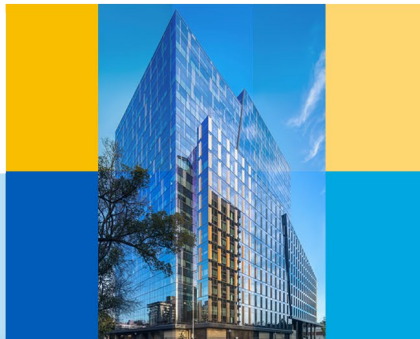


Pathway 1: Building Reuse Requirements

Reuse – 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 portions of a building deemed structurally unsound or hazardous shall not be included in the calculation

Verification of Compliance – Documentation shall be provided to demonstrate compliance with Section 5.105.2. Worksheet WS-3 is available in Chapter 8



Demonstrate Compliance - Example #1

Scope of work:

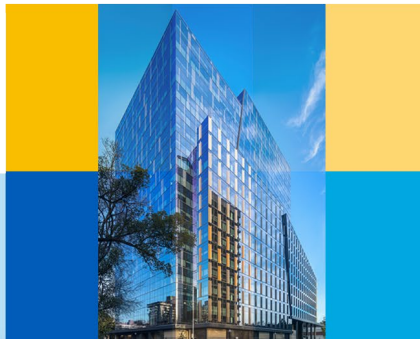
- An existing office building of 50,000 square feet
- Alterations to 35,000 square feet (primary structural elements not affected, enclosure mostly maintained, window assemblies and insulation replaced)
- Addition of 10,000 square feet
- Addition of 80,000 square feet
- Demolition of 15,000 square feet ('u' shape to provide more natural light)

Step 1 calculations: Section 5.105.1 Scope

50,000 sf + 10,000 sf + 80,000 sf = 140,000 sf

140,000 sf > 100,000 sf

Result:
This project is required to comply with either building reuse, WBLCA, or product GWP compliance regulations



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Demonstrate Compliance - Example #1

Step 2 calculations: Exception to Section 5.105.1 Scope

10,000 sf + 80,000 sf < 50,000 sf x 2

90,000 sf < 100,000 sf

Result:

This project is eligible to use Section 5.105.2 for compliance.

Step 3 calculations: Section 5.105.2 Reuse of existing building

35,000 sf / 50,000 sf x 100% = 70%

70% > 45% by a comfortable margin

Result:

Worksheet WS-3 to demonstrate compliance

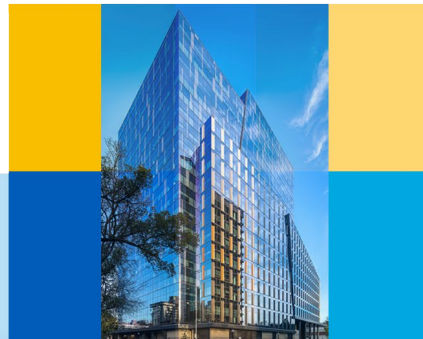
DOCUMENTATION OF COMPLIANCE OF EXISTING BUILDING REUSE:

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%



Demonstrate Compliance - Example #2

Scope of work:

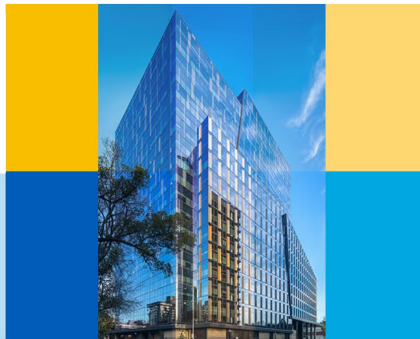
- An existing office building of 50,000 square feet
- Alterations to 25,000 square feet (primary structural elements not affected)
- Addition of 10,000 square feet
- Addition of 40,000 square feet
- Demolition of 25,000 square feet

Step 1 calculations: Section 5.105.1 Scope

50,000 sf + 10,000 sf + 40,000 sf = 100,000 sf

100,000 sf = 100,000 sf

Result:
This project is required to comply with either building reuse, WBLCA, or product GWP compliance regulations



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Demonstrate Compliance - Example #2

Step 2 calculations: Exception to Section 5.105.1 Scope

10,000 sf + 40,000 sf < 50,000 sf x 2

50,000 sf < 100,000 sf

Result:

This project is eligible to use Section 5.105.2 for compliance

Step 3 calculations: Section 5.105.2 Reuse of existing building

25,000 sf / 50,000 sf x 100% = 50%

50% > 45% not by a comfortable margin

Result:

The project team should provide a more detailed component-based calculation

(See next slide)

Demonstrate Compliance - Example #2

The results of the component-based calculation and 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)

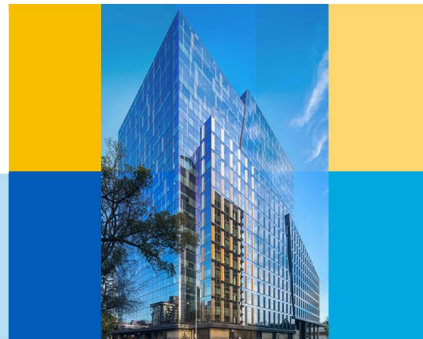
DOCUMENTATION OF COMPLIANCE OF EXISTING BUILDING REUSE:

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)
Primary Structural Elements of Existing Building(s) (foundations; columns, beams, walls, and floors; and lateral elements)	57,000 SF	29,000 SF	51%
Building Enclosure of Existing Building(s) (roof framing, wall framing and exterior finishes only)	40,000 SF	17,000 SF	43%

Total % Reuse of Required Elements = 47%



CBSC CALIFORNIA BUILDING STANDARDS COMMISSION

DSA DIVISION OF THE STATE ARCHITECT DEPARTMENT OF GENERAL SERVICES

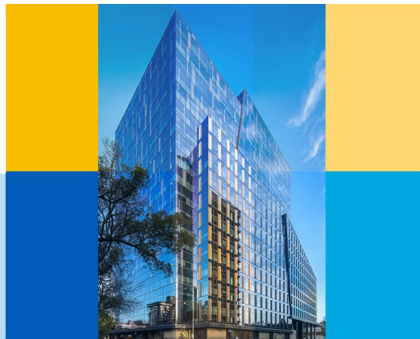
Pathway 1: Building Reuse - Enforcement

Plan review:

- Confirm Building Reuse pathway is identified on construction documents
- Review plans and calculations for required %
- Worksheet WS-3 - not mandatory
  - Can help design professionals show compliance
  - Assists local jurisdictions

On-site enforcement:

- Review the permit set of plans
- Verify existing primary structural elements and enclosure are maintained per construction documentation



Definitions

ENVIRONMENTAL PRODUCT DECLARATION (EPD)

A third-party verified report that summarizes how a product impacts the environment

Per ISO 14025 (+14020) and ISO 21930, type III EPDs can be:

INDUSTRY-WIDE EPD

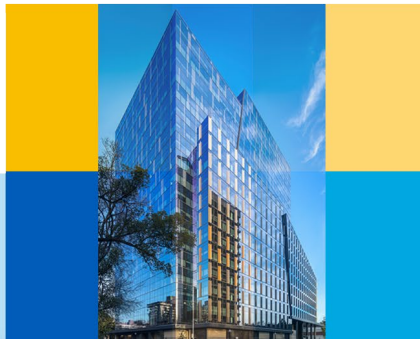
Environmental impacts are an average of the typical manufacturing impacts for a range of products within the same product category for a group of manufacturers.

PRODUCT-SPECIFIC EPD

Environmental impacts can be attributed to a product design and manufacturer across multiple facilities.

FACTORY-SPECIFIC EPD

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



Definitions

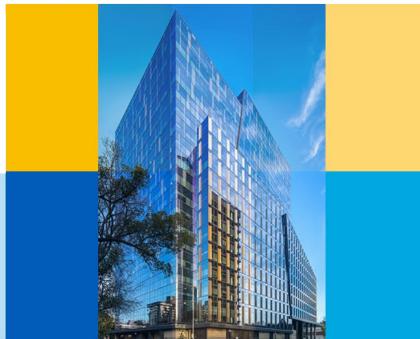
GLOBAL WARMING POTENTIAL (GWP)

A measure of how much energy the emissions of 1 ton of a gas will absorb over a given period relative to the emissions of 1 ton of carbon dioxide (CO_2). The larger the GWP, the more 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



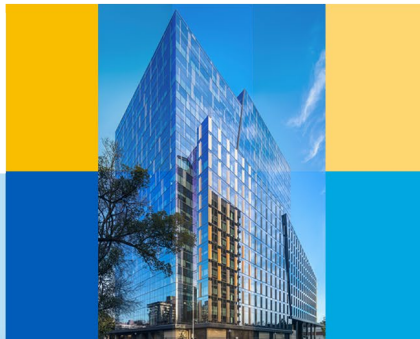
Pathway 2: WBLCA – Performance Path

50,000 sf and greater – Schools K-12 (DSA)
100,000 sf and greater (50,000 sf in Jan 2026) – Nonresidential (BSC)

WBLCA – Cradle-to-grave. Demonstrates minimum 10% reduction in GWP compared to baseline building. Operational energy excluded.
Reference study period is 60 years.

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

Building Components – Glazing assemblies, insulation and exterior finishes. Primary and secondary structural members: footings and foundations, and structural columns, beams, walls, roofs and floors.



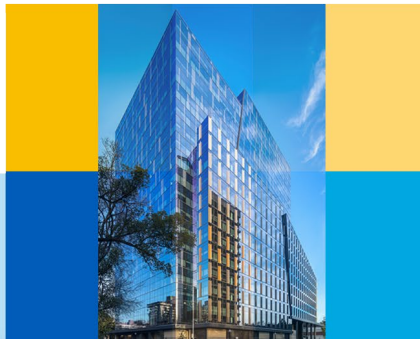
Pathway 2: WBLCA – Enforcement

Plan review:

- Confirm WBLCA pathway is identified on construction documents
- Confirm the following is included in the construction documents (drawings or specifications)
  - Summary of the GWP analysis (Worksheet WS-9 may be used)
  - Worksheet WS-4 signed by the design professional of record

On-site enforcement:

- The enforcing agency may require inspection and reports in accordance with Sections 702.2 and 703.1 during and at completion of construction

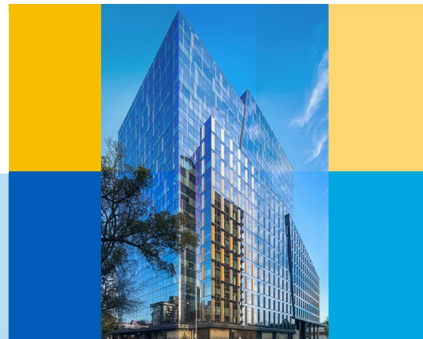


Pathway 2: WBLCA – Required Worksheet WS-4

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:



Pathway 2: WBLCA – GWP Analysis Summary

Worksheet WS-9 example

WORKSHEET (WS-9)
Section 5.409.2 and Section A5.409.2 WHOLE BUILDING LIFE CYCLE ASSESSMENT

CALGreen Whole Building LCA Reporting Template

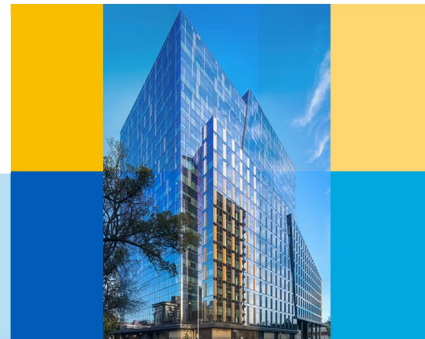
LCA model run	User input	Units	Overall scope included (select all that apply)	
LCA Modeler (company) *[private]*	Atelier Ten		Structure (required)	☒
Date of Model Run (mm/yyyy)	March-24		Enclosure (required)	☒
Project Phase at Model Run	Design Development		Interiors (optional)	☐
Reference Study Period (years)	60		MEP (optional)	☐
Software and Version Used*	One Click LCA. 0.24.1		Site/Landscaping (optional)	☐
Biogenic Carbon Included* (y/n)	no		FFE (optional)	☐
Model Floor Area	25,000	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):	9,000,000	500,000	700,000	50,000	200,000	10,450,000
Baseline Enclosure GWP (kgCO2e):	2,400,000	20,000	300,000	1,600,000	70,000	4,390,000
Baseline Whole Building GWP (kgCO2e):	**11,400,000**	**520,000**	**1,000,000**	**1,650,000**	**270,000**	**14,840,000**
Proposed Structure GWP (kgCO2e):	7,100,000	500,000	700,000	50,000	200,000	8,550,000
Proposed Enclosure GWP (kgCO2e):	2,300,000	20,000	300,000	1,600,000	60,000	4,280,000
Proposed Whole Building GWP (kgCO2e):	**9,400,000**	**520,000**	**1,000,000**	**1,650,000**	**260,000**	**12,830,000**

Percent Reduction	14%
Mandatory	COMPLIANT
Tier 1	-
Tier 2	-



CBSC CALIFORNIA BUILDING STANDARDS COMMISSION

DSA DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

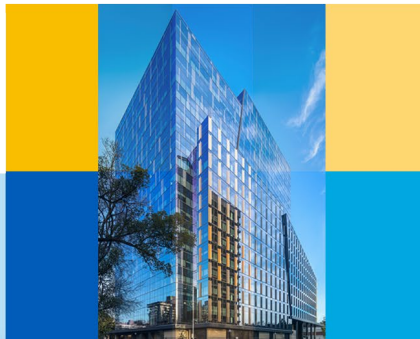
Pathway 3: Product GWP Compliance – Prescriptive Path

50,000 sf and greater – Schools K-12 (DSA)
100,000 sf and greater (50,000 sf in Jan 2026) – Nonresidential (BSC)

Product GWP Compliance – Each installed product listed in Table 5.409.3 shall have a Type III 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 that allowed per Table 5.409.3 using Exception Equation 5.409.3.1

Verification of Compliance – Calculations, Type III EPDs, and signed Worksheet WS-5 shall be provided with the construction documents



Pathway 3: Product GWP – Materials

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

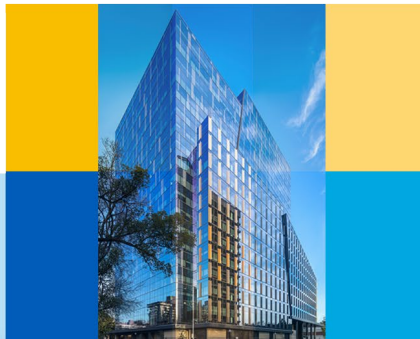
Not part of the BCCA

Included in CALGreen

GWP values are based on 175% of BCCA **except concrete products**

For **concrete**, 175% of NRMCA 2022 Version 3 Pacific Southwest regional benchmark values is used for GWP allowed, **except High Early Strength**

High Early Strength is calculated at 130% of the ready mixed concrete GWP allowed values for each product category



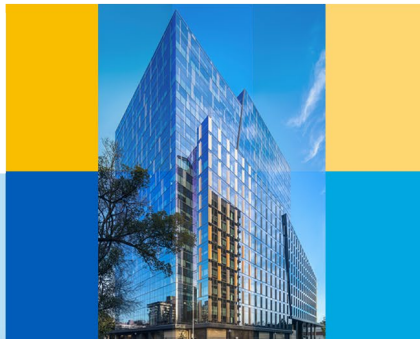
Pathway 3: Product GWP – Enforcement

Plan review:

- Confirm Product GWP pathway is identified on construction documents
- Confirm the following is included in the construction documents (drawings or specifications)
  - Calculations (if exception for concrete is used)
  - Type III EPDs for products required to comply
  - Worksheet WS-5 signed by the design professional of record

On-site enforcement:

- The enforcing agency may require inspection and reports in accordance with Sections 702.2 and 703.1 during and at completion of construction

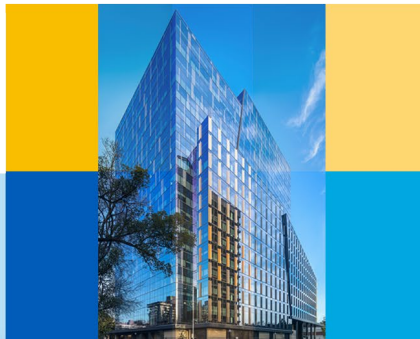


Pathway 3: Product GWP – Required Worksheet WS-5

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:



Pathway 3: Product GWP – Type III EPDs

ENVIRONMENTAL PRODUCT DECLARATION

Owens Corning

Thermafiber® Mineral Wool

According to ISO 14025, EN 15804 and ISO 21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL ENVIRONMENT 333 PFINGSTEN ROAD NORTHBROOK, IL 60611
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	General Program Instructions v2.5 March 2020
MANUFACTURER NAME AND ADDRESS	Owens Corning, One Owens Corning Parkway, Toledo, OH, USA
DECLARATION NUMBER	4790011847.102.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	1 m^2 insulation at R_{SI}1
REFERENCE PCR AND VERSION NUMBER	Part B: Building Envelope Thermal Insulation EPD Requirements, UL 10010-1
DESCRIPTION OF PRODUCT APPLICATION/USE	Thermafiber® Formaldehyde-Free Mineral Wool is a type of slag wool insulation product used in a variety of building applications, both residential and commercial, requiring the use of thermal insulation.
PRODUCT RSL DESCRIPTION (IF APPL.)	75 years
MARKETS OF APPLICABILITY	Building Material
DATE OF ISSUE	10/1/2021
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product-specific
RANGE OF DATASET VARIABILITY	NA
EPD SCOPE	Cradle to gate with options (A4, A5, C1-C4)
YEAR(S) OF REPORTED PRIMARY DATA	2020
LCA SOFTWARE & VERSION NUMBER	SimaPro 9.1
LCI DATABASE(S) & VERSION NUMBER	ecoinvent 3.6
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1 v1.05

The PCR review was conducted by: UL Environment; PCR Review Panel; epd@ulenvironment.com; Cooper McCollum, UL Environment

This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL — Aspire Sustainability

This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:

This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by: Thomas P. Gloria, Industrial Ecology Consultants

LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

ENVIRONMENTAL PRODUCT DECLARATION

CALPORTLAND

4. ENVIRONMENTAL INDICATORS DERIVED FROM LCA

FACILITY:	Alameda
MIX NAME:	O40D2S8E1
COMPRESSIVE STRENGTH:	5000 psi @ 28 days
DECLARED UNIT:	1 cubic yard (1 cubic meter) ready mix concrete produced at CalPortland Alameda plant.

CALCULATED RESULTS A1-A3 PER CUBIC YARD AND CUBIC METER

Core Mandatory Impact Indicator			per yd³	per m³
Global warming potential	GWP	kg CO2e	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 SO2e	0.69	0.90
Eutrophication potential	EP	kg Ne	0.08	0.11
Formation potential of tropospheric ozone	SFP	kg O3e	14.72	19.25
Abiotic depletion potential for fossil resources	ADPf	MJ, NCV	1,744.10	2,281.28
Abiotic depletion potential for non-fossil mineral resources	ADPe	kg Sbe	2.10E-04	2.74E-04
Fossil fuel depletion	FFD	MJ Surplus	77.08	100.82
Use of Primary Resources				
Renewable primary energy carrier used as energy	RPRE	MJ, NCV	60.80	79.52
Renewable primary energy carrier used as material	RPRM	MJ, NCV	0.00	0.00
Non-renewable primary energy carrier used as energy	NRPRE	MJ, NCV	1,847.90	2,417.05
Non-renewable primary energy carrier used as material	NRPRM	MJ, NCV	0.00	0.00
Secondary Material, Secondary Fuel and Recovered Energy				
Secondary material	SM	kg	0.00	0.00
Renewable secondary fuel	RSF	MJ, NCV	0.00	0.00
Non-renewable secondary fuel	NRSF	MJ, NCV	0.00	0.00
Recovered energy	RE	MJ, NCV	0.00	0.00
Mandatory Inventory Parameters				
nsumption of freshwater resources	FW	m3	0.50	0.66
ination and carbonation emissions	CCE	kg CO2e	109.62	143.38
ators Describing Waste				
rdous waste disposed	HWD	kg	0.00	0.00
azardous waste disposed	NHWD	kg	39.17	51.23
vel radioactive waste, conditioned, to final repository	HLRW	m3	1.89E-08	2.47E-08
diate- and low-level radioactive waste, to final	ILLRW	m3	4.02E-07	5.26E-07
y				
nts for re-use	CRU	kg	0.00	0.00
or recycling	MR	kg	0.00	0.00
r energy recovery	MER	kg	0.00	0.00
nergy exported from the product system	EE	MJ, NCV	0.00	0.00

4

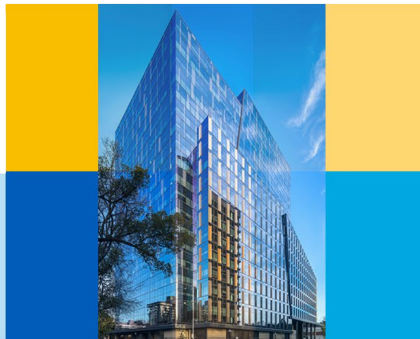
Environmental Product Declaration | Gerdau | Structural Steel | North American Steel Mill

Table 5. Life Cycle Impact Assessment (LCIA) results for 1 metric ton of Gerdau fabricated 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			
CML-IA	A1	A2	A3	Total (A1-A3)
GWP (kg CO_2 eq)	700	37.6	78.6	817
	86%	4.6%	9.6%	100%
AP (kg SO_2 eq)	1.75	0.143	0.224	2.12
	83%	6.8%	11%	100%
EP (kg $(PO_4)^3$ eq)	1.12	3.33×10^{-2}	0.187	1.34
	84%	2.5%	14%	100%
POCP (kg C_2H_4 eq)	0.140	4.76×10^{-3}	1.30×10^{-2}	0.157
	89%	3%	8.3%	100%
ODP (kg CFC-11 eq)	6.51×10^{-5}	6.86×10^{-6}	6.16×10^{-6}	7.81×10^{-5}
	83%	8.8%	7.9%	100%
ADPE (kg Sb eq)	5.70×10^{-6}	3.42×10^{-7}	1.58×10^{-6}	7.62×10^{-6}
	75%	4.5%	21%	100%
ADPF (MJ)	9,160	564	1,280	11,000
	83%	5.1%	12%	100%
TRACI 2.1				
P (kg CO_2 eq)	691	37.5	77.5	806
	86%	4.6%	9.6%	100%
(SO_2 eq)	1.93	0.168	0.220	2.32
	83%	7.2%	9.5%	100%
eq)	2.37	3.93×10^{-3}	0.421	2.83
	84%	1.4%	15%	100%
1 eq)	28.7	4.17	2.47	35.3
	81%	12%	7%	100%
	8.10×10^{-5}	9.13×10^{-6}	8.17×10^{-6}	9.83×10^{-5}
	82%	9.3%	8.3%	100%
	1,210	82.6	159	1,450
	83%	5.7%	11%	100%

be made between product-specific or industry average EPDs at the design stage of a project, before a fied. Comparisons may be made between product-specific or industry average EPDs at the time of product performance and specifications have been established and serve as a functional unit for tal impact results shall be converted to a functional unit basis before any comparison is attempted. all be subject to the requirements of ISO 21930. EPDs are not comparative assertions and are e limited comparability when they have different system boundaries, are based on different e missing relevant environmental impacts. Such comparison can be inaccurate and could lead to ials or products which are higher-impact, at least in some impact categories.

11



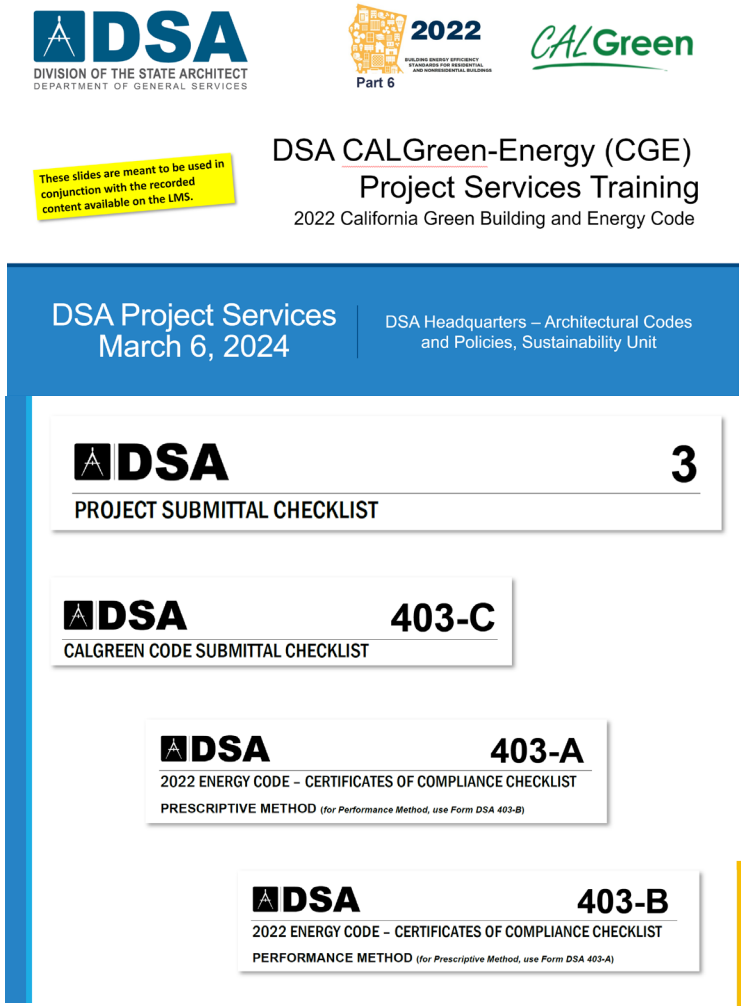
CBSC CALIFORNIA BUILDING STANDARDS COMMISSION

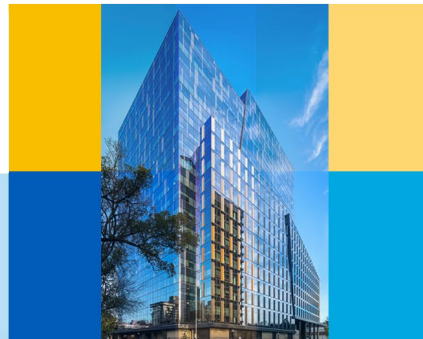
DSA DIVISION OF THE STATE ARCHITECT DEPARTMENT OF GENERAL SERVICES

DSA Project Verification

DSA Plan Review:

- DSA HQ trains key intake staff
- Intake staff verifies *inclusion* of required information and design professional certification
- Project architect certifies compliance
- DSA HQ available for consultation
- Project inspectors verify conformance to approved plans and submit a final verified report
- Project architect submits a final verified report





DSA Project Verification

DSA **1**

APPLICATION FOR APPROVAL OF PLANS AND SPECIFICATIONS

Forms and publications referenced within this document are available on the DSA Forms and the DSA Publications webpages. Please print or type all information—or you may complete online and print for signatures.
ALL FIELDS MUST BE FILLED IN PER INSTRUCTIONS (SEE PAGE 5).

27. **Statement of responsibility: Architect/Engineer in General Responsible Charge**
I certify under penalty of perjury that all information presented on this form is true and correct and that I understand, and will fulfill, my responsibilities as the architect/engineer in general responsible charge of this project as defined in Title 24, Part 1, Section 4-341 of the California Code of Regulations.

Signature: _____ **Date:** _____
(Architect or Engineer in General Responsible Charge)

Disclaimer: *I certify that this form is an exact duplicate (verbatim) of the form provided by the Division of the State Architect (DSA), i.e., form DSA 1 (Revision 01/08/20). In the event a conflict should exist, the language in the current DSA form will prevail.*

403-C

CALGREEN CODE SUBMITTAL CHECKLIST

CHAPTER 5 – NONRESIDENTIAL MANDATORY MEASURES FOR K-12 SCHOOLS AND COMMUNITY COLLEGES

CALGreen Section – Title[1]	Sheet(s) # in Plans and/or Spec. Section or N/A
5.106 – SITE DEVELOPMENT	
Section 5.106.4.2.1 Student bicycle parking	
Section 5.106.4.2.2 Staff bicycle parking	
Section 5.106.5.3.1 Electric vehicle capable spaces	
Section 5.106.5.3.2 Electric vehicle charging stations	
Section 5.106.8 Light pollution reduction	
Section 5.106.10 Grading and paving	
Section 5.106.12 Shade tree irrigation	

DSA **6-AE**

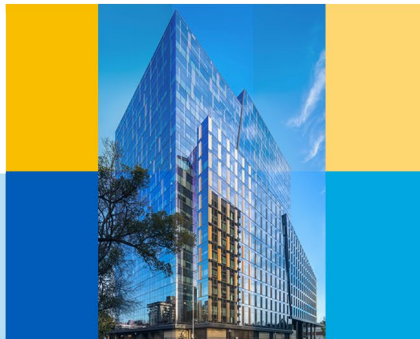
ARCHITECT/ENGINEER VERIFIED REPORT

Division of the State Architect (DSA) documents referenced within this form are available on the DSA Forms or DSA Publications webpages.

I attest that, based on my own personal knowledge (as defined in California Code of Regulations, Title 24, Part 1, Sections 4-336 and 4-214) that, except as marked in Section 2, as of the date of this report, the work has been performed and materials have been used and installed, in every material respect, in compliance with the *DSA-approved* construction documents. I declare under penalty of perjury that I prepared this report and that all statements are true.

Design Professional in General Responsible Charge: *(Signature)* _____
Print Name: | CA Registration No: | Date:

Design professional indicates where in the documents the information is located simplifying an audit by regional intake staff or HQ



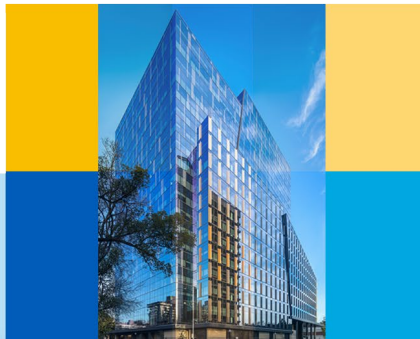
Future CALGreen Amendments

2024 Triennial Code Adoption Cycle

- **There will be no changes to these regulations**
  ≥ 50,000 sf effective January 1, 2026

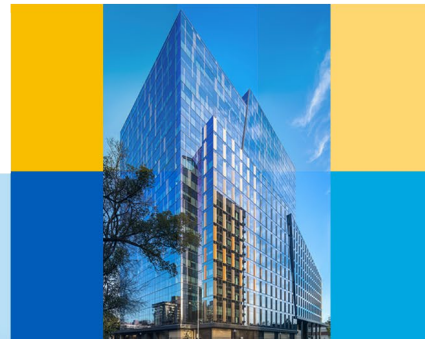
Future Code Adoption Cycles

- SB 596 requires concrete emissions reduction to 40% of 2019 levels by 2035 and NZE by 2045
- Current levels are well above BCCA and NRMCA (175%) thresholds
- Voluntary tiers transition to mandatory for triggers, performance and prescriptive limits
- Additional prescriptive materials
- "…these pathways will facilitate the mainstreaming of increasingly rigorous decarbonization standards in the future…"



Embodied Carbon Regulations Education and Outreach

- 2022 CALGreen Guide Supplement (dgs.ca.gov/BSC/CALGreen)
- CCRC Education & Outreach Workgroup
- DSA Learning Management System
- CBSC YouTube channel



QUESTIONS