STOPWASTE

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CALGreen Interim Code Cycle Updates:

Implementing the new embodied carbon requirements in nonresidential construction projects starting July 1, 2024

An Overview for Building Officials

Spring 2024


15
CALGreen
2009 - 2024
CBSC
CALIFORNIA BUILDING STANDARDS COMMISSION

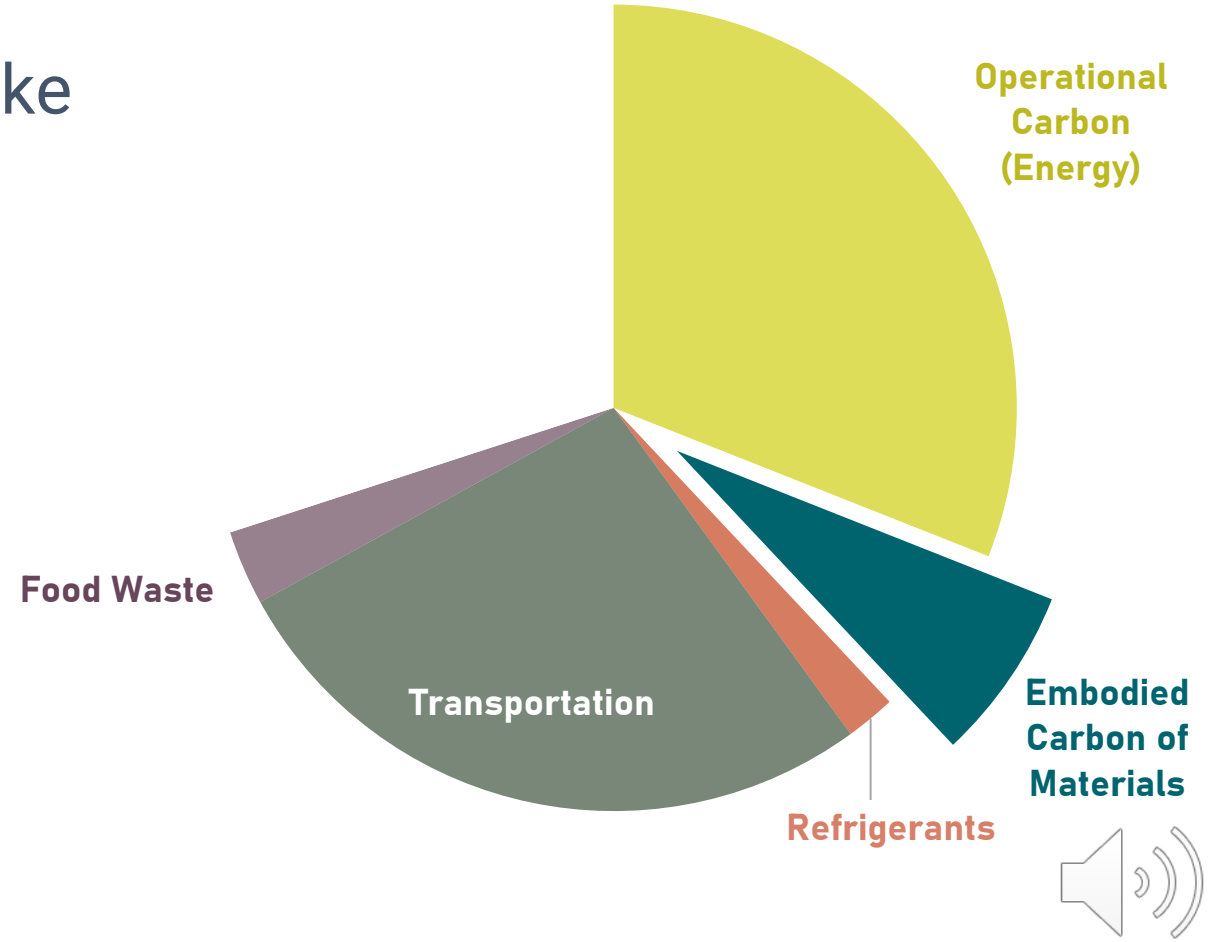
What is Embodied Carbon of Building Materials?

Embodied carbon refers to the energy and associated emissions that it takes to extract, transport, process and manufacturer the raw materials that make up building products.

Major sources of embodied carbon emissions:

- Concrete and cement
- Steel products
- Aluminum and other metals
- Glass

Annual Carbon Emissions:
US numbers from EPA



Timeline for CALGreen code updates on Embodied Carbon

2022 intervening code cycle updates go into effect

July 1, 2024

Embodied carbon provisions required for projects over **100,000** sf

2025 Code goes into effect

January 1, 2026

Embodied carbon provisions now required for projects over **50,000** sf

2025 intervening code cycle updates go into effect

July 1, 2027

No anticipated changes to embodied carbon provisions

2028 Code goes into effect

January 1, 2029

Updates expected for embodied carbon provisions:

- Lower embodied carbon thresholds
- More on building reuse/preservation
- More building types covered

CALGreen Code Embodied Carbon Mandatory Measure

- *Applies to 100,000+ sq ft nonresidential and 50,000+ sq ft schools starting July 1, 2024*
- *Applies to 50,000+ sq ft nonresidential and schools starting January 1, 2026*

Pathway	Mandatory: Comply with 1 Pathway
Path 1: **Building Reuse** *(Section 5.105)*	45% of the structure and enclosure to be reused
Path 2: **Whole Building LCA (WBLCA)** *(Section 5.409.2)*	10% reduction from baseline
Path 3: **Prescriptive Approach (Product Limits)** *(Section 5.409.3)*	175% or less of Industry-Wide Environmental Product Declarations Global Warming Potential limits (IW-EPD GWP limits)

Covered projects: as of July 1, 2024

- **Projects covered by the new embodied carbon code sections:**
  - Nonresidential new construction under authority of the Building Standards Commission (BSC) over 100,000 square feet*
    - Nonresidential portions of mixed-use buildings (if over 100,000 sf)
    - Additions, modernizations or repurposed buildings that, in aggregate, are over 100,000 square feet*
  - School projects:
    - Schools projects under authority of the Department of the State Architect (DSA)
      - Over 50,000 square feet
    - Schools under authority of BSC*
      - Over 100,000 square feet

*Projects under authority of BSC will drop to 50,000 square feet in January 2025

Projects that are NOT covered

- **Any residential buildings under authority of Housing & Community Development (HCD) are not required to meet these provisions**
  - Residential occupancies including single family homes, hotels, motel, etc.
  - Residential portions of multi-use buildings
  - Any residential occupancies regulated by HCD
- **DSA, OSHPD, UC and State Universities may have their own procedures for compliance**

Compliance Pathway 1: Building Reuse

Path 1: Building Reuse

Demonstrate that 45% or more of the structure and enclosure are being reused

Can include rehabilitation, retrofits, and renovations that maintain the core structural elements of the building

StopWaste offices, Oakland
LEED® Platinum certified, 2007

Compliance

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 documentation

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%

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)
Primary Structural Elements of Existing Building(s) (foundations; columns, beams, walls, and floors; and lateral elements)	_____ SF	_____ SF	_____ %
Building Enclosure of Existing Building(s) (roof framing, wall framing and exterior finishes only)	_____ SF	_____ SF	_____ %

Total % Reuse of Required Elements ≥ 45% _____ %

Compliance Pathway 2:
Whole Building Life-Cycle Assessment

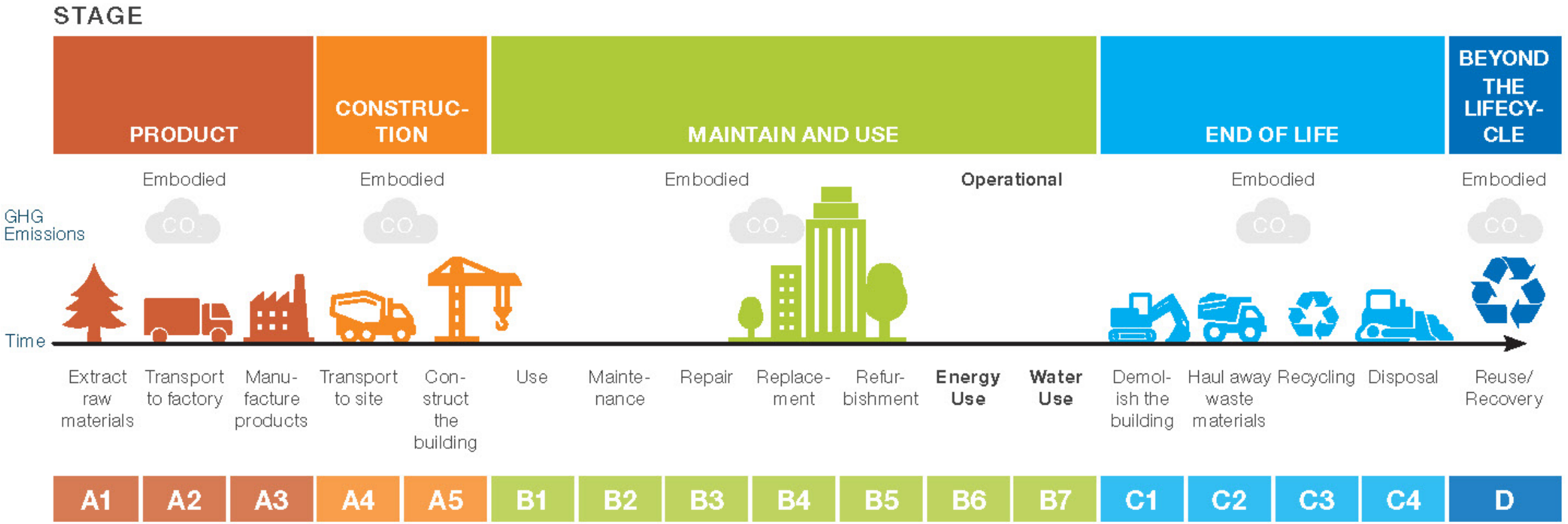
Path 2: Whole Building Life-Cycle Assessment

Requirements:

- Conduct a Whole Building Life-Cycle Assessment (WBLCA)
- Demonstrate at least 10% reduction in Global Warming Potential (GWP) compared to a baseline building
- Include these building components at a minimum:
  - Structural footings, foundations, columns, beams, walls, roofs and floors
  - Enclosure components: glazing, insulation and exterior finishes
- The WBLCA shall represent a 60-year lifespan

Life-cycle stages

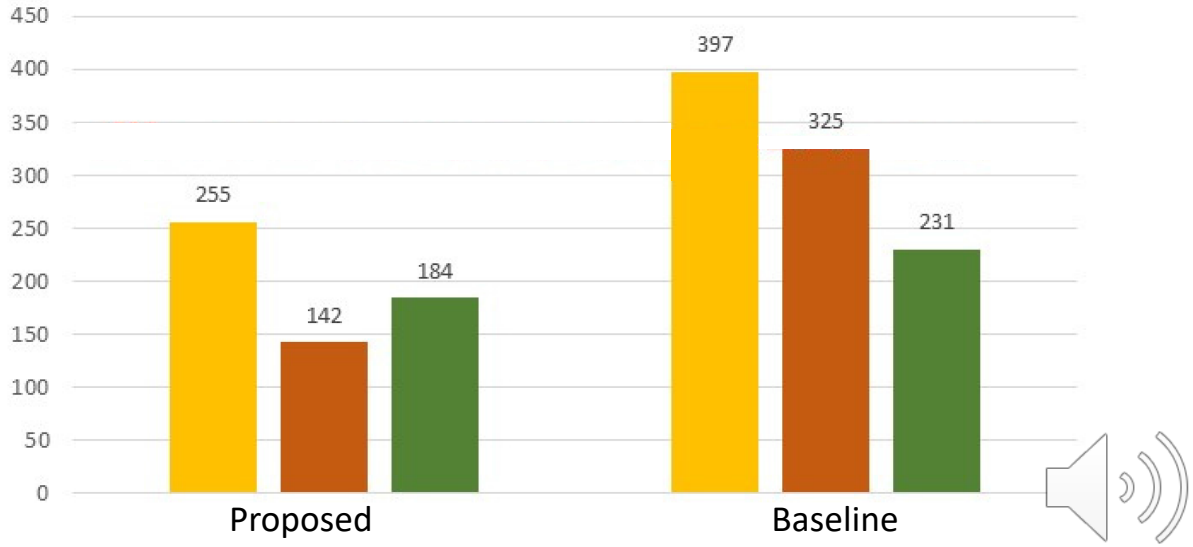
FIGURE 1: LIFECYCLE STAGES
Data source: BS EN 15978:2011



Comparing to a baseline

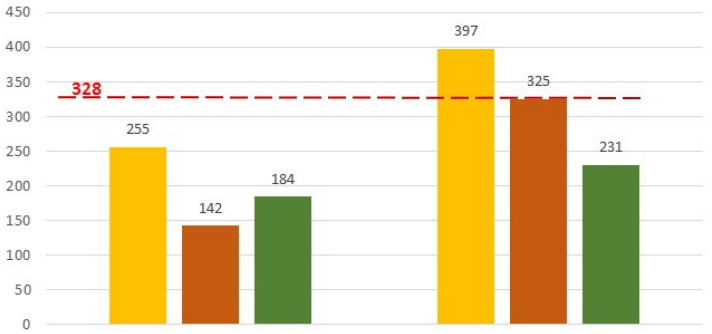
The project's design team will calculate the materials related embodied carbon impacts using software.

They will calculate the base scenario for the building project and compare their proposed project to demonstrate a 10% reduction.



Compliant WBLCA reports

- The baseline model must be project-specific
- Reductions are based on design optimizations
- Reductions based on material substitutions
- Most projects will use software tools to demonstrate compliance



Compliance steps

- Ensure the scope of the WBLCA is cradle-to-grave
- Review a summary of the GWP analysis produced by the software tool used
- Review the worksheet WS-4 (sample found in CALGreen Chapter 8) and ensure it is signed by the design professional for accuracy and completeness
- Worksheet WS-9 is optional but can help in project review

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:

Optional Worksheet WS-9

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
LCA Modeler (company) *[private]*		
Date of Model Run (mm/yyyy)		
Project Phase at Model Run		
Reference Study Period (years)		
Software and Version Used*		
Biogenic Carbon Included* (y/n)		
Model Floor Area		m2

Overall scope included (select all that apply)

- ☐ Structure (required)
- ☐ Enclosure (required)
- ☐ Interiors (optional)
- ☐ MEP (optional)
- ☐ Site/Landscaping (optional)
- ☐ FFE (optional)

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):						

Percent Reduction	
Mandatory	
Tier 1	
Tier 2	

A1-A3*
(A1) Raw Material Supply, (A2) Transport to Factory, and (A3) Manufacturing

A4*
(A4) Transportation to site

A5*
(A5) Construction Installation or "on-site energy use". Leave blank if unkown

B1-B5*
(B1) Use, (B2) Maintenance, (B3) Repair, (B4) Replacement, (B5) Refurbishment

C1-C4*
(C1) Deconstruction/Demolition, (C2) Transport to Waste Processing/Disposal, (C3) Waste Processing, (C4) Disposal of Waste

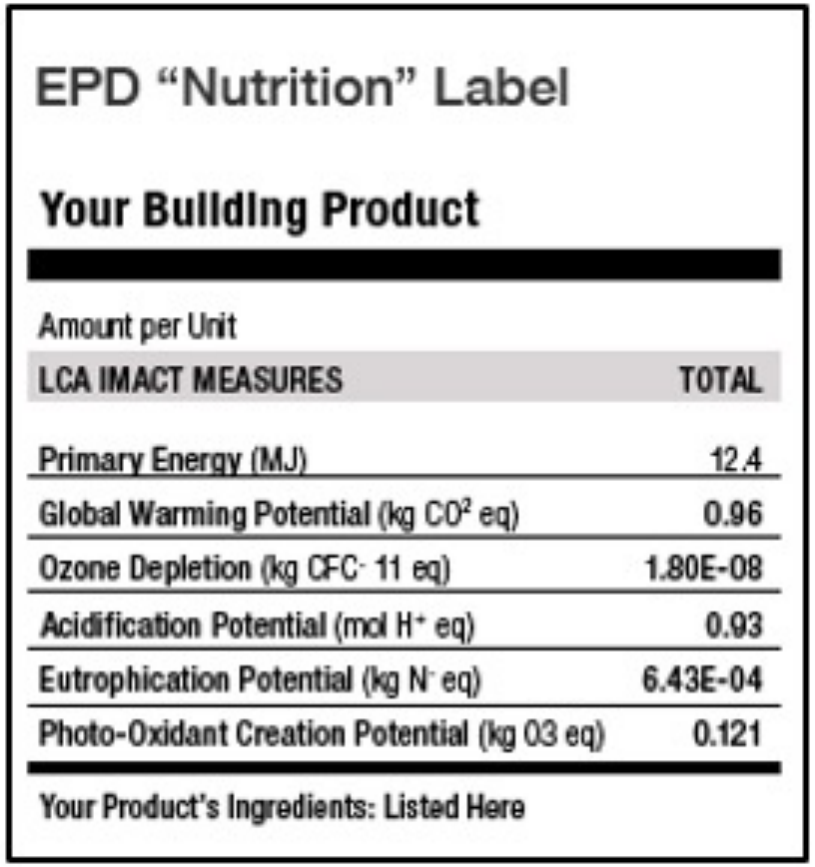
D*
(D) Reuse-Recovery & Recycling Potential

Optional Items - Proposed Design ONLY

Compliance Pathway 3: Prescriptive Approach (GWP Limits)

What is an Environmental Product Declaration?

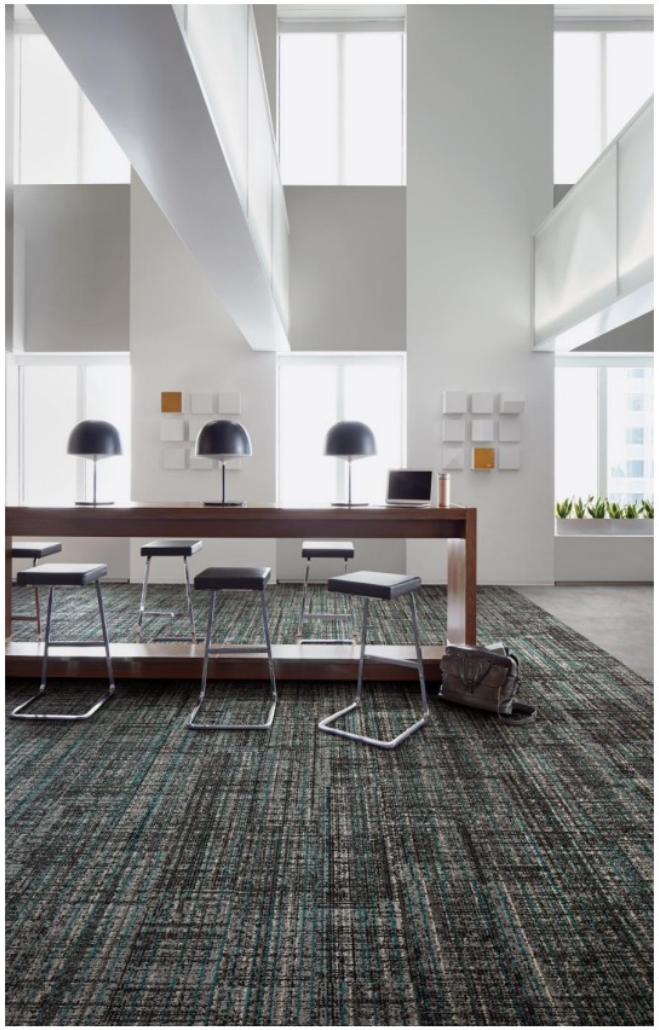
- ”Nutrition Label” for products
- Information = Impact
- Cradle-to-gate or Cradle-to-grave
- Reports lifecycle impacts:
  - Global Warming Potential (embodied carbon)
  - Eutrophication (excessive nutrients in waterways)
  - Depletion of the stratospheric ozone layer
  - Acidification (acid rain)
  - Tropospheric ozone formation (smog)
  - Depletion of nonrenewable energy resources
  - Ecotoxicity
  - And more!



ENVIRONMENTAL PRODUCT DECLARATION

MODULAR CARPET

INTERFACE, INC AMERICAS
GLASBAC ®, NYLON



GlasBac®
Modular Nylon Carpet

Interface®

For more than four decades, Interface has consistently led the industry through design and innovation and is a world leader in environmental sustainability. We a committed to transparency and wi continue to share our progress as we work to become a carbon negative company by 2040.

At Interface, we believe Life Cycle Assessment is critical for evaluatin the environmental impacts of our products. The LCA-based Environmental Product Declaratio is the best way to provide full disclosure of those impacts to our customers.

Interface was one of the first companies to develop EPDs for a of our products manufactured globally, and we are committed to providing this level of transparenc to our customers, partners and the industry.

For more information visit
www.interface.com

CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

Interface®

Interface, Inc Americas
Modular Carpet on GlasBac®
Nylon

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

Results of the LCA – Product stage A1-A3 TRACI Global Warming Potential (GWP) measured in kg CO^2-e for additional product yarn weights (ounces per square yard / grams per square meter)

YARN WEIGHT (OZ./YD²) AND (GM/M²)		GWP MEASURED IN KG CO2-E
12 oz.	407 gr.	4.14
13 oz.	441 gr.	4.22
14 oz.	475 gr.	4.30
15 oz.	509 gr.	4.38
16 oz.	542 gr.	4.46
17 oz.	575 gr.	4.54
18 oz.	610 gr.	4.62
19 oz.	644 gr.	4.70
20 oz.	678 gr.	4.78
21 oz.	712 gr.	4.85
22 oz.	746 gr.	4.93
23 oz.	780 gr.	5.01
24 oz.	814 gr.	5.09
25 oz.	848 gr.	5.17
26 oz.	881 gr.	5.25
27 oz.	915 gr.	5.33
28 oz.	949 gr.	5.41
29 oz.	983 gr.	5.49
30 oz.	1017 gr.	5.56
31 oz.	1051 gr.	5.64
32 oz.	1085 gr.	5.72
33 oz.	1119 gr.	5.80
34 oz.	1153 gr.	5.88
35 oz.	1187 gr.	5.96
36 oz.	1220 gr.	6.04
37 oz.	1254 gr.	6.12
38 oz.	1288 gr.	6.20
39 oz.	1322 gr.	6.27
40 oz.	1356 gr.	6.35
41 oz.	1390 gr.	6.43
42 oz.	1424 gr.	6.51

ENVIRONMENTAL PRODUCT DECLARATION

Interface®

Interface, Inc Americas
Modular Carpet on GlasBac®
Nylon

According to ISO 14025, EN 15804, and ISO21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Environment 333 Pfingsten Road Northbrook, IL 60611	https://www.ul.com https://spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	General Program Instructions v.2.5 March 2020	
MANUFACTURER NAME AND ADDRESS	Interface, Inc.; Troup County, Georgia, USA	
DECLARATION NUMBER	4789956802.106.1	
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	One square meter functional floor covering	
REFERENCE PCR AND VERSION NUMBER	PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. 10010 Version 3.2. UL Environment. December 2018 PCR Guidance for Building-Related Products and Services Part B: Flooring EPD Requirements. 10010-7 Version 2. UL Environment. September 2018.	
DESCRIPTION OF PRODUCT APPLICATION/USE	Modular flooring	
PRODUCT RSL DESCRIPTION (IF APPL.)	15 years	
MARKETS OF APPLICABILITY	Americas	
DATE OF ISSUE	October 1, 2021	
PERIOD OF VALIDITY	5 Years	
EPD TYPE	Product Specific	
RANGE OF DATASET VARIABILITY	Industry average	
EPD SCOPE	Cradle to gate with options	
YEAR(S) OF REPORTED PRIMARY DATA	2020	
LCA SOFTWARE & VERSION NUMBER	GaBi v. 9	
LCI DATABASE(S) & VERSION NUMBER	GaBi v. 9.2.169	
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1/ CML 4.2	

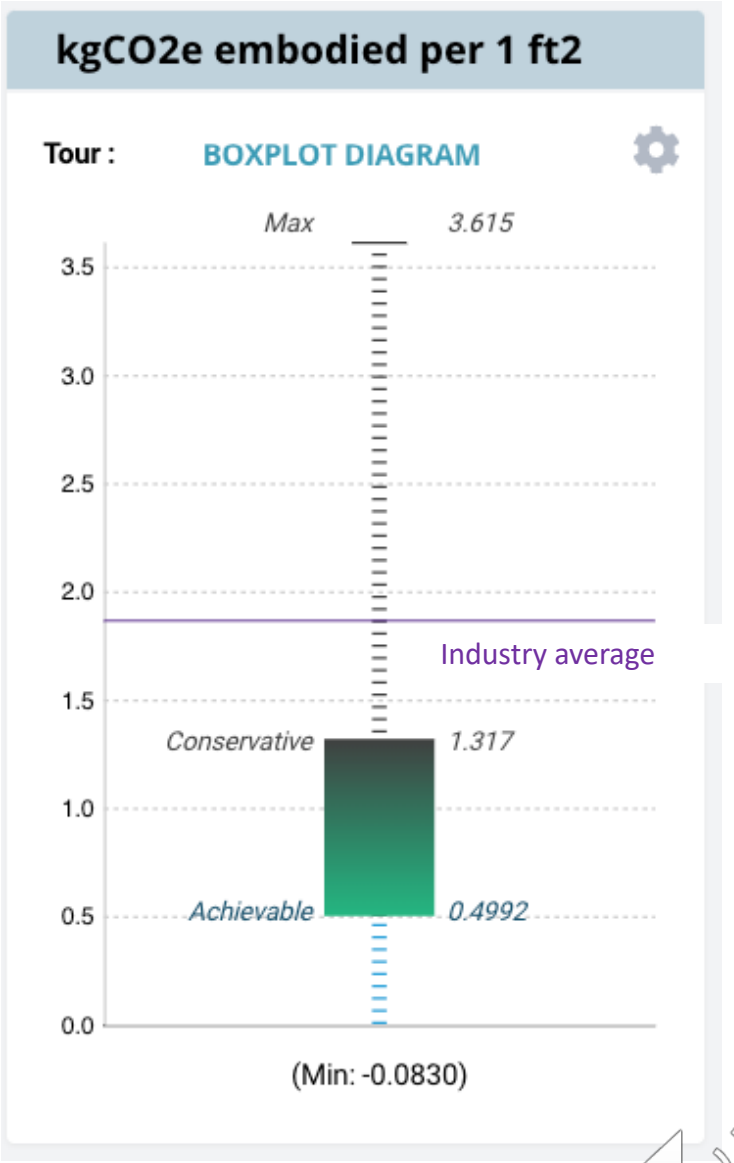
This PCR review was conducted by:	UL Environment PCR Review Panel epd@ulenvironment.com
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Thomas P. Gloria, Industrial Ecology Consultants
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas P. Gloria, Industrial Ecology Consultants

Prescriptive Pathway: EPDs

Targets specific high-embodied carbon materials for structure & enclosures

Project teams select low-embodied carbon products that have EPDs

Teams then compile results and compare against industry average values published in the code



Path 3: EPDs

Each product category must meet GWP limits that are 175% of industry average values

TABLE 5.409.3
PRODUCT GWP LIMITS

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

Prescriptive Concrete 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.

Verification of compliance.

- Calculations to demonstrate compliance
- Type III EPDs for products required to comply
- Worksheet WS-5 signed by the design professional of record
- EPDs to be provided to the owner at the close of construction and to the enforcement entity upon request.

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:

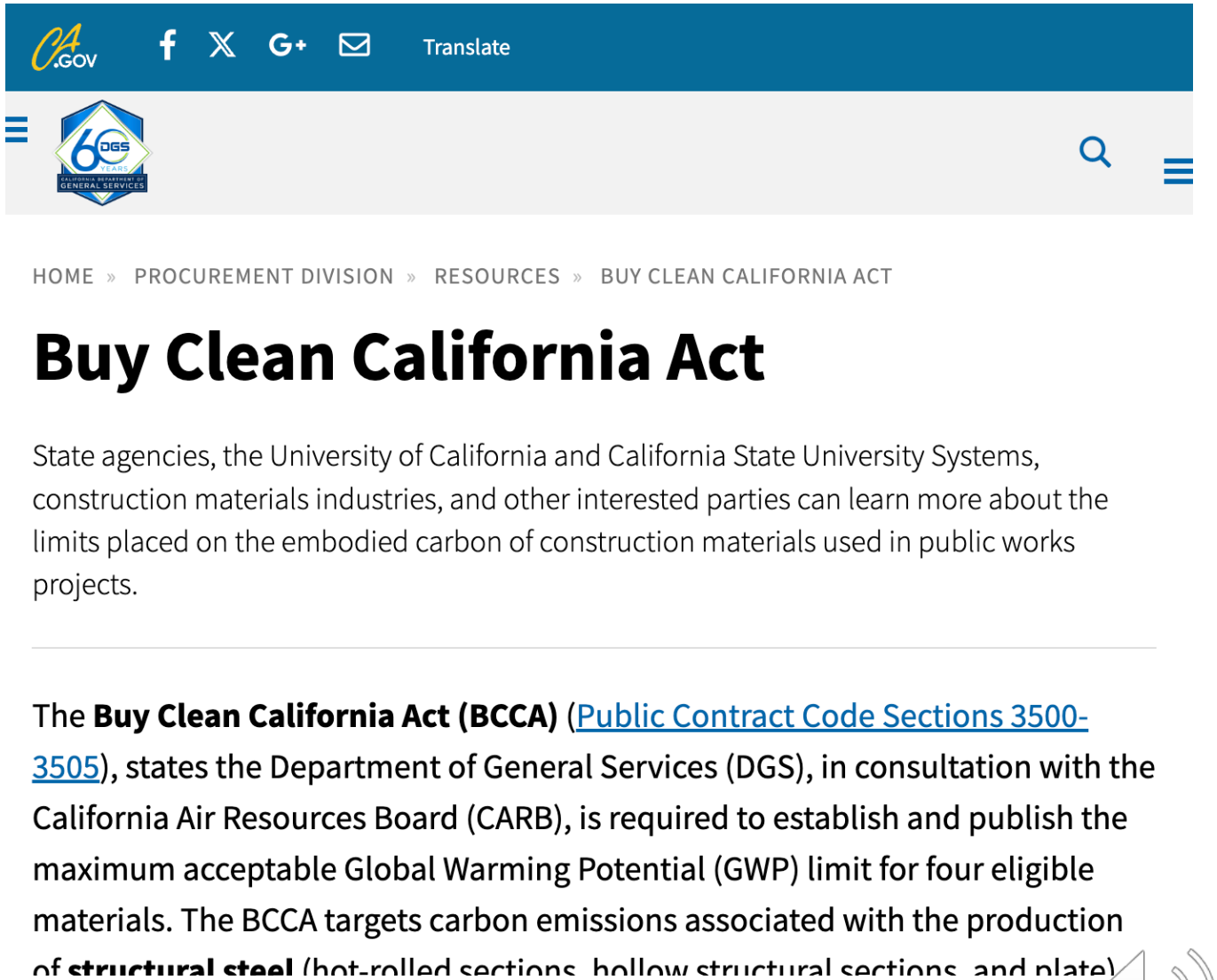
Conclusion & Resources

State and Federal action on embodied carbon

Buy Clean California Act

Federal Buy Clean Federal

US Gov't spending $400 million on embodied carbon data for manufacturers



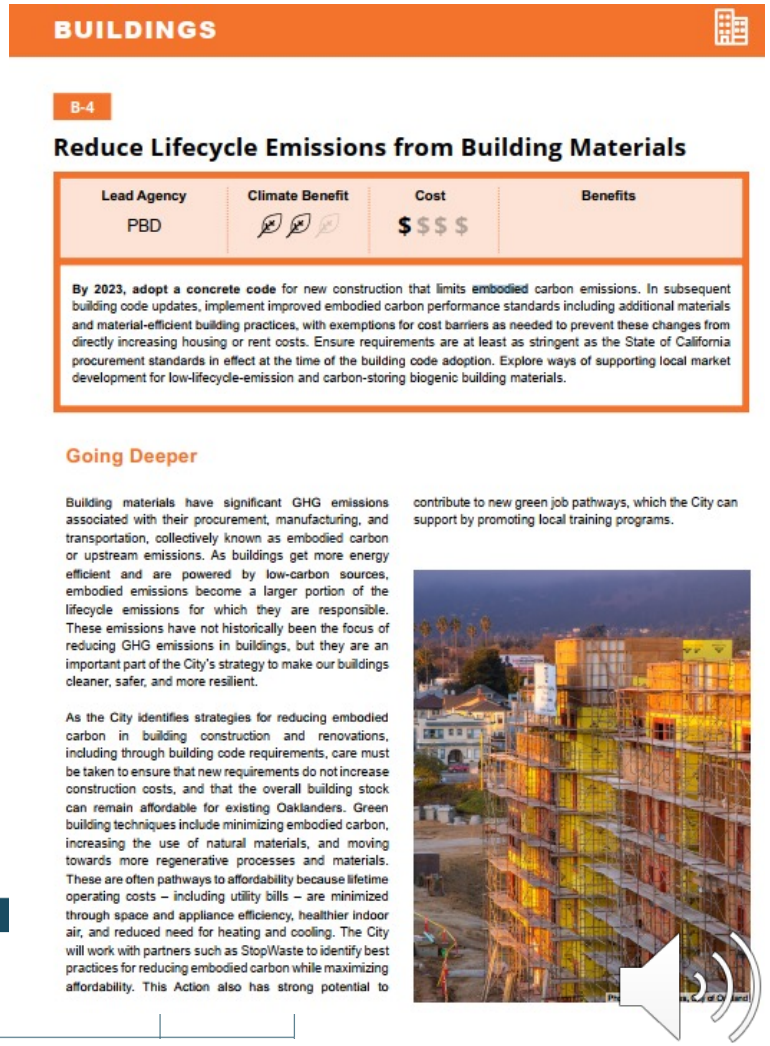
Local Governments Acting on their Own

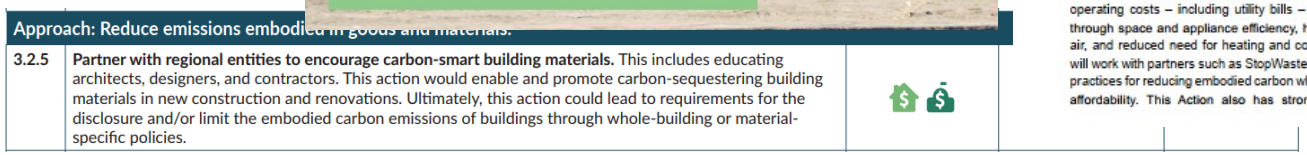
Marin County (and Palo Alto)
Low Carbon Concrete Code

Emeryville
Mass Timber Bonus Points

Embodied Carbon in Bay Area Climate Action Plans

- Albany
- Contra Costa County
- Dublin
- Fremont
- Livermore
- Oakland
- Marin County
- Pleasanton
- San Francisco
- San Leandro





Resources

- **View the CALGreen code online:**

  https://codes.iccsafe.org/content/CAGBC2022P1

- **Official Guide to CALGreen (supplement) available on BSC website:**

  www.dgs.ca.gov/BSC/CALGreen

- **Third party resources**
  - Carbon Leadership Forum website: https://carbonleadershipforum.org/resource-library
  - American Institute of Architects (AIA) website: www.aia.org/landing-pages/6456754-zero-carbon .
- **More online resources coming soon**

Please contact us for questions or comments on the embodied carbon code measures in CALGreen

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