CLIMATE ACTION WEBINARS

Wednesday 06.12.24
1 LU|HSW / 1hr ZNCD MCE

CALGREEN EMBODIED CARBON SERIES

Building Reuse for Decarbonization and Compliance

AIA California

SEAOSC
STRUCTURAL ENGINEERS ASSOCIATION OF SOUTHERN CALIFORNIA

Learning Objectives

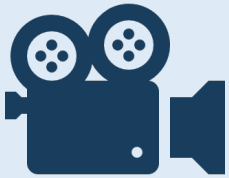
Discover benefits of existing building reuse and how it contributes to operational and embodied carbon emissions reductions, both now and in the future.

Review the requirements for CALGreen embodied carbon mandatory code compliance through the existing building reuse pathway.

Walk through example calculations that are required to demonstrate CALGreen code compliance.

Study existing building reuse examples, discuss associated carbon reductions, and what design professionals can do to support these projects.

Housekeeping Reminders



Access to today's recording will be made available on our website

Today's session qualifies for 1 AIA HSW/LU & 1hr of ZNCD

Please use the Q&A function to ask questions for today's presenters

Cultivate a positive learning environment

CALGreen Embodied Carbon Series Moderators

Luke Lombardi, PE
Sr. Sustainability Consultant, Buro Happold

Avideh Haghighi, AIA, LFA
Associate Principal
Sustainable Design Lead, ZGF

Today's Speakers

Irina Brauzman, AIA
Supervising Architect,
California Building
Standards Commission
(CBSC)

Hafsa Burt, AIA, LEED Fellow, LFA, ENV SP
Principal,
hb+a Architects

Isabelle Hens, LEED AP BD+C, WELL AP
Senior Environmental Designer,
Atelier Ten

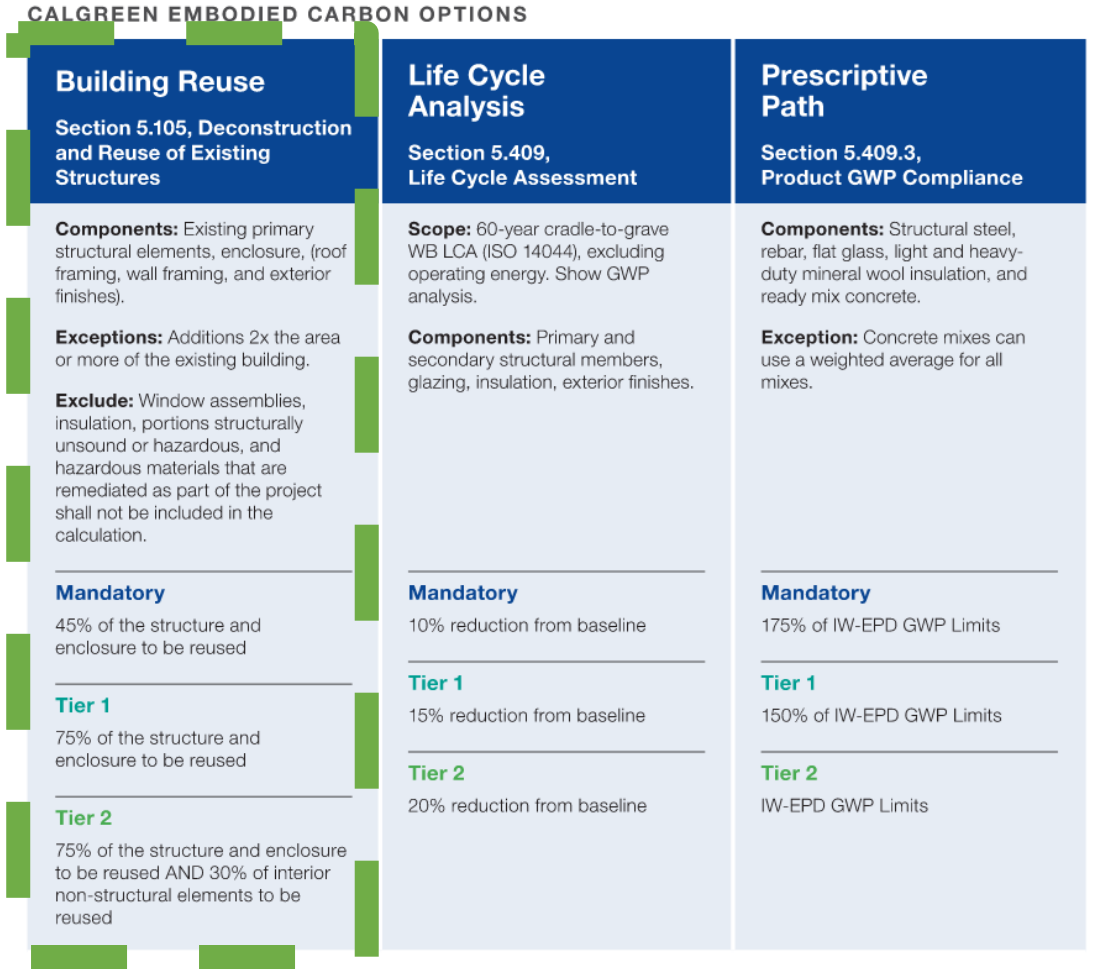
CALGreen Embodied Carbon Series

4-part series made in partnership with SEAOC's Sustainable Design Committee

Feb. 21, 2024	Understanding the 2023 Embodied Carbon Amendments
Mar. 13, 2024	WBLCA for Code Compliance
Apr. 10, 2024	Implications of Material Procurement for Design Professionals
June 12, 2024	**Building Reuse for Decarbonization and Compliance**

Refresher from last webinar

- Starting July 1, 2024
- Non-residential buildings over 100,000 sf
- Schools over 50,000 sf
- **Three compliance pathways**



California Energy Codes and Standards: CALGreen Embodied Carbon Requirements Fact Sheet

Is my project covered by the measure?

Covered

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)

Not Covered

Non-residential Projects < 100,000 sf
(< 50,000 sf effective January 1, 2026)

Public school (K-12) and community college
(projects < 50,000 sf)

Projects under OSHPD authority
Hospitals, Skilled Nursing Facilities, etc.

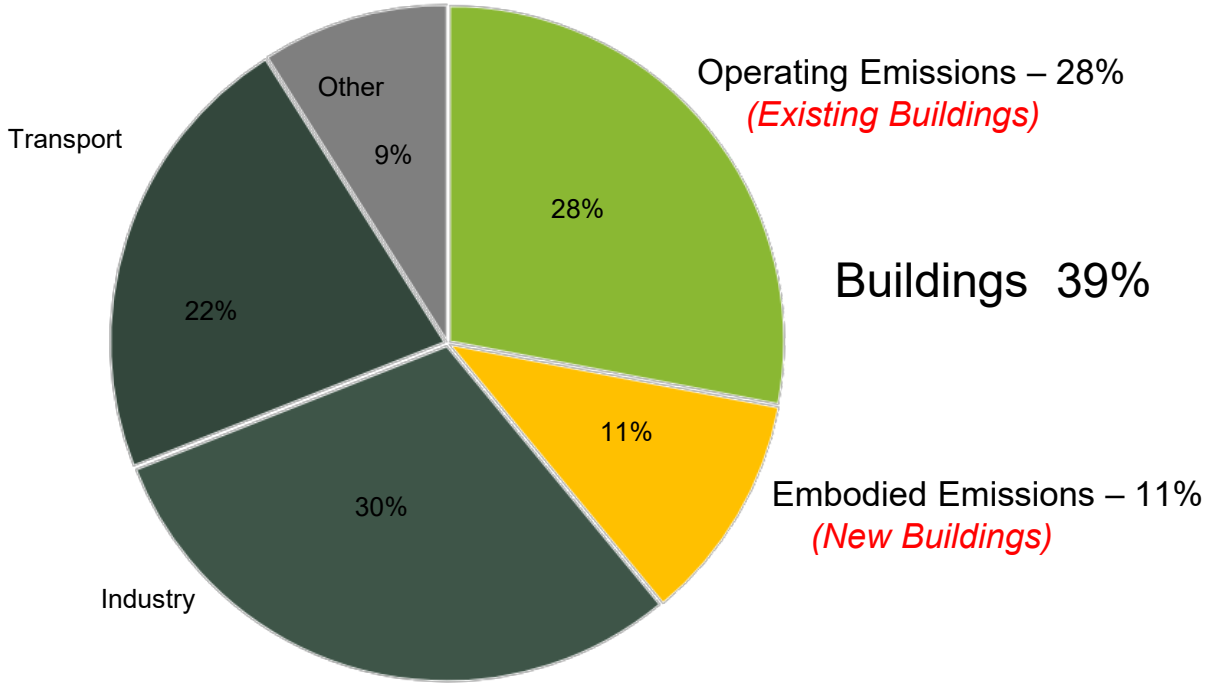
Residential Projects under HCD authority
Single Family, Multifamily, Hotel, Motel, etc.

Today’s Outline

1. Introduction
2. Why existing buildings matter
3. Building Reuse for CALGreen Compliance
4. What architects and design professionals are doing right now
5. Q&A

Why Existing Buildings Matter

Annual GHG emissions by end use



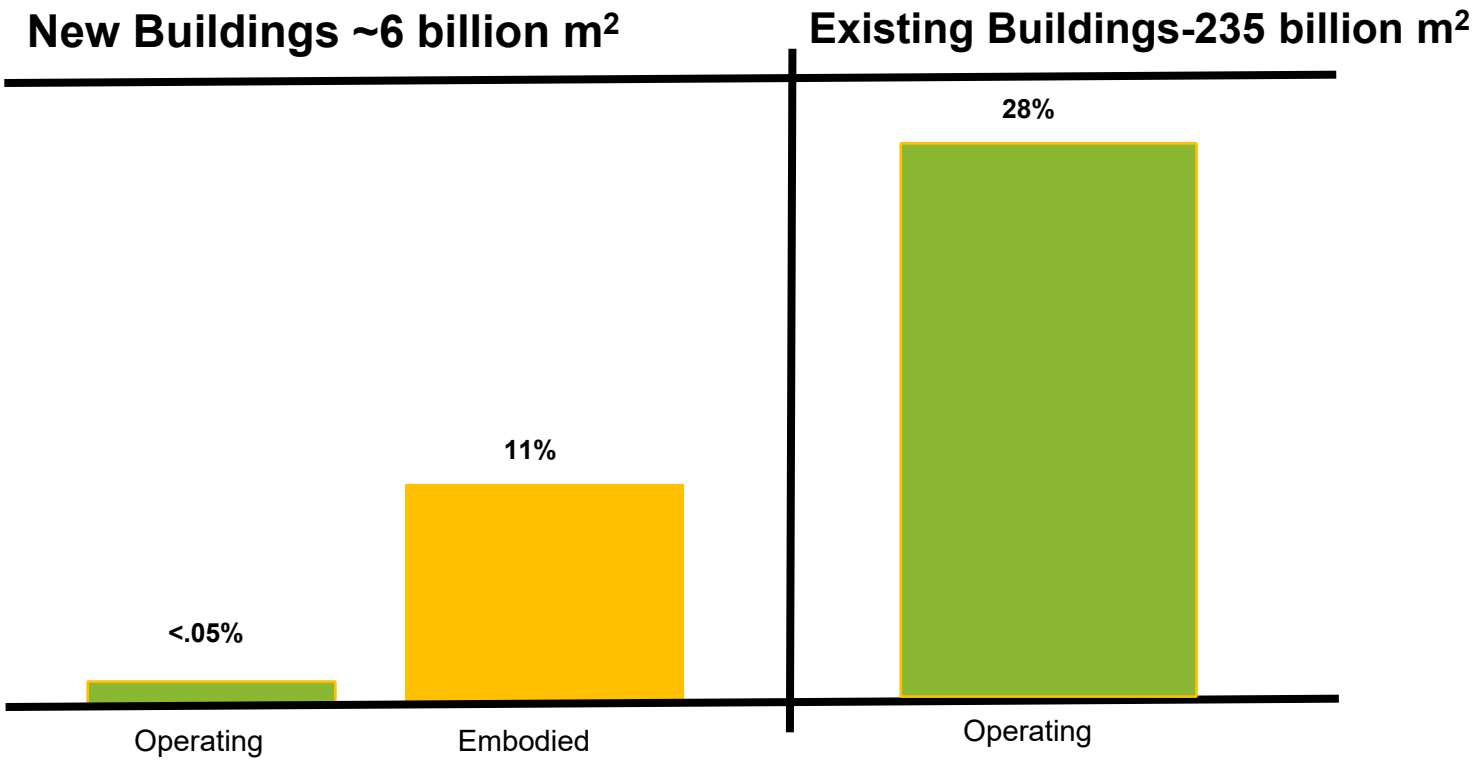
2019 Global Status Report, Global Alliance for Building and Construction and Architecture(GABC)

Why existing buildings matter

We have a lot of buildings ~ 235 billion m^2 / yr
- they are not very efficient
- we can't afford to replace them all
- we can't afford to leave them alone

We build a lot of buildings ~ 6 billion m^2/yr
- more efficient to operate, but not to build
- we can't afford to keep building them all

Annual Global GHG Emissions from Buildings



Building Reuse for CALGreen Compliance

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

(See next slide)

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

(See next slide)

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%

Project Examples

What architects are doing right now


TERRA
LEASING
OFFICE

Terra Glen, San Jose

3.28 Acres
Original construction - 1978
Apartments in the Community - 112 (avg. size 1000 sf)
Buildings in the Community - 11/2 Stories

95% of Original Structure Reused.
65% of Original Enclosure Reused.
Building Envelope Improvements:
Original Structure Exposed in all Amenity spaces
Stucco replaced with Bamboo
Energy Efficiency upgrades to Insulation:
Polyiso (6.8) Roof
XPS (5) Walls
(N) Windows for Daylight
(E) Windows/Doors Upgraded: Dual Pane, Low E Glazing in Insulated Frames.
HVAC upgrades: SEER HVAC units with Zone Control and SMART Thermostats
Ceiling Fans
Low Flow Fixtures for Water Efficiency

- **Faucets: Maximum flow rate of 1.5 gallons per minute (gpm) at 60 psi.**
- **Showerheads: Maximum flow rate of 2.0 gpm at 80 psi.**
- **Toilets: Maximum flush volume of 1.28 gallons per flush (gpf).**
- **Urinals: Maximum flush volume of 0.5 gpf.**

Low VOC Materials:

- **Interior Paints: ≤ 50 g/L for flat finishes**
- **Exterior Paints: ≤ 100 g/L for flat finishes**
- **Adhesives: ≤ 70 g/L for general purpose adhesives**
- **Wood Finishes: ≤ 250 g/L for clear wood finishes, ≤ 350 g/L for wood sealers**

Tenant wide Comprehensive Recycling (Weather Resistant 95 Gallon Bins) and Composting (Vented bins to reduce odors) Program w/ central Collection points
Sustainable Landscaping using native plants and permeable pavements, efficient irrigation systems with smart controls
Amenities for Well Being (Fitness Center, common areas and play spaces)
ADA Upgrades for all Common Areas and large Amenity spaces

hb+a Architects

Terra Glen, San Jose

Documentation (internal) process:

Building, located at . . . . .
The building has remained unoccupied for the past 8 months. Ownership records show that the another entity has owned the building for the last five years. There have been no active lease agreements for the past 8 months as supported by utility reports. Structural and environmental assessments have identified significant issues, including major roof leaks, foundation cracks, and the presence of asbestos. Photographic evidence and inspection reports further confirm the building's neglected condition.

- Exterior Photos: overgrown landscaping, and signs of neglect.
- Interior Photos: empty spaces, broken fixtures
- Detailed Survey
- Structural Assessment: Indicating major structural issues such as roof leaks, foundation cracks, and/or compromised load-bearing walls.
- Environmental Assessment: Identifies presence of asbestos in insulation materials and mold due to water leaks.

$$\text{Reuse Percentage} = \left(\frac{\text{Quantity of Reused Materials}}{\text{Total Quantity of Materials in the Project}} \right) \times 100$$

Vs LEED MR (Building Life-Cycle Impact Reduction) Credit

$$\text{Reuse Percentage} = \left(\frac{\text{Area or Volume of Reused Elements}}{\text{Total Building Area}} \right) \times 100$$

Hikari Sales, Hayward, CA

Original Construction 1971

Building - Concrete Tilt Up Panels - Typical Bay 22'x73'

6 Acre Site

4 ply built up roof

Demand for Commercial Spaces in the area

Existing Layout was Assessed for commercial use with factors such as ceiling height, floor loading capacity, and access.

Full Compliance for ADA, cause construction cost was above DSA Threshold.

Comprehensive upgrades for emergency evacuation that included procedures for assisting individuals with disabilities along with visual and auditory alarms, accessible evacuation routes, and areas of refuge.

Commercial Parking Requirements per City of Hayward Zoning 1/1000 sf, plus ADA and EV parking requirements per chapter 11 and CalGreen, up to 38 EV Capable, 1 per every 25 Accessible parking

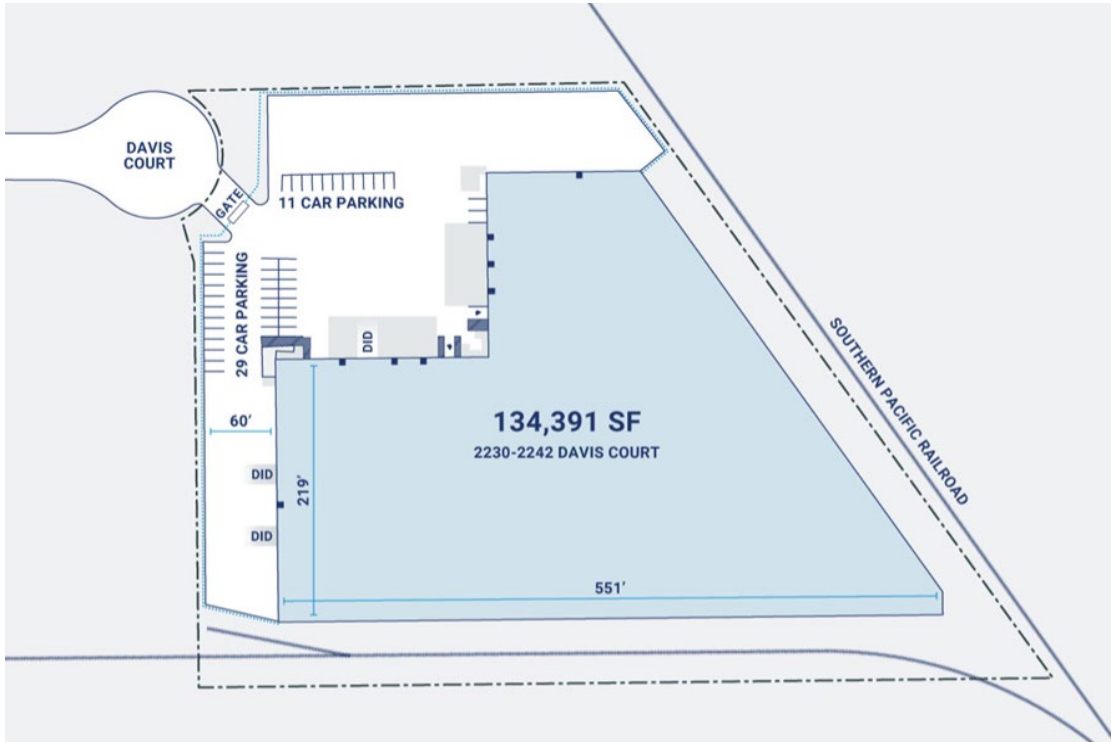
Path Path travel updates inside and out

Energy Efficiency - Tilt-up concrete buildings inherently benefit from the thermal mass of the concrete walls to stabilize indoor temperatures by absorbing and releasing heat.

Rooftop Units with Min. EER of 10.8 and zoned controls, R4.2 insulation for ducts

Ventilation rates per ASHRAE 62.1-2016 for indoor air quality requiring a minimum of 5 cubic feet per minute (cfm) per person plus 0.06 cfm per square foot of floor area. Code Min. MERV 13 Filtration

Blower tests to quantify air infiltration rates and identify areas needing sealing or remediation specifically in penetrations and joints. Lighting and Controls upgraded to optimize productivity and uniform



hb+a Architects

Hikari Sales, Hayward, CA

Change of Occupancy

New Mezzanine (structural implications)

Functional Performance testing for Equipment and controls.

Entire Enclosure and Structure Re-used.

Identify Materials

(E) Concrete (for floors)

Gypsum board (for new interior walls)

Flooring retained

hb+a Architects

Hikari Sales, Hayward, CA

WORKSHEET (WS-3)
5.105.2 BUILDING REUSE

DOCUMENTATION OF COMPLIANCE OF EXISTING BUILDING REUSE

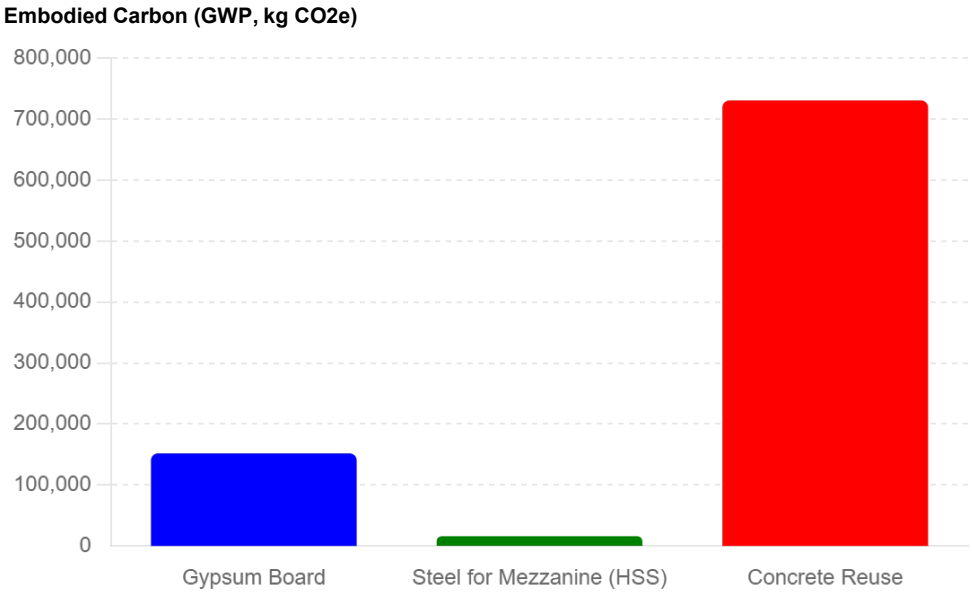
Area of Existing Building(s) _____ SF

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% _____ %

Hikari Sales, Hayward, CA



Embodied Carbon for New Materials

Gypsum Board:

- **Total Wall Area**: 166,841.74 sq ft
- **Emission Factor (GWP)**: 0.910 kg CO2e/sq ft
- **Embodied Carbon**: 151,901.18 kg CO2e
- Percentage: 16.90%

Steel for Mezzanine

- **Mezzanine Area**: 9,999.66 sq ft
- **Steel Quantity**: 9.29 tons
- **(HSS) Emission Factor (GWP)**: 1.71 metric tons CO2e/metric ton (1,710 kg CO2e/metric ton)
- **Embodied Carbon**: 15,885.9 kg CO2e
- Percentage: 1.77%

Concrete Reuse Calculation

- **Total Reused Concrete Volume**: 86,037.20 ft³
- **Emission Factor (GWP)**: 8.495 kg CO2e/ft³
- **Embodied Carbon Reduction**: 730,890.00 kg CO2e
- Percentage: 81.33%

BUILDING REUSE

Horton Plaza

Project Info

Location	San Diego, CA
Building area	1,381,960 ft^2 (incl. parking)
Program	Mixed-use
Project type	Adaptive Reuse
Status	Construction in progress

Team

Client	Stockdale Capital Partners
Architect	RD Collaborative, RIOS
LCA	Atelier Ten
Structural	Miyamoto International

WBLCA Parameters

Scope	A1-A4, B1-B5, C1-C4
Boundary	Substructure, superstructure, enclosure, Interiors
Service life	60 years
Phase	CD

Embodied Carbon Reduction Strategies

Adaptive reuse of substructure and superstructure
Concrete embodied carbon reduction
Low-carbon facade panels

Image by RD Collaborative

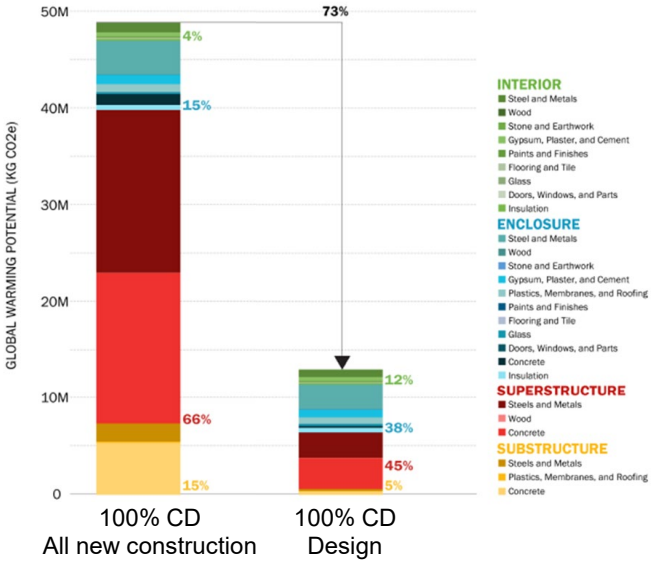


Image by Atelier Ten

Q & A

Thank you!

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AIA members should receive today's course credit on your transcript within 1-2 weeks.

ZNCD certificates for members and non-members will be sent via email to those who qualify.