

SE 2050

# EMBODIED CARBON **ACTION PLAN**

2024

# INTRODUCTION

“There is a rapidly closing window of opportunity to secure a **liveable and sustainable future for all**... The choices and actions implemented in this decade will have impacts now and for thousands of years.”

– IPCC, 2023 Summary for Policymakers

IPCC, 2023: Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34, doi: 10.59327/IPCC/AR6-9789291691647.001

Rapid, deep reductions in global greenhouse gas emissions are needed across all industries to secure a safe future for generations to come. At our core, Degenkolb’s purpose is to **engineer the future for our clients and communities**, and we are committed to being part of the climate solution. Since signing onto the SE 2050 Commitment in 2021, we have been actively working to reduce the environmental impacts of our projects by extending structures’ service lives, designing efficient systems, procuring lower-carbon products, and tracking our impacts by conducting embodied carbon assessments. In the next year, our primary focuses are firm-wide education and resource sharing as we expand offices, and leveraging our in-house embodied carbon accounting tool, EnviCASE, on more projects.

▶ **SE 2050 Mission Statement:** All structural engineers shall understand, reduce and ultimately eliminate embodied carbon in their projects by 2050.

## 2023 YEAR IN REVIEW

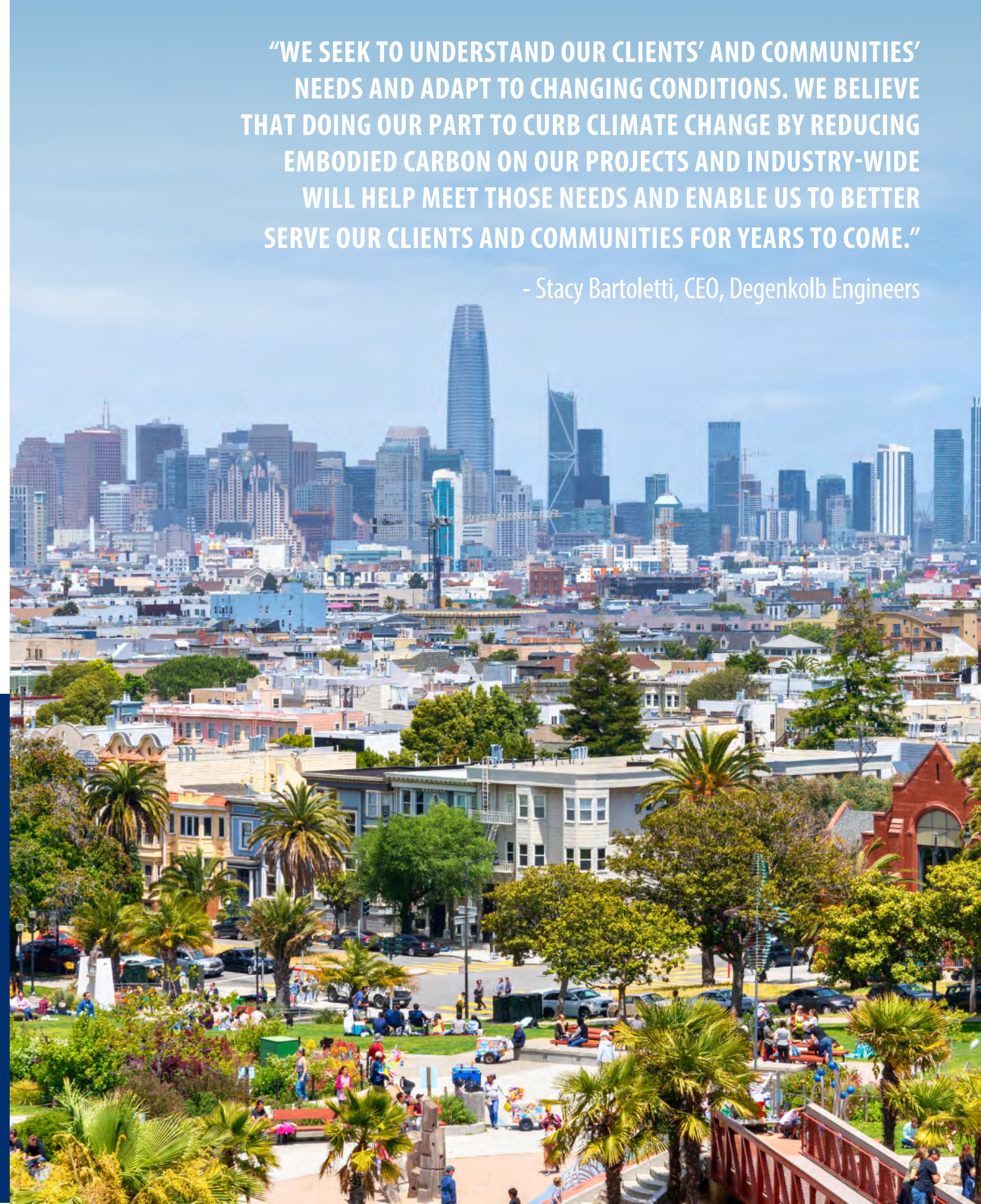
- ▶ In 2023, Degenkolb **committed to firm-wide education** about embodied carbon. We grew company-wide engagement in our Embodied Carbon Interest Group, revamped our internal resources hub, and attended countless webinars and presentations.
- ▶ In March 2024, we **publicly released EnviCASE**, our embodied carbon calculation tool suited to the structural engineer’s workflow.
- ▶ We established a **mass timber** working group, to grow and share our experience and expertise.
- ▶ We **increased our engagement** in state and national sustainability committees, and shared our knowledge at national conferences.

## 2024 KEY ACTIONS

- ▶ **Committing to firm-wide education and adoption**
  - ▶ Engage every office in our expanding company
  - ▶ Perform EnviCASE embodied carbon assessments on major projects

“WE SEEK TO UNDERSTAND OUR CLIENTS’ AND COMMUNITIES’ NEEDS AND ADAPT TO CHANGING CONDITIONS. WE BELIEVE THAT DOING OUR PART TO CURB CLIMATE CHANGE BY REDUCING EMBODIED CARBON ON OUR PROJECTS AND INDUSTRY-WIDE WILL HELP MEET THOSE NEEDS AND ENABLE US TO BETTER SERVE OUR CLIENTS AND COMMUNITIES FOR YEARS TO COME.”

– Stacy Bartoletti, CEO, Degenkolb Engineers



# PEOPLE

► **Degenkolb's Sustainable Design Committee** manages the firm's involvement in SE 2050 by leading our firm-wide embodied carbon education program, developing our LCA capabilities, updating our specifications and standard design practices, and advocating for embodied carbon reduction.



**ELENA GOOD**  
Embodied Carbon Reduction Champion  
Project Engineer, Oakland



**ARIANE ROSARIO**  
Reduction Team Lead  
Project Engineer, San Francisco



**COREY BECK**  
Reporting Team Lead  
Design Engineer, Oakland



**RYAN WHITE**  
Education Team Lead  
Design Engineer, San Francisco



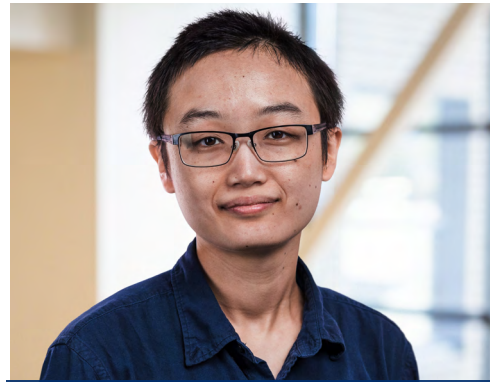
**VINCENT WENZEL**  
Advocacy Team Lead  
Design Engineer, San Francisco



**MORGAN MICHNA**  
Marketing Specialist, San Francisco



**KYLE STEUCK**  
Principal, Seattle



**EVELYN LI**  
Design Engineer, Los Angeles



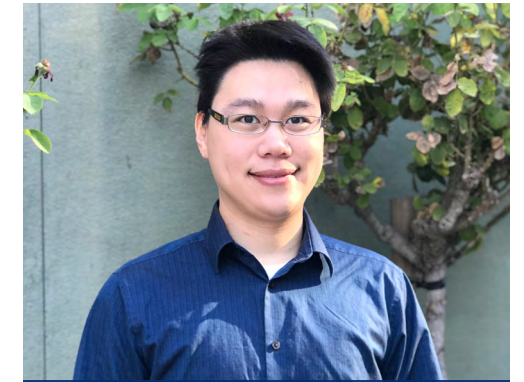
**RAY PUGLIESI**  
Senior Principal, San Francisco



**BRENDIN RANDALL**  
Designer 3, Oakland



**CLAUDIA ZAPATA-KRAFT**  
Designer 2, Orange County



**CHARLIE CHI**  
Project Engineer, Sacramento



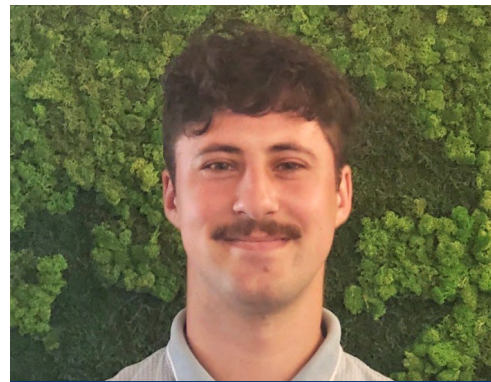
**CLAIRE KILLIAN**  
Designer 2, San Francisco



**PRIYA HELLE**  
Designer 2, Oakland



**JOSEPH RODGERS**  
Designer 2, San Francisco



**AUSTIN ANDERSON**  
Designer 2, Seattle



**CANDICE HANNA**  
Design Engineer, San Diego



**MICHELLE ATTO**  
Associate, Detroit

# EDUCATION

**Educating our employees on embodied carbon and our internal resources** is crucial in order to maximize our embodied carbon reduction. Degenkolb is looking to use a more structured approach to expand and connect our education throughout all our offices and employees.

- We plan to increase knowledge and usage of our internal embodied calculation tool with engineers acting as local LCA and **embodied carbon experts** at each office.
- We have **increased participation in our Embodied Carbon Interest Group (ECIG) meetings** and will continue to educate our employees on new and emerging embodied carbon topics.
- Last year, we assembled an **internal embodied carbon resource hub and directory**. It contains presentations, an event calendar, spreadsheets, and other tools to aid in education about and reduction of embodied carbon for all Degenkolb employees.
- Degenkolb has recently expanded to new offices in Michigan. We are working on **expanding our onboarding training** to get our newer employees up to speed on embodied carbon accounting tools, reduction strategies and more.
- We aim to **collaborate with an external presenter** in the AEC industry to host an internal presentation, further growing our knowledge base.

## MEMBERS OF THE DEGENKOLB SUSTAINABLE DESIGN AND WORKPLACE COMMITTEES AT OUR ANNUAL INTERNAL CONFERENCE IN SAN FRANCISCO



### ACTIONS

2023

- ✓ Continued to host and increased engagement in firm-wide Embodied Carbon Interest Group (ECIG)
- ✓ Created an internal resource hub to share tools, presentations, and upcoming events
- ✓ Achieved committee involvement across our offices

2024

- ▶ Engage an embodied carbon expert at every office
- ▶ Expand onboarding education
- ▶ Host an external presenter to discuss embodied carbon

BEYOND

- ★ Provide every Degenkolber with baseline knowledge and access to resources for embodied carbon reduction on every project
- ★ Engage in industry sustainability committees in all of our geographic regions

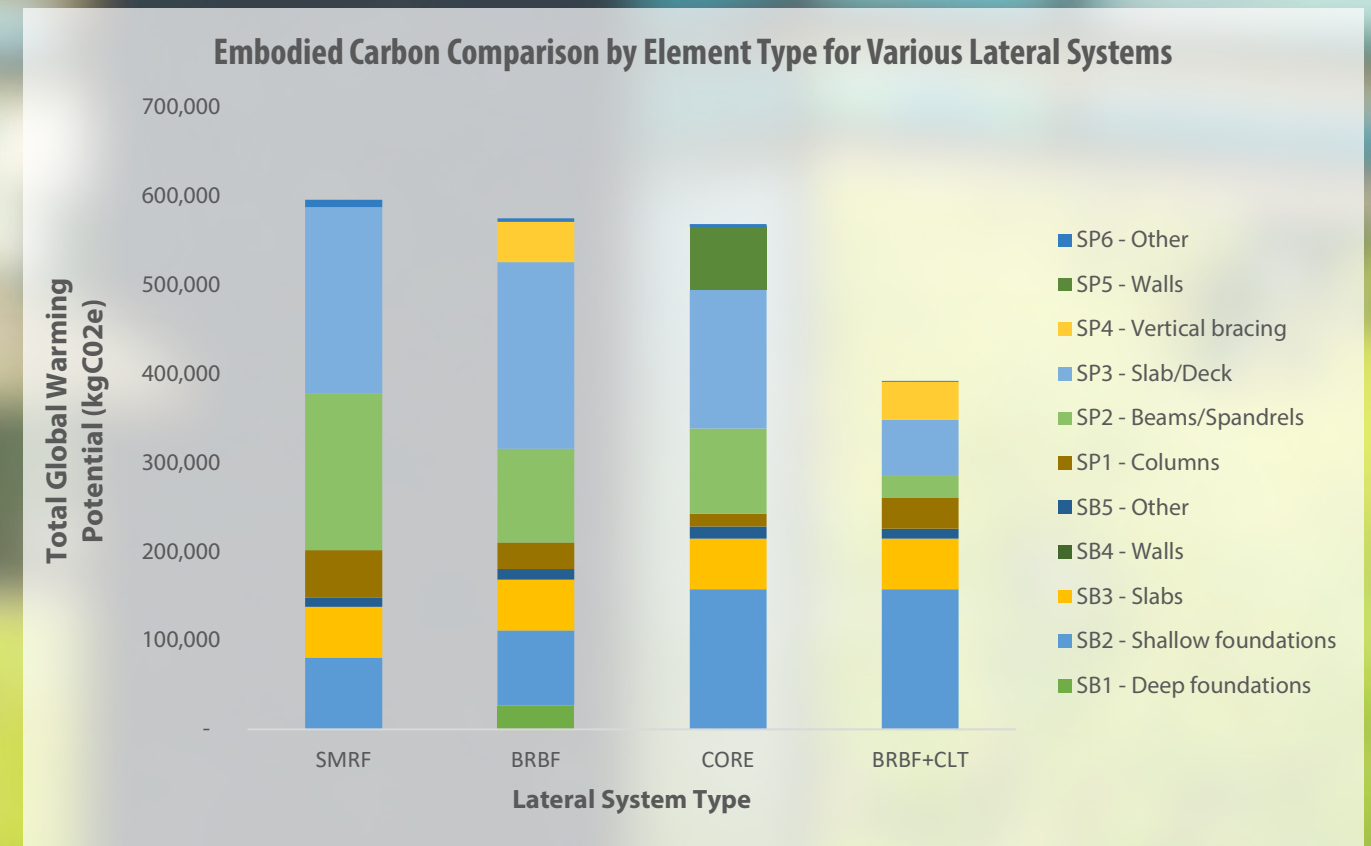
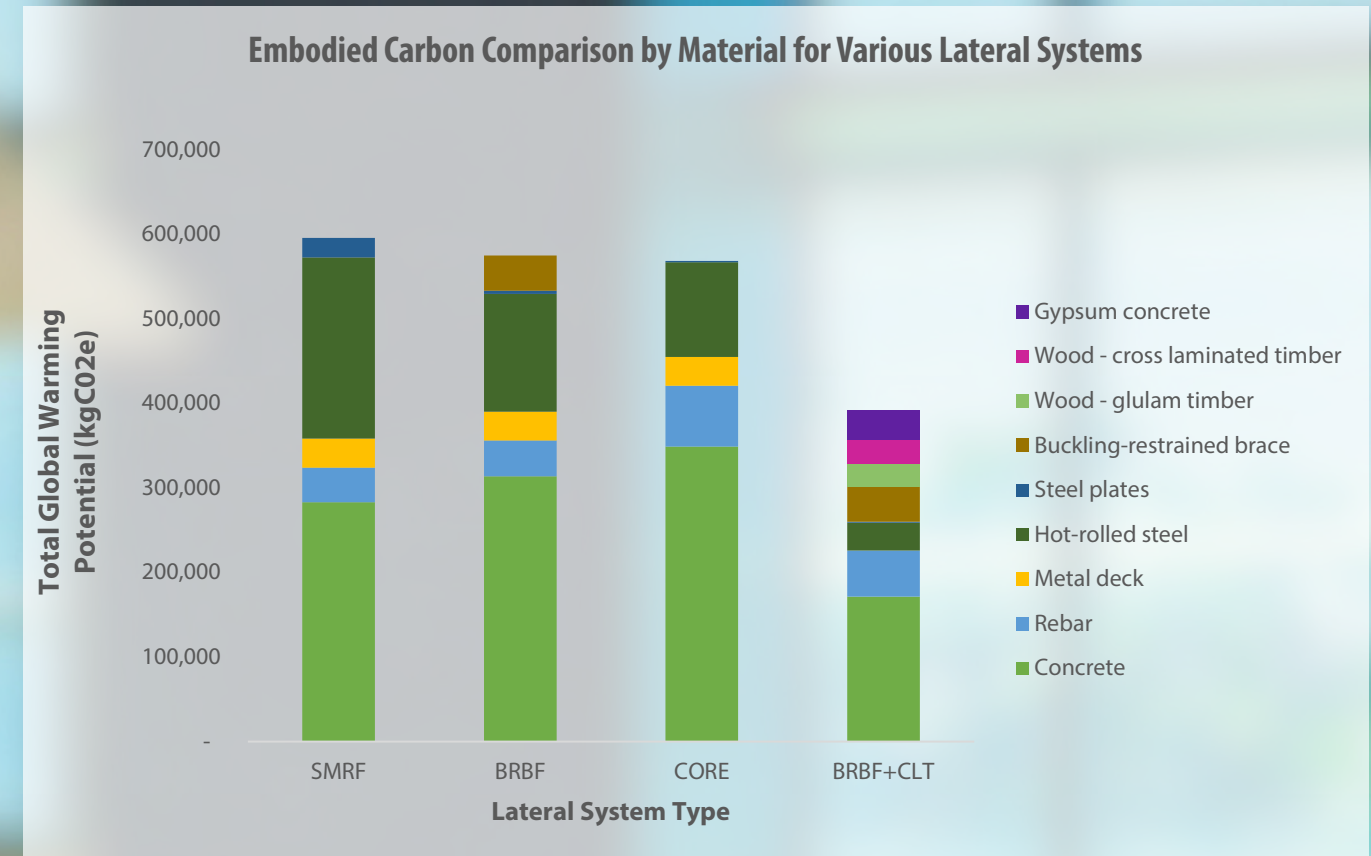
# REPORTING

Degenkolb understands the **importance of quantifying the embodied carbon in our designs**. As we continue to collect data related to buildings' embodied carbon, Degenkolb is focused on better understanding, in both a new-design and retrofit setting, the leading contributors to these emissions. By refining our understanding, we can set targeted, proactive goals focused on reducing our environmental impact.

- Degenkolb is a growing company with offices of all different sizes. This year, we plan to **normalize reporting requirements across the company** based on project volume, project type, or revenue.
- In early 2024, Degenkolb released our **internal embodied carbon calculator (EnviCASE)** to the public for free to support SE 2050's shared goal of carbon neutral projects. Degenkolb will continue advertising the benefits of the tool with the hope of engaging other structural engineering firms.
- A large portion of Degenkolb's work is in the retrofit space. We are continuing to **study how different retrofit schemes affect a building's environmental impact** over the remaining life of the structure.
- Last year, Degenkolb developed an internal database to collect information on project's embodied carbon footprint. This year, we plan to **develop case studies to compare the embodied carbon impact** of projects with similar building types designed by different offices.

## ACTIONS

- 2023**
  - ✓ Submitted 2+ projects per west-coast-based US office to the SE 2050 database.
  - ✓ Publicly released in-house embodied carbon calculator EnviCASE
  - ✓ Developed internal database for quantifying company's carbon impact
- 2024**
  - ▶ Develop submittal guidelines for embodied carbon calculation
  - ▶ Publish internal case studies comparing embodied carbon impact of similar buildings
  - ▶ Publicize EnviCASE to engage more firms in the SE 2050 commitment
- BEYOND**
  - ★ Perform LCAs for all significant Degenkolb projects
  - ★ Use database to set EC targets on each project
  - ★ Advise clients on potential EC savings for different structural schemes or retrofits



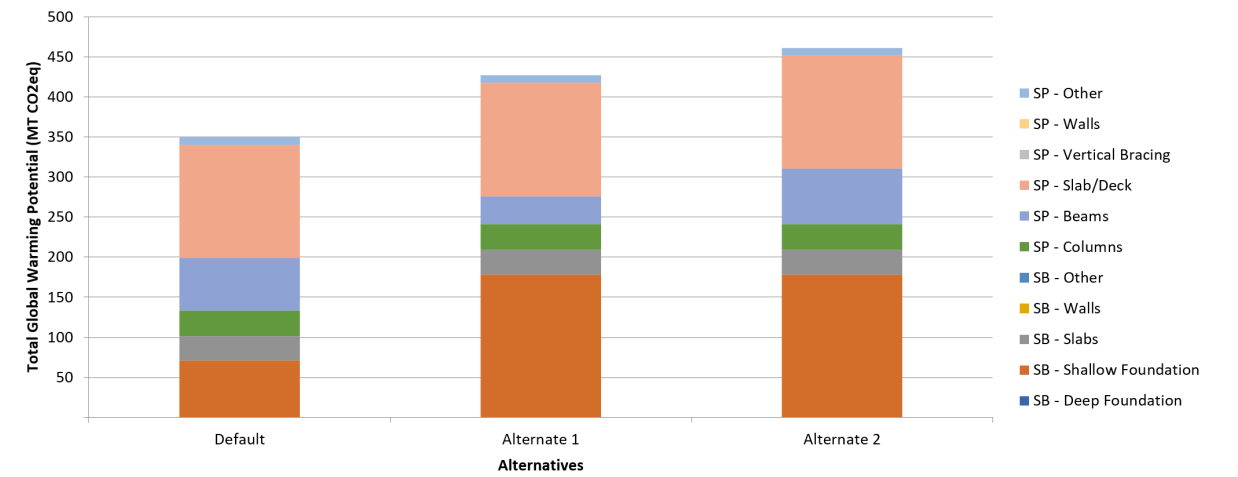
**DEGENKOLB USED OUR IN-HOUSE EMBODIED CARBON ESTIMATION TOOL TO COMPARE LATERAL SYSTEM TYPES IN THE SCHEMATIC DESIGN PHASE FOR A THREE-STORY HEALTHCARE ADMINISTRATION BUILDING. THE LOWER EMBODIED CARBON WAS A FACTOR IN MOVING FORWARD WITH A MASS TIMBER DIAPHRAGM AND GRAVITY SYSTEM.**

The **AEC community must take the lead on climate change**. Buildings are one of the largest overall contributors of carbon emissions to the atmosphere. As such, Degenkolb has developed and released **EnviCASE** (Environmental Carbon Accounting for Structural Engineers) to assist firms of all sizes in quantifying and reducing their projects' carbon impact. Structural engineers, equipped with EnviCASE, yield consequential power to fight climate change. The tool is publicly available on Degenkolb's website [here](#) and runs off Microsoft Excel.

**Structural engineers can use EnviCASE to compile information across every component of a building embodied carbon assessment from cradle to gate, including:**

- **CARBON INTENSITY** - Quantify intensity of carbon for each material used in a project, choosing between industry standard values provided for all common building materials or custom values.
- **MODEL INTEGRATION** - Tabulate material quantities used throughout a project by synthesizing data from analysis programs such as RAM and ETABS with user inputted data.
- **CARBON VISUALIZATION** - Visualize calculations with plots showing the project's total carbon emissions broken down by material, structural element, or even custom grouping. Easily summarize the quantities needed to submit to SE2050 for each project.
- **PROJECT COMPARISON** - Easily develop project alternatives and visualize the embodied carbon of each alternative side-by-side using our built-in comparison tool.

Embodied Carbon Comparison of Alternatives by SE2050 Grouping



**PROJECT COMPARISON**



**CENTRAL CONCRETE**  
ENVIRONMENTAL PRODUCT DECLARATION  
Mix 3E5E75E1 • Stockton (wet) Plant

This Environmental Product Declaration (EPD) reports the impacts for 1 m<sup>3</sup> of ready mixed concrete mix, meeting the following specifications:

- ASTM C94: Ready-Mixed Concrete
- UNSPSC Code 30111505: Ready Mix Concrete
- CSA A23.1/A23.2: Concrete Materials and Methods of Concrete Construction
- CSI Division 03-30-00: Cast-in-Place Concrete

**COMPANY**  
Central Concrete  
755 Stockton Ave.  
San Jose, CA 95126

**PLANT**  
Stockton (wet) Plant  
790 Stockton Ave  
San Jose, CA 95112

**EPD PROGRAM OPERATOR**  
ASTM International  
100 Barr Harbor Drive  
West Conshohocken, PA 19428

**ENVIRONMENTAL IMPACTS**

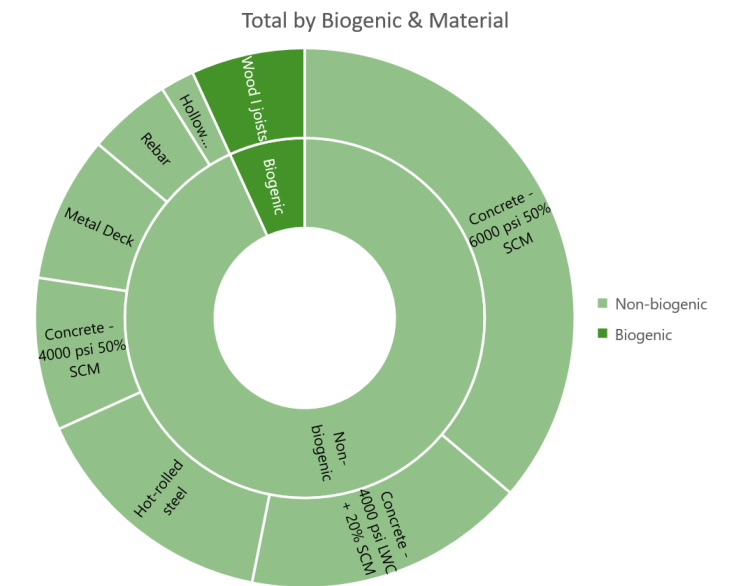
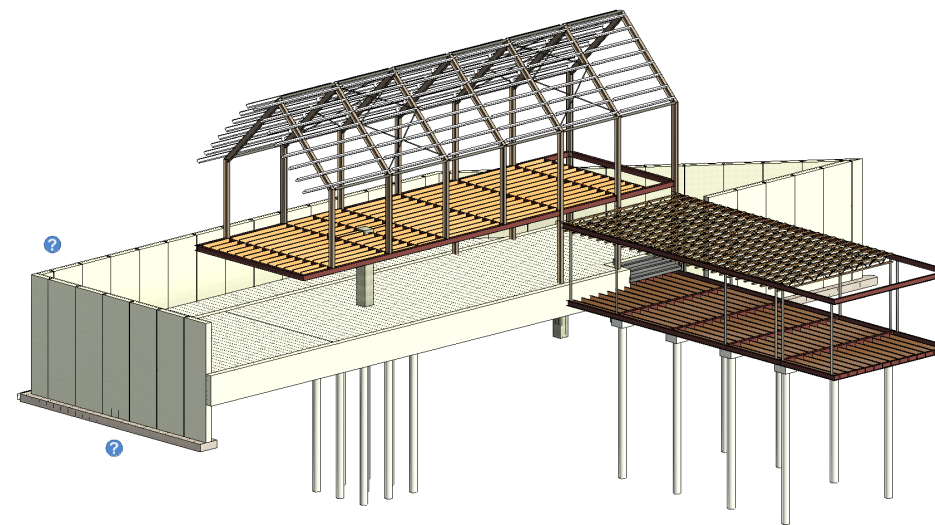
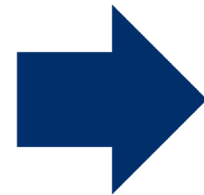
**Declared Product:**  
Mix 3E5E75E1 • Stockton (wet) Plant  
Description: **3IN LN 0.45W/C 1" 25FA 3-SSL**  
Compressive strength: **6500 PSI at 28 days**

**Declared Unit:** 1 m<sup>3</sup> of concrete

Global Warming Potential (kg CO <sub>2</sub> -eq)	<b>294</b>
Ozone Depletion Potential (kg CFC-11-eq)	9.40E-6
Acidification Potential (kg SO <sub>2</sub> -eq)	1.50
Eutrophication Potential (kg N-eq)	0.35
Photochemical Ozone Creation Potential (kg O <sub>3</sub> -eq)	32.1
Abiotic Depletion, non-fossil (kg Sb-eq)	5.61E-5
Abiotic Depletion, fossil (kg Cu)	730
Total Waste Disposed (kg)	82.2
Consumption of Freshwater (m <sup>3</sup> )	1.09

**Product Components:** natural aggregate (ASTM C33), Portland cement (ASTM C150), fly ash (ASTM C618), batch water (ASTM C1602), admixture (ASTM C494)

Additional detail and impacts are reported on page three of this EPD



**CARBON INTENSITY**



**MODEL INTEGRATION**

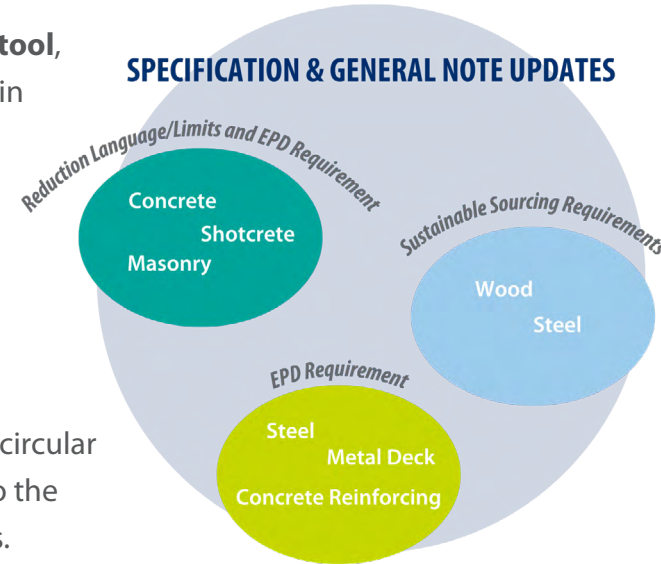


**CARBON VISUALIZATION**

# REDUCTION

**Degenkolb is committed to reducing embodied carbon in the built environment.** Through expanding our carbon accounting tool abilities and reach, improving our standard workflow, drawing, and specification templates, and working closely with staff at all levels, Degenkolb is reducing the carbon footprint in projects.

- This year, Degenkolb continued to **refine and expand material sustainability requirements** in specifications and General Notes. These changes have resulted in increased submission of EPDs from suppliers, as well as lower carbon intensity in concrete mix designs. The sustainability committee works closely with project teams with sustainability goals to incorporate lower-carbon requirements with minimal to no impact on project constructability and cost.
- Degenkolb has published its internal **carbon accounting tool**, EnviCASE, to help compare and reduce embodied carbon in projects within the firm as well as externally.
- Degenkolb **established a mass timber sustainability working group** with a focus on evaluating and incorporating the low carbon benefits of mass timber into standard project workflows.
- In 2024, Degenkolb is aiming to explore the **impact of retrofit and renovation vs. new construction**, as well as circular economy practices and how they can be incorporated into the Degenkolb practice areas via research and project analysis.



**UC IRVINE HEALTH, NEW ACUTE CARE HOSPITAL - DEGENKOLB IS WORKING ON UCI'S NEW STATE-OF-THE-ART HOSPITAL THAT, ONCE OPENED, WILL BE THE FIRST ALL-ELECTRIC HOSPITAL IN THE COUNTRY.**



## ACTIONS

- 2023**
  - ✓ Developed and shared embodied carbon calculator and comparison tool
  - ✓ Updated sustainability requirements of shotcrete and masonry specifications
  - ✓ Updated sustainability requirements of General Notes
  - ✓ Established mass-timber sustainability working group
- 2024**
  - ▶ Investigate circular economy
  - ▶ Explore impact of renovation and retrofit vs replacement
  - ▶ Evaluate commercial LCA tools and incorporate usage into standard workflow where applicable
  - ▶ Gather mass timber resources for incorporation of sustainable language and goals
- BEYOND**
  - ★ Incorporate LCA into standard project practice. Incorporate sustainability benchmarks and goals on every project
  - ★ Incorporate circular economy practices into standard design process
  - ★ Quantify carbon intensity of renovation and retrofit vs. replacement



# ADVOCACY

## KNOWLEDGE SHARING

**Advocating for the reduction of embodied carbon to coworkers, industry peers, and policy makers is essential in fighting climate change.** Structural engineers have the expertise and responsibility to participate. Degenkolb is well-suited to advocate for sustainability due to our firm’s close relationships with great clients, expertise in new and existing buildings, and work in a diversity of markets.

- During the course of our three years participating in SE2050, we have created a wealth of internal resources for staff engineers and project managers to use to understand embodied carbon. Our tools enable project managers to make quantifiable comparisons quickly to inform decisions. Going forward, we will focus on **interacting with clients and the public** to share knowledge.
- Conventionally, each design specialization would work independently. To improve sustainability of projects enough to meaningfully avert climate change, a more collaborative approach is necessary. We **engage early with clients for higher-level discussions:** leveraging our expertise to be an interdisciplinary collaborator to find greater embodied carbon reduction.
- Partnering with architecture firms for **knowledge sharing presentations** is an effective way to improve collaboration. While these may be focused on any technical topic, the interaction strengthens a collaborative relationship.
- Degenkolb participates in **SEI and SEAONC sustainability committees** to advocate within our industry, and with community-based organizations, such as Engineers Alliance for the Arts and ACE Mentor Program of America, to advocate in our communities.
- Our **EnviCASE tool** release advances sustainability in our industry by enabling smaller firms to quantify impact more readily. See the page on EnviCASE in this ECAP for more detail!
- In 2023, Degenkolb Engineers acquired Michigan-based firm **Ruby+Associates**. The wealth of sustainability knowledge Degenkolb has developed are now available to more engineers practicing in new locations and markets. Ruby+Associates’ expertise in steel construction will improve the efficiency in all of our future steel designs.
- We **advocate to policy makers** by following legislation and participating in calls for comments.

**DEGENKOLB’S EMBODIED CARBON CHAMPION, ELENA GOOD, CO-PRESENTED “EMBODIED CARBON 201: A PRACTICAL GUIDE TO CARBON REDUCTION AT EACH PROJECT PHASE” WITH DORIAN KRAUSZ AT THE 2023 NCSEA STRUCTURAL ENGINEERING SUMMIT.**



### ACTIONS

2023

- ✓ Developed resources for project managers
- ✓ Posted blogs and interviews
- ✓ Presented at industry conferences: NCSEA and NASCC

2024

- ▶ Participate in SEI and SEAONC sustainability committees
- ▶ Continue to post media
- ▶ Engage in policy and material standards development
- ▶ Follow legislation and anticipate how it will impact the industry
- ▶ Advocate for EC reduction on projects with clients and in our communities

BEYOND

- ★ Advocate for EC reduction on projects with clients and in our communities
- ★ Maintain a PM Sustainability Toolbox of resources relevant to EC advocacy
- ★ Contribute to the wider body of knowledge about EC
- ★ Work with government bodies and policy makers



# CONTACT US & GET INVOLVED



Degenkolb aims to be a model for embodied carbon reduction in structural engineering. We look forward to collaborating with our excellent peers in SE2050 to fight climate change.

- ▶ Email us at [sustainability@degenkolb.com](mailto:sustainability@degenkolb.com)
- ▶ Look us up at [degenkolb.com/se2050/](https://degenkolb.com/se2050/)
- ▶ Follow us on Instagram [@degenkolbengineers](https://www.instagram.com/degenkolbengineers)
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