


# Embodied Carbon Action Plan

2024

**We are compelled by engineering possibilities.**

**We are open to new ideas and not bound by the rote application of rules.**

**We strive to bring our inquisitiveness to each project for the benefit of our clients.**



Holmes is an international design firm with employees around the Pacific Rim and beyond.

We believe projects become great by what you put into them. With inspired practicality, we reconcile the complex, competing interests and constraints, providing not just engineering but optimal solutions. In this way, we create more meaningful, integrated designs as a collaborative process in the vital pursuit of building great things.

**US OFFICE LOCATIONS**

Boulder, Los Angeles, Portland,  
San Francisco, Seattle

**WEBSITE**

[holmes.us](https://holmes.us)

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# 1.0 Introduction

## A More Global Spin on Net Zero

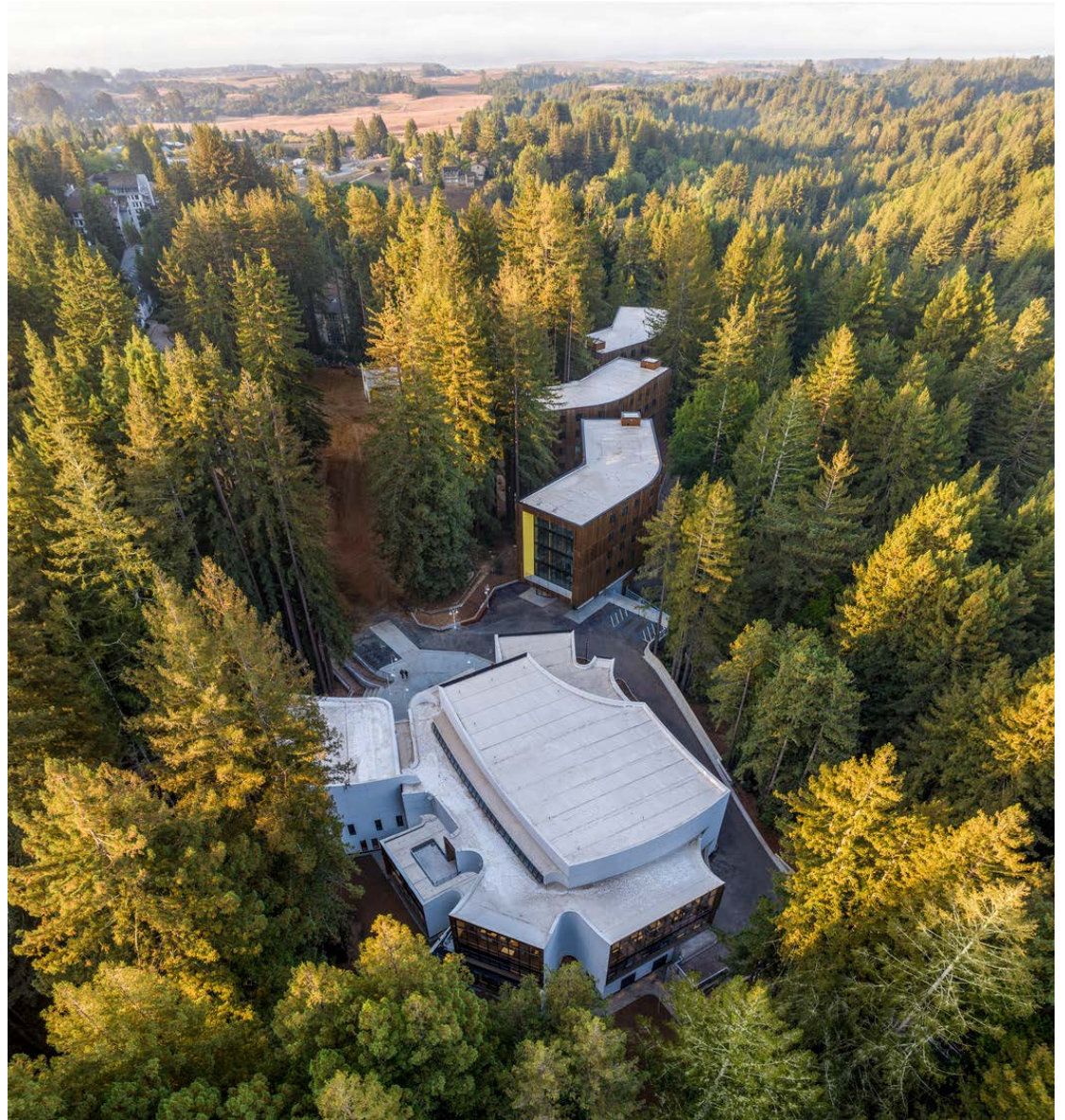
In our fourth year of SE 2050, we're building on our foundation with sustainable strategies across the international Homes Group. This extends to all practice areas and markets (the United States, New Zealand, Australia, and Europe). We are continuing efforts to unify the business and work more closely together. Our sustainability leaders in the US and ANZ are working to build a team of sustainability champions. Through these appointments, Holmes is making real efforts to share resources, knowledge, and upskill our people in decarbonization.

This year we have also been awarded a sustainability internship grant from the Oregon Energy Trust to help us work on our SE 2050 commitment. Having a dedicated resource has helped us increase the number of project LCAs we are able to undertake and dive into Module D LCA and existing building impacts. We look forward to carrying this momentum into another year of commitment to reducing our embodied carbon.

Internally, we are working to calculate our operational impacts for our US business. Externally, we are engaging with our clients reduce our project embodied carbon! We are leveraging our fire engineering and climate risk teams to make more holistic improvements.

“Seeing the increase in demand for lower carbon structures is super exciting. Bringing more to the table with our clients by incorporating sustainable fire strategies and climate risk into our projects is proving to be very rewarding.”

—Megan Stringer, Assoc. Principal & Sustainability Lead



Holmes provided structural and fire engineering of the mass timber components throughout four completed new buildings at UC Santa Cruz - Kresge College.



# 2.0 Education

## Where Curriculum Meets Culture

Holmes is executing a Groupwide Plan for 2023-2024 to continue upskilling our staff while exploring how to best leverage the group and share resources. Our objectives remain:

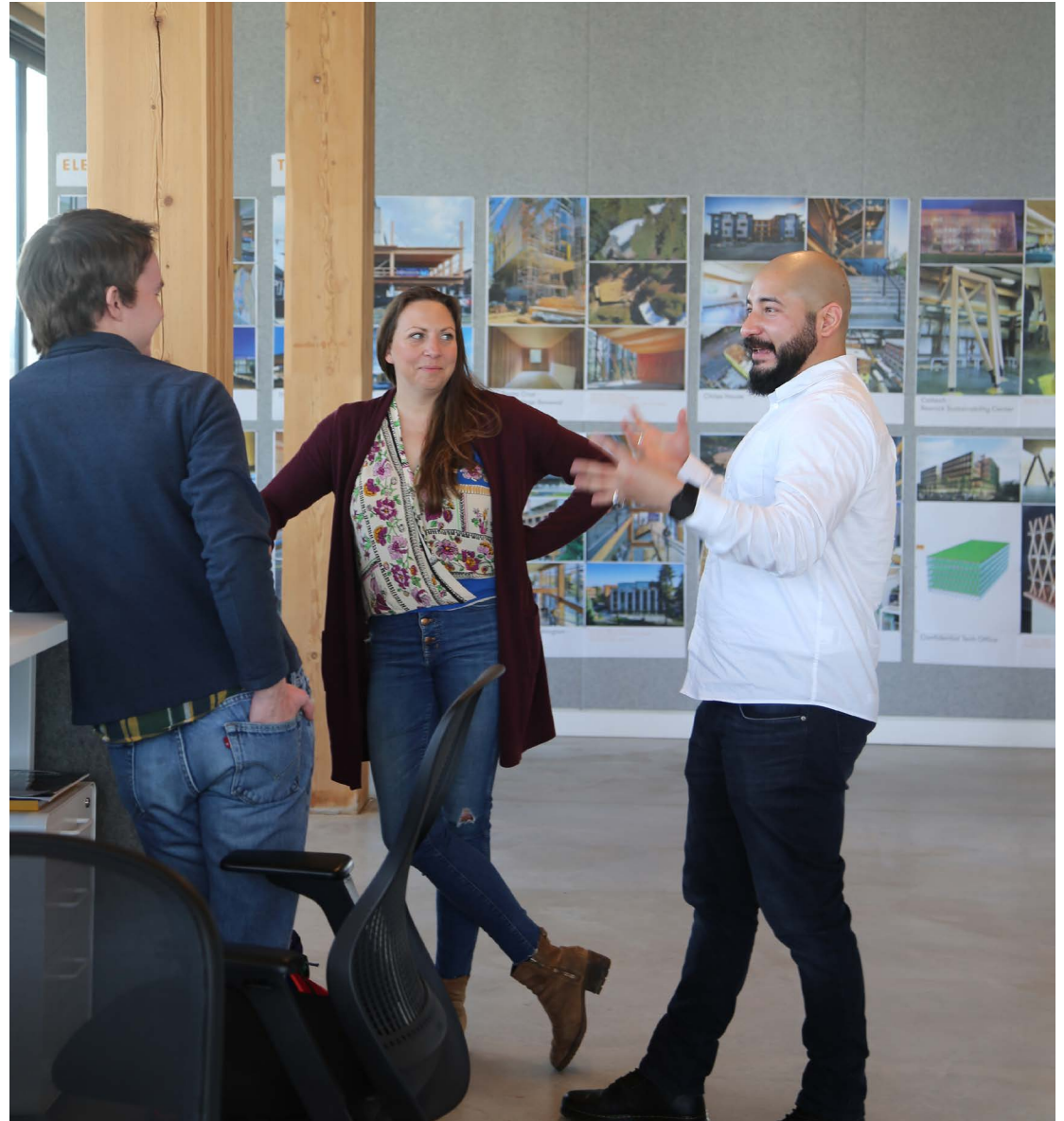
- Infusing sustainability into our company culture.
- Providing all staff the knowledge and skill set to speak to sustainability and our role in carbon reduction.
- Performing LCAs as a service and receiving compensation.
- Securing more sustainable projects based on our expertise.

As part of this plan, we have presented to staff lessons learned from recent LCAs and Climate Risk. Quarterly, we take a broader look at sustainability and how it applies across our service lines and locations. Topics include:

- Holmes Sustainability Statements relating to embodied carbon, operation carbon and corporate sustainability.
- Rebar quantity take-offs.
- Integrating embodied carbon metrics into our Revit families, allowing for quick calculations of project embodied carbon.

We are organizing a group-wide sustainability library with technical resources, articles, presentations, and design guides centralized in one place. In addition, our employees attend external conferences and report back. This year we are developing an embodied carbon database and standardizing Revit modeling toward a consistent Structural Material Quantities (SMQ) collection.

LCA software helps us evaluate various designs using national average Environmental Product Declarations (EPDs) and other vetted life cycle inventories. Mass timber continues to be a larger portion of our work (we have 85+ projects stateside), with many clients selecting timber for its assumed lesser carbon footprint. Going further, some of our clients seek to support forests that sustain the largest sinks of biogenic carbon. Our sustainability team sources and disseminates this range of biogenic carbon across geographic boundaries, harvest regulations, forest landowners, and forest certification programs.



Engineers catch up at our Portland office around the Intl. Mass Timber Conference.

# 3.0 Reporting

## SE 2050 Database Contributions

Holmes has reported embodied carbon data on five projects this year. In previous years, the projects we chose incorporated strategies to reduce embodied carbon. This year we selected projects that represent more market-rate baselines.

For example, we conducted an LCA on a Mixed-Use Development in Los Angeles using a low-carbon concrete superstructure. This project had gone through previous design iterations with a mass timber superstructure. Project Neptune is also a conventional high-end single-family residence, which incorporates steel girders and columns between wood joists to support long spans and heavy finishes.

We undertook this year’s assessments by using OneClick LCA with bills of quantities extracted from Revit. Projects do not include any reduction due to biogenic carbon sequestration. Read on for more project- and material-specific highlights.

### The Nine

Last year’s design for The Nine featured nine stories of mass timber with steel-braced frames, and three stories of below-grade concrete. This year we assessed a post-tensioned concrete design which provided the same gross area and architectural program. The mass timber version had 2/3 of the carbon footprint when compared to the concrete version. When including biogenic carbon, the mass timber version had 1/3 the carbon footprint of the concrete version.

### Seattle Storm Center for Basketball Performance

This WNBA practice facility holds two basketball courts, fitness and therapy rooms, and team offices. It has long-span steel joists, a conventional composite steel-framed floor, and tilt-up concrete walls. It sits on a site that required deep foundations. This project is already garnering awards for its low-embodied concrete: the concrete portion has a 35% GWP reduction compared to baseline industry mixes. Pile cap mixes were 50% portland cement and 50% slag; tilt-up wall mixes were 80% slag. These concrete mixes have less than 200 kg CO<sub>2</sub> eq per cubic meter, which is less than half of the National Ready Mixed Concrete Association (NRMCA)’s regional benchmark. In total, the overall building structure achieved a 20% reduction in GWP in relation to benchmark materials.

### Confidential Market Hall

This project is a six-story mixed-use building, with two stories of retail below four stories of office. The office floors are comprised of glulam beams, CLT floors, concrete topping, and concrete shear walls. The retail floors are comprised of post-tensioned concrete and sits on a mat foundation. This project’s GWP intensity is the median of those evaluated this year.

Table 1: Embodied Carbon Data of 5 Holmes Projects

Project	Size (SF)	Usage	Phase LCA Evaluated	# of Stories	Vertical Gravity System	GWP Intensity (kgCO <sub>2</sub> e/m <sup>2</sup> )
The Nine	220,000	Office	Schematic Design	9	Concrete	298
Confidential Market Hall	304,000	Office & Mercantile	Construction Documents	6	Wood: Mass Timber	305
Project Neptune (Main Res.)	14,000	Single-Family Residential	Construction Documents	3	Steel & Wood: Light Frame	198
LA Mixed-Use Development	730,000	Office	Construction Documents	3	Concrete	369
Seattle Storm Center for Basketball Performance	44,000	Other	Construction Documents	2	Concrete	393



# 4.0 Reduction

## Higher Standards, Lower Carbon

Holmes lowers embodied carbon on projects through a variety of strategies including:

### Specifying Low-Carbon Materials

We are updating the Holmes General Notes Template to implement embodied carbon reduction in all materials as a requirement—not a suggestion. We started with the largest emitter: concrete. In the last year we have completed revisions to the concrete section of our specification template, now requiring lower overall GWP for concrete mixes. Not only has Holmes established a baseline cement replacement requirement, we have incorporated a matrix with options to comply per either cement volume or GWP limits.

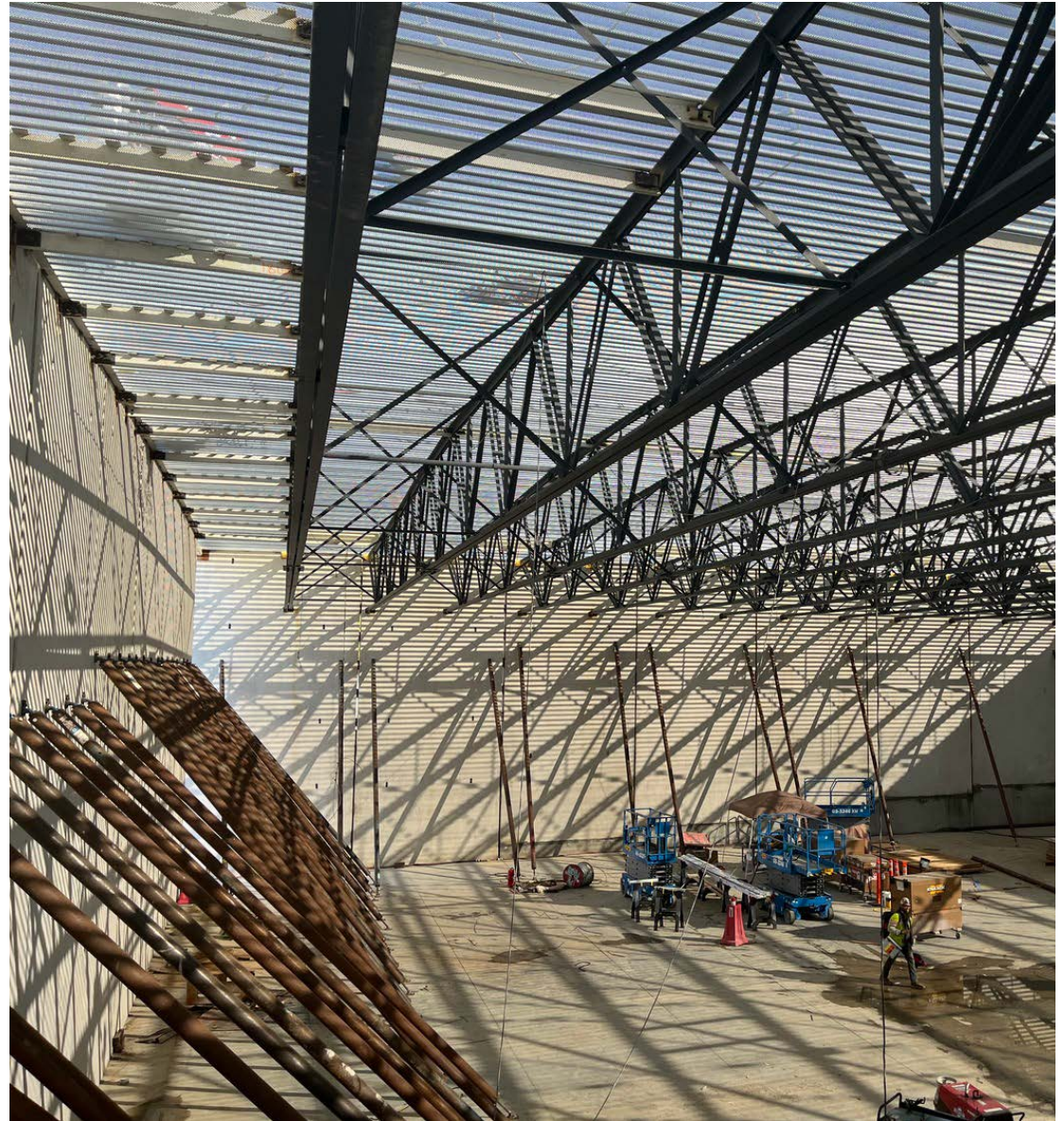
We are taking a similar approach as we move on to steel, introducing limits on GWP for different shapes and sections. As the City of Seattle petitions to adopt carbon limits on concrete and steel, Holmes is monitoring this effort to ensure that our criteria are aligned with the jurisdiction's requirements. We are ready for the new CALGreen provisions going into effect on July 1st that will limit project embodied carbon for certain projects built in California.

### Establishing a Concrete Baseline

To quantify reduction, we must first establish a baseline for comparison. Holmes is developing in-house tracking tools that tabulate SMQs for input into different LCA software databases. These tools are user-friendly for quick adoption by Holmes staff. Reinforcement take-off calculations for different concrete elements are under development within the structural SMQ/LCA space. While this is tedious work by nature, Holmes is building tools to better estimate tonnages and carbon emissions for each element and overall structure.

### Completion of Cradle-to-Cradle Project

Holmes completed structural and fire engineering on a YouTube campus expansion. Every component across two mass timber additions is designed for future disassembly and return to the industry/earth. Use of FSC-certified lumber and greener materials reduced carbon impacts by 50% relative to the originally-entitled steel and concrete design.



The Seattle Storm Center for Basketball Performance flexes 35% GWP reduction in its concrete mixes. Low-carbon concrete tilt-up walls surround future practice courts.

# 5.0 Advocacy

## Amplifying Our Voices

We initiate climate-conscious conversations and advocate for carbon reduction. Informed by lessons learned from built solutions, we're holding international dialogues with project teams and the broader AEC community. Last year, we keynoted the New Zealand Structural Engineering Society's Conference with 'The Structural Engineer's Role in Getting to Net Zero.' It was an honor to return to our roots and present in the country where Holmes was founded! We also presented at the International Mass Timber Conference on how to mind the gap between typical concrete multi-family construction and point-supported mass timber.

### Tapping into Single-Family Residential Construction

Holmes has the opportunity to tailor our sustainable approach to engineering for the single-family residential sector. Single-family construction accounts for roughly one third of Holmes' projects, positioning us to advocate for sustainable solutions on projects we have already secured. We're confident that we can reach a wider clientele and create a larger impact by incorporating this practice.

We are utilizing the tools we have already developed for larger commercial projects and are altering them to suit the goals of single-family homeowners. By educating our clients and identifying partners who share our values, we are spreading our knowledge on construction efficiencies, low-carbon building materials and technologies. We're expanding on construction efficiencies relating to light-frame construction in particular. We're identifying high-emitting materials within a project and targeting solutions (such as low-carbon concrete) that cut the most carbon.

### Spreading the Word

We continue to have a strong record of Holmes speakers at industry events. Regularly, we present to clients at informal lunch and learns on how we progress sustainability benchmarks. Our team members also contribute to building codes, design guidelines, and research projects that expand possibilities for sustainable construction.

## BUILDING CODE & DESIGN DEVELOPMENT

- CLT Diaphragm Design for Wind and Seismic Resistance
- Marin County: Low-Carbon Concrete Code (first in the nation)
- Nail-Laminated Timber Design & Construction Guides - US & Canada
- NHERI TallWood-Research
- REACT Consortium
- US Mass Timber Floor Vibration Design Guide
- Project-Specific Testing Including:
  - Long-Span Timber-Timber Composite Floor Cassettes
  - Point-Supported CLT Panel Testing
  - Timber Diagrid System

## PROFESSIONAL COMMITTEES

- Carbon Leadership Forum
- NCSEA Sustainable Design Committee
- SEI Sustainability Committee
- SEI SE 2050 Committee
- SEO Code Advisory Committee (Mass Timber)
- SEAOC Board of Directors, Sustainable Design Committee
- SEAONC Board of Directors (Past President), Sustainable Design Committee
- SEAOSC Sustainable Design Committee
- SEAW Sustainable Design Committee
- USGBC - California Council of Experts & Los Angeles Chapter

## RECENT SPEAKING OPPORTUNITIES

- A'24 AIA Conference on Architecture
- The Building Science Podcast
- Greenbuild
- Humid Climate Conference
- NASCC: The Steel Conference
- SEAONC Association Meeting
- Tall Timber Frame Construction Webinar



**We're All in on Net Zero.**

