

2026



SE 2050 **Embodied Carbon** ACTION PLAN

kpff

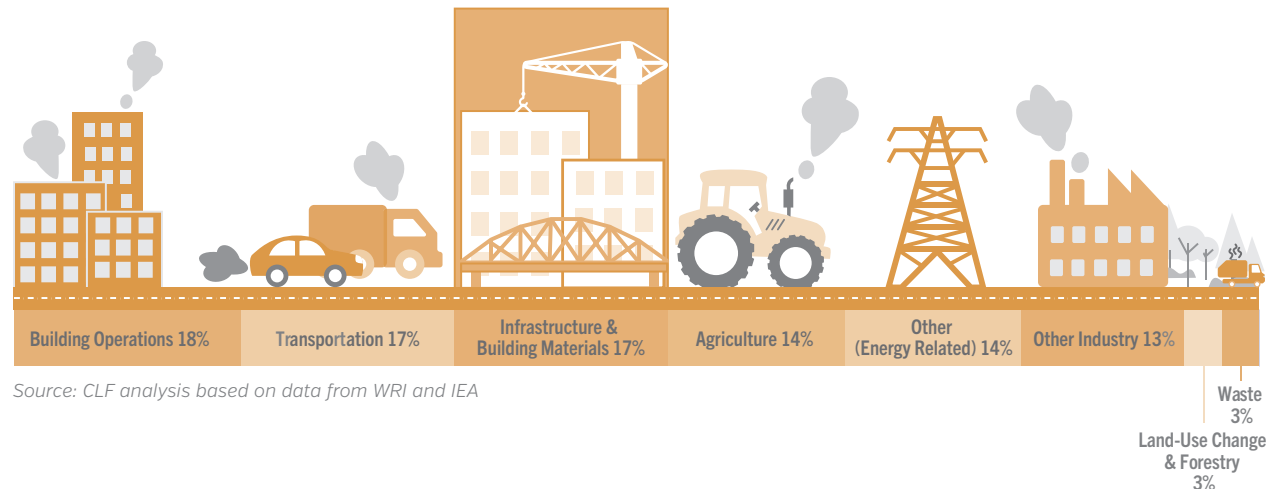
Introduction

KPFF recognizes and supports the SE 2050 Challenge vision statement that “all structural engineers shall understand, reduce, and ultimately eliminate embodied carbon in their projects by 2050.” As the SEI Board of Governors stated in their endorsement of the SE 2050 Challenge, we also “recognize the need for coordinated action across our profession to achieve the globally stated goal of net zero carbon by 2050.”

KPFF joined the SE 2050 Commitment in 2021, and we update our Embodied Carbon Action Plan (ECAP) annually to show what we have been doing during the past year and what our plans are for the next year.

The vision of SE 2050 directly aligns with the core values that have guided our organization successfully over the last 66 years. These values are relationships, trust, passion, excellence, and stability. The vision of the future contained within the SE 2050 program is one of **relationships** with our community locally and globally. It is a vision of providing **stability** and maintaining **trust** with future generations, recognizing that we play an essential role in reducing the embodied carbon (EC) that will impact future generations for the next 24 years and beyond. It exemplifies the **passion** we have as engineers to meet the challenges of today with new ideas and solutions. It requires the leadership and **excellence** to find and implement new carbon strategies that are truly effective and impactful.

Globally, the primary sources of greenhouse gas emissions are:



Source: CLF analysis based on data from WRI and IEA

Project Highlight >>

HUB Community Center & Herz Gymnasium

San Francisco, CA

The Sunnydale HOPE SF development spans more than 50 acres and will deliver 1,700 new homes, replacing over 700 deteriorated public housing units with a vibrant and healthy neighborhood. As part of this transformation, the new HUB at Sunnydale and the Herz Gymnasium serve as essential community anchors, offering safe, welcoming spaces for recreation, learning, and connection. The HUB Community Center is a 30,000-square-foot, two-story facility designed with flexible gathering areas and supportive services, while the 12,000-square-foot Herz Gymnasium provides a full gym, and a multipurpose room for youth and community programs.

Originally planned as conventional steel and concrete structures, typical for this building type in the area, the projects shifted direction when the design team explored mass timber through the GovOps/WoodWorks Grant from the 2019 California Mass Timber Building Competition. The grant supported early design studies and enabled a successful transition to mass timber using CLT roof and floor systems supported by glulam beams and columns. This change reduced structural embodied carbon by 50% for the HUB and 11% for Herz Gym. Leveraging KPFF's knowledge of local concrete performance, the team further optimized concrete mixes to achieve an additional 14% reduction for the HUB and 32% for Herz Gym, without increasing project costs.

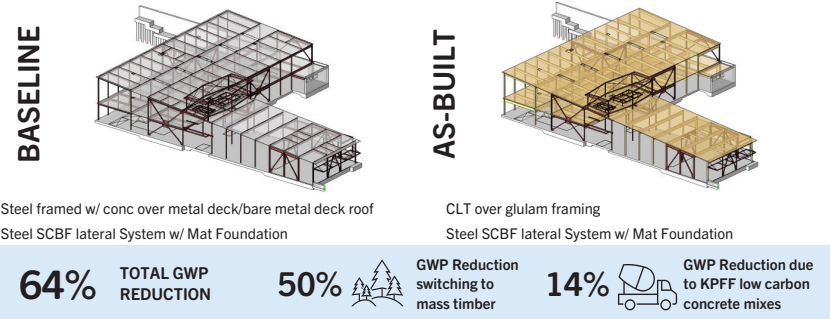
The move to mass timber also strengthened the architectural vision, supporting a park-focused design with strong indoor-outdoor connections and warm, nature-inspired interiors made possible by exposed wood. These strategies reduce environmental impact while reinforcing Sunnydale's goals for safe, sustainable, community-centered spaces and positioning the development as a model for sustainable mass timber innovation in California.

Hertz Gym: Featured on front cover (Photo by Bruce Damonte) and above right
 Hub Community Center: Featured on back cover and above left



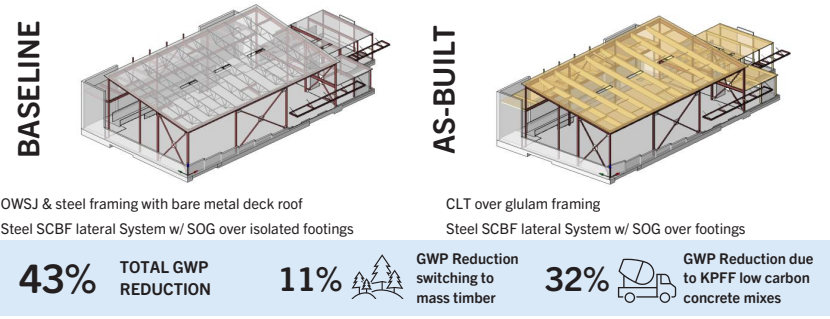
HUB COMMUNITY CENTER

Structural Materials Comparison Only
 Inclusive of Biogenical Carbon using Tally



HERZ GYM

Structural Materials Comparison Only
 Inclusive of Biogenical Carbon using Tally



Embodied Carbon Leaders at KPFF

KPFF has two designated Embodied Carbon Champions for our firm: Molly Seto and Shana Kelley. However, **our leadership group for embodied carbon within our firm has had enormous growth** over the last few years. Several of our office locations have identified one or more leaders responsible for educating and advocating within their office and local markets. This distributed approach to leadership is essential in making sure we are constantly **growing our embodied carbon expertise** and that we are accounting for the regional differences of our projects.

SHANA KELLEY



Seattle, WA

MOLLY SETO



San Francisco, CA

ELLA YAZBECK



Seattle, WA

NICHOLAS MILEY



San Francisco, CA

REID ZIMMERMAN



Portland, OR

MATT HOFFMAN



Portland, OR

NICK HALSEY



Portland, OR

TYLER BICK



St. Louis, MO

OLIVIA PAXSON



St. Louis, MO

JANET RANF



St. Louis, MO

CHAD SIMMS



Columbus, OH

SEAN KELTON



New York, NY

KANE PITHEY



Greater Los Angeles, CA

SARA ABOU KARROUM



Greater Los Angeles, CA

MICHAEL DILLARD



Sacramento, CA

TAMARA CARDENAS



San Diego, CA

EMMA ELLRICH



Salt Lake City, UT

NICK PALLADINO



Special Projects

Reduction Strategy

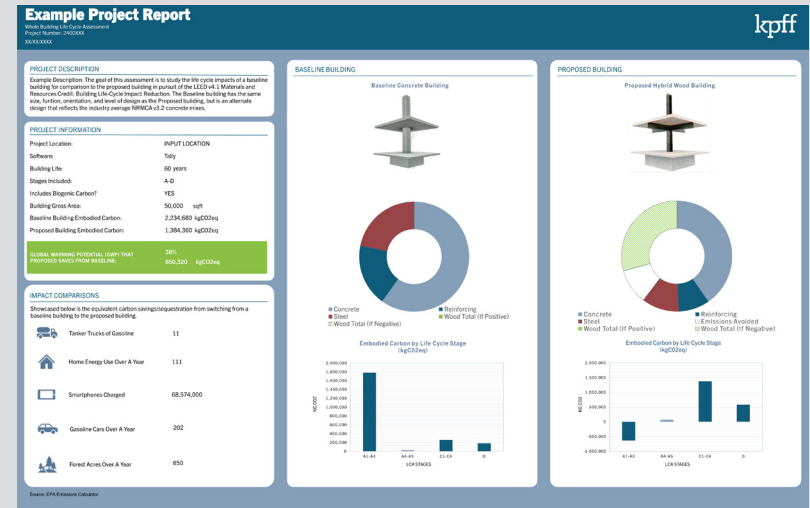
As we've implemented numerous reduction strategies on projects over the last few years, we've learned a great deal about how to **effectively and economically reduce carbon** both in our designs and in our specified materials.

This year we've developed both **short- and long-term goals** for reductions on our projects.

Short-Term: In order to set reduction targets, we will need to increasingly be tracking a larger portion of our projects. In 2025, we rolled out a new in-house LCA spreadsheet available across all KPFF structural offices. This is beginning to allow us to **track embodied carbon more widely across all our offices**, but we plan to ramp up implementation more over the coming years. We will also continue to further expand the requirements for EPDs in our specifications.

Long-Term: As we track both material-specific and project-wide reductions on projects, we will utilize this information to increasingly apply **GWP limits on materials that are tailored to the project region and type**. We are already implementing these limits in many regions, but as EPDs and lower-carbon material options become more widely available we will be able to apply limits in more locations and for more materials.

Reduction Highlight >>



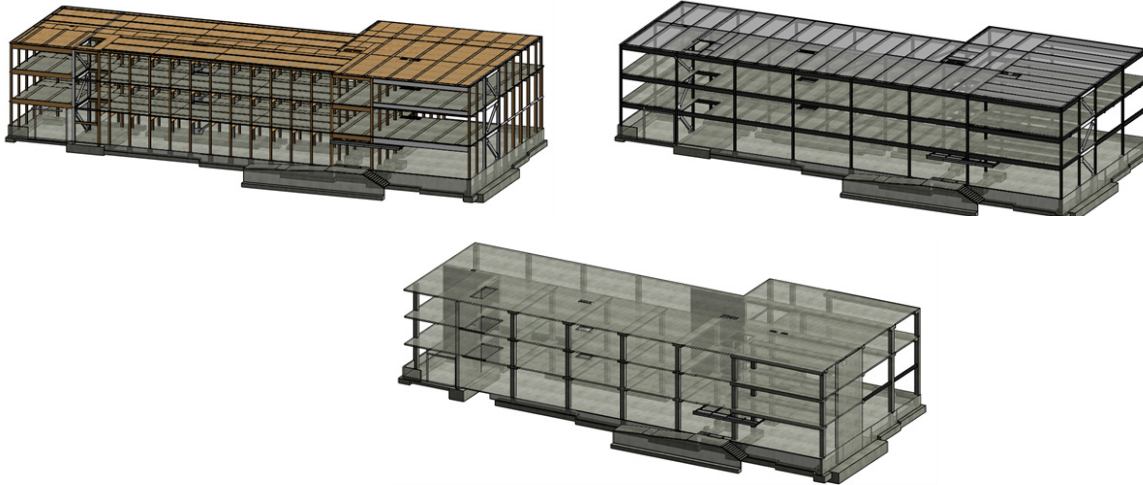
In-House LCA Tool

KPFF has collaborated across multiple offices to create a simple in-house spreadsheet that allows engineers without extensive LCA backgrounds to compare structural systems and LCA outputs with different background assumptions. This tool allows more projects to incorporate embodied carbon impacts into early design decisions and ensure that these calculations accurately reflect the results from any full LCA modeling implemented later in the project. It is also starting to increase the quantity of projects that have an LCA, making it easier to compare trends and draw conclusions on performance for the future.

Structural System Selection

Many projects begin with specific environmental goals or considerations, addressing the embodied carbon impacts of different structural systems in requests for proposals and project interviews. Early coordination to **explore the embodied carbon impacts of structural systems** is key to achieving reductions.

To guide teams in these early stages and have ready, relevant answers, we have focused on developing a comprehensive understanding of the impacts of structural system selection. We have done this by creating our own **in-house database of structural system life cycle assessments**. Even on projects without named sustainability goals, this database helps us guide conversations when making structural system choices.



*La Plaza Esperanza photo by Dan Cronin
California Air Resources Board photo by Connie Zhou*

LA PLAZA ESPERANZA



CALIFORNIA AIR RESOURCES BOARD
MARY D. NICHOLS CAMPUS



UW INNOVATION HALL



Retrofits / Adaptive Reuse

A key reduction strategy that we are really excited about is adaptive reuse and retrofitting existing structures to create new spaces. **Retrofitting existing structures uses the carbon we have already spent** and can significantly increase the building's useful life. Retrofits have always been a part of our practice, but we are improving our ability to help clients quantify the environmental costs of retrofitting versus building new.

BY RETROFITTING EXISTING STRUCTURES, WE ARE ABLE TO UTILIZE THE CARBON THAT HAS ALREADY BEEN SPENT

Material Reuse

Even when reusing an entire structure is not an option, there are still opportunities to **incorporate elements from demolished projects in our new construction.**

A great example of this is the Federal Center South project in Seattle, where we used 200,000 board feet of wood framing from an existing structure demolished on-site. This is roughly equivalent to the yield of 4 acres of Washington forest. This work required extensive cataloging of the existing framing, unique and flexible detailing, and structural testing to fully capture the capacity of the existing wood.

We are continuously exploring new ways of detailing our current systems to consider **end-of-life reuse.** A great example of this exploration was on the University of Washington Health Sciences Education Building, where we studied the demolition of various vibration test models, which gave us great insight into what details kept the wood elements in the best condition for re-use.

100 STOCKTON PROJECT



FEDERAL CENTER SOUTH



UW HSEB TEST SPECIMENS



Material Specification

Once the structural system has been selected, the next opportunity to reduce embodied carbon is material selection. We have made the biggest impacts through **changing how we specify high EC intensity materials** such as concrete and steel. Several of our offices have implemented location-specific language requiring environmental product declarations (EPDs) and/or global warming potential (GWP) reductions on certain projects.

Keeping it Local

Embodied carbon reduction strategies need to vary depending on the location of the project. The knowledge base and information available regarding the embodied carbon of structural materials varies widely across the nation. This variability applies to information about local building materials as well as contractor knowledge. Each project's embodied carbon goals need to recognize this variability and be **customized for the project location**. For example, many of our offices require reporting and reductions for embodied carbon in concrete submittals. Where EPDs are readily available, the specifications can be written to require a calculation of the reduction from a regional baseline. Where EPDs are not readily available, limitations on high embodied carbon constituents can be specified instead.

Being Flexible

We have learned to **stay flexible** when implementing embodied carbon reduction strategies. Ultimately our goal is to reduce the embodied carbon of our structure, but we've found that achieving those reductions sometimes requires adjustments during construction. When material shortages or unexpected changes impact our embodied carbon assumptions, using **previous embodied carbon studies and construction experience** can help us pivot when needed.



Project Highlight >>

Redmond Library

Redmond, OR

KPFF provided structural design services for a new 38,000-square-foot, two-story, wood-framed Type V-B library in Redmond, Oregon. This mass timber structure includes acoustic dowel-laminated timber on glulam beams and girders, queen post trusses, and a floating feature stair. The queen post trusses span 66 feet, were prototyped using 3D printing to validate the design early and often, and are constructed from a pair of glulam beam compression elements and a steel tension rod and posts. The hybrid framing system selectively leverages both steel and timber to optimize the structural embodied carbon.

The feature stair cantilevers from a central stringer laterally supported by steel struts hidden within the raised access floor at Level 2. The lateral system consists of concrete shear walls at two stair towers and the central elevator along with plywood-sheathed cold-formed shear walls on the exterior facade.

Embodied carbon was minimized by employing conventional wood structural panel diaphragms at Level 2 and the roof, avoiding carbon-intensive concrete topping slabs. The performance-based concrete specifications targeted reductions in embodied carbon within each mix design relative to local benchmarking of concrete carbon intensity.

Architect - The Miller Hull Partnership
Redmond Library photos by Lara Swimmer



Education

In 2021, during KPFF's first year as an SE 2050 Signatory, we created a Structural Sustainability group made up of **embodied carbon champions** from each office. This group meets in person every other year for an Embodied Carbon Summit to share information across our offices.

In addition to the internal **Embodied Carbon Summits**, KPFF provides avenues to share lessons and expertise to all our structural engineers. We have created a firm-wide portal for structural sustainability on our Microsoft Teams hub that is accessible by all KPFF employees as a means to broadcast sustainability messages. A resources section includes documents from SE 2050, as well as copies of internal presentations and resources. The **Question and Message Board** page allows structural engineers to share resources and get advice from engineers throughout the firm. Over the last year, posts sharing strategies to lower office-wide emissions, wood transparency, and new EPDs for structural element types have garnered the most interest.

Many offices have internal Sustainability Groups that focus on finding **embodied carbon strategies that are tailored to local conditions**.

Outside our offices, we have many employees who actively give and attend presentations hosted by the **Carbon Leadership Forum**, local **Structural Engineering Association** chapters, and various organizations. See the next page for a highlight of a mass timber case study authored by engineers from our Portland office.

Education Highlight >>

In 2025, KPFF leaders from across our offices gathered together for our biennial KPFF Embodied Carbon summit. This group grew significantly since the last time we met, now representing all our reporting centers that offer structural engineering services.



We had sessions on best practices for performing life cycle assessments (LCAs), implementing carbon reductions in our specifications and drawings, and a working session to try out our new in-house LCA spreadsheet. These summits are a great opportunity to connect, share, and be inspired by each other.

Project and Education Highlight >>

Julia West House

Portland, OR

With an underutilized 5,000-square-foot lot in downtown Portland and an urgent need for affordable housing, Community Development Partners, Holst Architecture, and KPFF designed a compact 12-story structure to deliver 90 new affordable senior housing units. KPFF performed life cycle analyses of several structural system options during schematic design. A mass timber structure with buckling restrained braced frames for the lateral system saved approximately 1,080 metric tons of embodied carbon relative to a conventional flat-plate post-tensioned concrete structure, with a slight cost premium offset by a faster construction schedule. This selected option enabled residents to move in sooner, in many cases directly from houselessness, in addition to experiencing the biophilic benefits of exposed timber within their units. At completion in late 2025, the Type IV-B Julia West House is the tallest mass timber building in Oregon.

To share the lessons learned on applying mass timber design to affordable housing projects, KPFF helped author a WoodWorks-published case study on the project. This case study includes important aspects of the design such as optimizing for stacked efficiency, providing code required fire-resistance, and accounting for the sound performance of the floor assembly.



Advocacy

Our approach to **advocacy** for embodied carbon reduction over the last year focused on sharing our experiences, advocating on our local projects, and advocating in the wider industry.

As we have been developing our knowledge base for embodied carbon in structures, we have found ways to **share these lessons** in local and national organizations. As noted in the Electives section, we participate in and present on embodied carbon topics related to structures both locally and nationally.

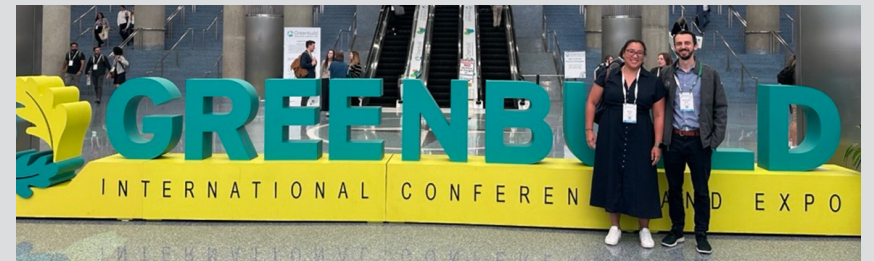
For our local projects, we proactively discuss pathways to embodied carbon reduction with architects, owners, jurisdictions, and contractors. One of the biggest roadblocks to embodied carbon reduction is reticence to change construction methods. By sharing evidence of projects **successfully implementing low-carbon strategies** and selectively test-running new materials or systems, we continue to move the needle forward.

KPFF recognizes that in order for there to be a sea change in the reduction of embodied carbon in the built environment, **national building codes and design standards** will need to acknowledge and include embodied carbon. See the Advocacy Highlight to the right for examples of our national advocacy work.

Advocacy Highlight >>

Over the last year many of KPFF's embodied carbon leaders have been sharing their experiences with reducing carbon. Presentations given by KPFF engineers this past year include:

- Idaho Forestry Day: Ashley Thompson of the KPFF Mountain West office was on a panel speaking about "Why Mass Timber is Right for Idaho" at the Idaho State Legislature.
- ACI Convention: At the 2025 Fall ACI convention, Shana Kelley of the KPFF Seattle office gave a presentation titled "Concrete Design 201 - Design of Low-Carbon Concrete using ACI CODE-323."
- Greenbuild 2025: KPFF San Francisco was well-represented at this year's conference. Jeffrey Zhang co-presented with LMS Architects on "Building a Community Hub: Design Strategies for Social Impact," while Molly Seto and Nicholas Miley attended to learn, gain new insights, and build connections with other industry leaders.



Reporting

KPFF takes a flexible, **project-specific** approach to measuring, tracking, and reporting embodied carbon. We use tools like Athena, Tally, OneClick, EC3, and our in-house spreadsheet, selecting the best fit for each project.

In 2022, KPFF began reporting embodied carbon to the SE 2050 database with projects from two of our offices. We've increased the number of projects reported every year, and in 2025 we've grown to reporting projects from seven different KPFF offices. The data submitted to SE 2050 is helping to create an **internal database** that tracks embodied carbon intensity across projects. We plan to track stages A–D, focusing on structural materials using the tools mentioned.

Many of our offices have also worked to track the impacts of locally available materials to better inform our life cycle assessments. For example, our San Francisco office has developed a **concrete database** with over 300 mixes from 15 years of projects, including EPD data when available. This helps project teams find appropriate low-GWP concrete mixes and allows us to continue innovating to reduce embodied carbon. We plan to continue **growing these material databases** in more locations over the next few years.

Project Highlight >>

Missouri Primary Care Association: Center of Excellence

Jefferson City, MO

The 52,000-square-foot MPCA Center for Excellence displays its sustainability efforts at its front door. The mostly steel-joint framed office building includes a CLT and glulam entry and two structural bamboo canopies to welcome its users. The project also includes provisions for future solar panels and extensive green roofs.



The structural bamboo canopy in the shop before installation.

Architect - Arcturis, Contractor - RiverCity Construction

Electives

We have reviewed the electives we included in our 2025 ECAP and we were able to achieve all those listed. See below for the electives we have selected to focus on this year.

Reduction [1 required, 4 recommended]

- ✓ Set clearly stated, firm-wide reduction targets in the short-term (<1 year) and long-term (>5 years).
See our Reduction Strategy section of this report.
- ✓ Submit a Circular Economy Narrative describing how a project supports the circular economy. This can be done by incorporating re-use or design for deconstruction into at least one project.
See our Reduction Strategy: Retrofits/Adaptive Reuse and Material Reuse sections of this report.
- ✓ Update your specifications to incorporate embodied carbon performance. Include embodied carbon in your submittal review requirements.
We continue to expand the use of requirements for EPD submittals and GWP reduction calculation in specifications on multiple projects.
- ✓ Communicate the embodied carbon impacts of different design options to clients with creative and effective data visualization.
- ✓ Compare different design options with embodied carbon as a performance metric during the project concept phase. Explain what you did and how the results changed (if anything).

Our new in-house LCA spreadsheet, which aggregates background data from several different LCA programs, allows us to quickly compare different structural systems during the concept phase. During this phase, cost estimates are typically produced that include rough takeoffs of material quantities, which allow the carbon footprint to be determined along with the cost. We are increasing the number of projects that utilize this approach during concept design, and these studies have often been influential in the final structural system type selected.

- ✓ Participate in a LEED, ILFI Zero Carbon, or similar project design charrette and speak to potential design considerations impacting embodied carbon.
- ✓ Collaborate with your concrete supplier to reduce embodied carbon in a mix design below an acceptable baseline (e.g. NRMCA regional baseline values).

This year, many of our offices have had direct coordination with concrete suppliers regarding EPDs and what approaches can be taken to reduce the GWP of our typical mixtures.

- ✓ Incorporate sustainably harvested biogenic materials in at least one project.

Many of our projects incorporate timber structural members that are certified to be sustainably harvested by FSC, SFI, or through project-specific material tracking.

Education [2 required, 4 recommended]

- ✓ Provide a narrative of how the Embodied Carbon Reduction Champion will engage embodied carbon reduction at each office.

See the Education section in this ECAP for more information about how our embodied carbon leads across our offices collaborate and educate our engineers.

- ✓ Present at least [1] webinar focused on embodied carbon and make a recording available to employees.

This past year, we've been focusing on sharing expertise from across our offices and we plan to continue sharing knowledge across offices this year. We're also coordinating having outside experts present to several of our offices at once.

- ✓ Initiate an embodied carbon interest group within your firm and outline their goals. This group may more broadly address sustainability, but they must include embodied carbon.

See our Education Plan section for a description of internal KPFF Sustainability Groups.

- ✓ Create an Embodied Carbon digital resource wiki and/or forum on your firm's internal website for staff to create, share, and discuss embodied carbon educational resources.

Our firm-wide MS Teams page has a Structural Sustainability page that is accessible by all KPFF employees. Engineers post resources to this page and give advice on the Q&A board.

- ✓ Engage with a CLF Regional Hub.

Several of our employees regularly attend CLF regional hub meetings and events, with several people acting as leaders for their regional hubs. We have people attending meetings of the Los Angeles, San Francisco, Portland, Seattle, Nebraska, and Nashville CLF regional hubs. Some of our people are even actively working to start new CLF hubs in their areas.



KPFF engineer Chad Simms helped launch the CLF Ohio Hub last year and is now serving as one of the new hub's co-leads.

Project and Education Highlight >>

ESI Construction Management Building

Boise, ID

The ESI Construction Management Building is the first mass timber building on Boise State University's campus. It is a two-story mass timber hybrid structure designed to teach through engagement. Inside, the building includes classrooms, offices, collaborative spaces, and a hands-on lab with an operable crane beam, all built to support real-world learning.

The building is a demonstration of biophilic and human-centered design, drawing focus to the structure with exposed roof decks, connections, and see-through walls that allow students to learn directly from the structure around them. These visible features can be used as a teaching tool for BSU students as they work and study in the facility. As sustainability is a growing focus within the construction industry, the building's use of mass timber is relevant for Construction Management students. Engaging directly with this material system allows students to gain firsthand exposure to a design approach that has been shaping low-carbon construction.

KPFF also led a tour of the building for a group of ACE high school students learning about architecture, construction, and engineering, helping to educate a new generation of design professionals.

We are submitting quantities for this building to SE2050 this year and have quantified the EC for this building to use as a benchmark for other mass timber buildings in this region.

Contractor - ESI Construction, Architect - Lombard Conrad Architects



Advocacy [2 required, 4 recommended]

- ✓ Describe the value of SE 2050 to clients.
KPFF regularly features our commitment to SE 2050 in our marketing materials, proposals, and our communications with clients.
- ✓ Publicly declare your firm as a member of the SE 2050 Commitment however you see fit.
When we first joined the SE 2050 commitment, a blog post describing the program and our work in adopting the commitment was posted on our website.
As we further develop and grow with the commitment, we will continue to post progress updates on our website at <https://www.kpff.com/culture-and-careers/sustainability/>
- ✓ Give an external presentation on embodied carbon that demonstrates a project success or lessons learned.
- ✓ Engage with structural material suppliers in your region to communicate the importance of Environmental Product Declarations (EPDs) and low-carbon material options.
- ✓ Engage with local, state, and federal governments to communicate the importance of low-embodied carbon procurement and construction policies, and provide expert testimony to this effect.
See the Advocacy Highlights in this report for details on how we've been working to advance embodied carbon provisions in national codes and also advocating for policy changes in the markets we work in.

Project Highlight >>

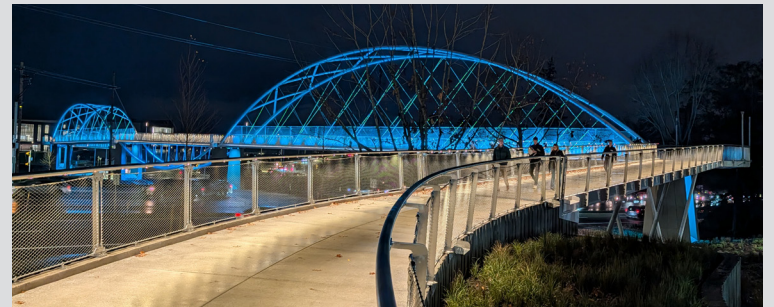
Sherwood Highway 99W Pedestrian Bridge

Portland, OR

While much of KPFF's work to reduce embodied carbon in our designs has focused on buildings, we are starting to apply what we've learned from our building life cycle assessments to structures beyond buildings.

A great example of this is the KPFF-designed pedestrian bridge recently constructed in the City of Sherwood. Public outreach revealed strong support for a tied arch structure and a signature design that could become a local landmark. By using shallow and materially efficient trusses, the final design requires less than half the steel tonnage of the initial bridge concept.

In addition to cost savings and aesthetic benefits, the final design saved approximately 300 metric tons of embodied carbon relative to the all-girder option.



Reporting [1 required, 2 recommended]

- ✓ Submit a minimum of [2] projects per U.S. office with structural engineering services to the SE 2050 Database. You are not required to submit more than [5] total projects across your firm, but we encourage you to submit as many as possible.

We continue to increase the number of projects we submit every year to SE 2050 as well as the number of our offices contributing.

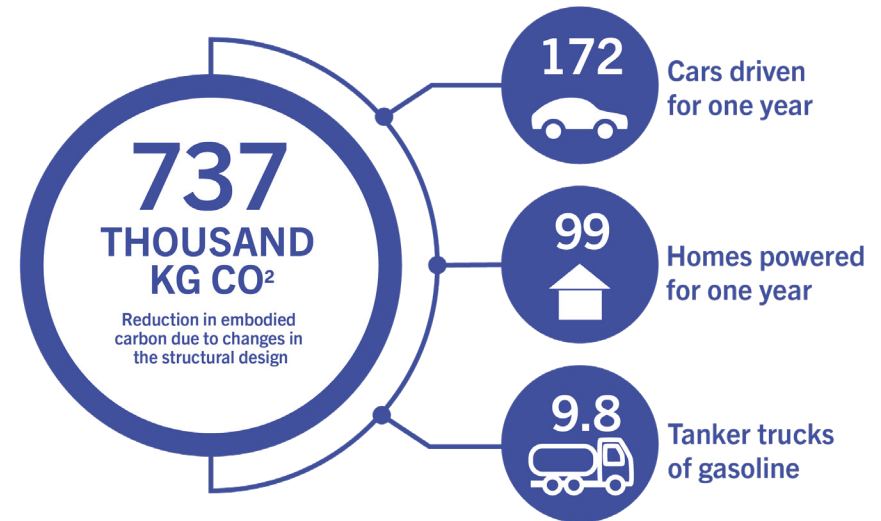
- ✓ For multi-office firms, describe how each office is measuring and reporting embodied carbon.

Each office individually tailors their approach to measuring and reporting embodied carbon for their market and project types. LCA results for individual projects are uploaded to our in-house tracking spreadsheet, and Molly Seto in our San Francisco office coordinates uploading our data yearly to the SE 2050 database. See our Reporting section for more information.

- ✓ Propose other actions that promote the reporting of embodied carbon data and describe their value.

Internal training for embodied carbon measurement: We have given presentations to several KPFF offices regarding the measurement of embodied carbon of both specific materials and of a whole building. We will continue to provide resources and presentations for the measurement of embodied carbon, to ensure that more reporting takes place.

LCA Tools: Our in-house LCA spreadsheet has made it easier to incorporate embodied carbon calculations more often and earlier in a wide variety of projects.



Embodied carbon reductions achieved on the HUB Community Center and Herz Gymnasium projects described in the Project Highlight of this report

Lessons Learned

During 2025 we focused on expanding our embodied carbon expertise across our firm, building tools that make LCA easier to implement, and finding new ways to look at how we collect data across our firm.

Progress Takes Investment:

It is not always easy to carve out time to dedicate to expanding and improving our approaches to reducing embodied carbon. By strengthening our expertise across many offices, we've been able to share the load and maintain steady, meaningful progress.

Making LCA Easier and More Accessible:

Early design decisions can have the greatest influence on embodied carbon, which makes rapid and trustworthy LCA tools essential. Our new in-house carbon calculation spreadsheet is helping us bring these estimates into the design process sooner and with greater ease.



Exploring New Ways to Extract Data:

Many of our younger engineers are passionate about sustainability and are eager for opportunities to make an impact. Their enthusiasm and fresh perspectives are helping us rethink how we collect data, uncovering new ways to automate and enhance our processes.

Seattle
Tacoma
Lacey
Spokane
Coeur D'Alene
Vancouver
Portland
Eugene
Sacramento
San Francisco
Los Angeles
Irvine
Newport Beach
Long Beach
San Diego
Austin
Boise
Salt Lake City
Denver
Madison
Des Moines
St. Louis
Chicago
Indianapolis
Lexington
Louisville
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