

## SE 2050 Commitment – 2021 Embodied Carbon Action Plan (ECAP)

### 1. Education

#### REQUIRED (All):

- Distribute firm-wide announcement of your firm’s pledge to join the SE 2050 Commitment.

A firm-wide announcement will be posted on the KPFF Microsoft Teams page. This announcement will be distributed in a way that notifies all structural engineering employees.

- Provide a brief narrative describing how your firm is promoting a firm-wide education program for embodied carbon reduction and the firm’s commitment to SE 2050.

While much of the previous work regarding structural sustainability at KPFF has been championed at individual offices, there has been an increasing amount of the sharing of resources and information-sharing across the entire firm. Seeing the need to share the lessons and expertise across the firm, a new firm-wide portal for structural sustainability was started in 2020 on our internal Microsoft Teams hub. This KPFF Structural Sustainability group on the KPFF MS Teams hub allows for messages regarding structural sustainability to be broadcast. It also has a Question and Message Board page that allows structural engineers to get advice from other engineers throughout the firm and a place to share resources.

Individuals within multiple offices that specialize in many different aspects of structural sustainability have also been giving presentations across offices to share information that will help us be more effective in our implementation of embodied carbon reduction.

- Nominate an Embodied Carbon Reduction Champion for your firm. Include a 1 brief profile in your ECAP.

KPFF will have two designated Embodied Carbon Reduction Champions for our firm: Shana Kelley of the Seattle office and Molly Seto of the San Francisco office. Shana and Molly will work together to establish and develop the firm-wide KPFF Embodied Carbon program.

Shana Kelley is the Director of Sustainable Design in the Seattle Structural Group of KPFF. She also serves as the chair of the ACI 318 Concrete Building Code Sustainability Subcommittee for the ACI 318-25 code cycle. Shana is active in the local Carbon Leadership Forum Seattle group and the Structural Engineering Association of Washington Sustainability Subcommittee.

Molly Seto is an Associate in the San Francisco Structural Group of KPFF. She helps leads internal sustainable initiatives within the KPFF San Francisco office, including developing an embodied carbon tracking system for our projects and external educational presentations on sustainability. The KPFF San Francisco office is active in the local Carbon Leadership Forums and the Structural Engineering Associate of Northern California Sustainability Subcommittee.



- Set a date within the first year to present the “Embodied Carbon 101” Webinar to your firm. Incorporate this information into your orientation/on-boarding programs.

Molly Seto and Shana Kelley have previously given a presentation titled “Sustainable Design in Structural Engineering” to structural engineers in many of the different KPFF offices. Molly and Shana are working to record this presentation, with specific information about embodied carbon reduction strategies, and make it available on the KPFF Structural Sustainability MS Teams page. We plan to have this presentation posted by the time our announcement about joining SE 2050 is made.

- Minimum (1) additional elective to educate your firm about embodied carbon and a narrative of its significance.

See below for the additional electives we are undertaking this year.

ELECTIVES (Min. (1) required, recommended to achieve (4) per year):

- Have one representative of your firm (any employee) attend quarterly external education programs (e.g. webinar, workshop) provided by SE 2050, Carbon Leadership Forum (CLF), or other embodied carbon resources.

Several structural engineers at KPFF already attend local CLF meetings as well as presentations and conferences by other organizations on embodied carbon. These organizations include the Structural Engineering Association of Washington Sustainability Committee, Structural Engineering Association of Northern California, The American Institute of Architects’ Committee on the Environment, American Concrete Institute, USGBC, and Living Futures. We will continue to attend these meetings and encourage more structural engineers in our offices to participate in embodied carbon programs.

- Share the SE 2050 library of resources with technical staff.

The MS Teams KPFF Structural Sustainability page has a direct link to the SE 2050 website on our resources page. This allows structural engineers to directly access the most up-to-date resources on the SE 2050 website.

- Attend a presentation or demo of an LCA-based tool used to calculate embodied carbon.

KPFF structural engineers have attended presentations on LCA-based tools and have also given presentations on the use of LCA-based tools at local CLF meetings. We will continue to expand our knowledge on LCA-based tools and work to share that information amongst our structural engineering staff.



- Initiate an embodied carbon interest group within your firm and provide a narrative of their goals.

As mentioned above, there is already a MS Teams KPFF Structural Sustainability page established. This firm-wide accessible group allows users across the company to share information, ask questions, and post resources. The goal of this group is to allow for easy communication between all offices regarding topics related to creating sustainable structural designs and lowering embodied carbon.

## 2. Reporting

### REQUIRED (All):

- Provide a narrative on how your firm plans to measure, track, and report embodied carbon data. Here are some considerations you may want to include:

- How will you calculate embodied carbon for structural materials? Do you have access to product- or region-specific EPDs?

Where possible, we try to utilize realistic embodied carbon intensities for materials that will be used on our projects, both for baseline and proposed models. Many of the markets that we work in do have extensive EPDs available for local concrete; however, some do not. We have found that the availability of EPDs for many structural materials is increasing for both local and regional materials.

- What commercially available LCA software will you be using to quantify embodied carbon?

The software type used on projects will depend on the sustainability goals and certifications for that particular project. Embodied carbon tracking software programs that have been commonly used on our projects include Tally, Athena, and EC3.

- What life cycle analysis (LCA) methodology will you use? Define where you plan to delineate scope (e.g. A1-A5 or whole life cycle), communicate inherent assumptions, etc.

The life stages included in the life cycle assessments we have done in the past depend on the purpose for performing the LCA. Where a choice between products for specific materials is being considered, we will sometimes look only at the cradle to gate embodied carbon using EPDs. However, when looking at overall structural systems we include more stages. Both LEED and ILFI have different requirements for the life stages to include, so those requirements often control what is included. When producing reports outlining our findings, we include a summary of what life stages are included.



- How will you extract material quantities and how often? (currently for internal use and not required in SE 2050 Database)

When embodied carbon is being studied early on in a project, the material quantities may only be estimated from previous similar projects. For projects that are further along in design, many of our current structural projects are modeled in Revit, and we have found that this is one of the most accurate ways to extract material quantities. Frequency of extraction of material quantities will vary depending on project goals.

KPFF is also working on developing a database of project-specific concrete quantities and EPDs in order to develop local embodied carbon baselines.

- Describe the internal training for embodied carbon measurement you provided or will provide.

Shana Kelley and Molly Seto have already given presentations to several offices regarding the measurement of embodied carbon of both specific materials and of a whole building. During this year we will work on adding new resources and webinars to our KPFF MS Teams Structural Sustainability page.

- Submit an annual minimum of (2) projects per U.S structural office or (5) total projects for the firm to the SE 2050 Database.<sup>2</sup>

We will submit a minimum of (5) total anonymized projects to the SE 2050 database per year. At the time of the writing of this ECAP, the SE 2050 Database was under development and had not yet been launched.

**ELECTIVES (Not required, recommended to achieve (1) per year):**

- For a project submitted to the database, ask the Architect or Owner if the project has a carbon budget or if there are established project sustainability goals at the project kickoff meeting.

Many of our projects have eco-charette meetings at the beginning of design to address sustainability issues. Embodied carbon and LCA often come up as topics during these meetings. At least one of the projects we plan to submit to the SE 2050 Database had embodied carbon reduction goals.



### 3. Embodied Carbon Reduction Strategies

#### REQUIRED (All):

Set a goal for the coming year and an implementation narrative. For second year's ECAP and beyond, describe successes and misses to help the program improve. Qualitative goals are encouraged for the first year.

During the first year of our membership in SE 2050, we will be focused on information gathering to determine our current baselines for project types, setting up a framework for how the reductions will be defined in our project documents, and information-sharing across offices about effective reduction strategies.

Determining baselines of the current typical EC intensities of both specific materials and overall structural systems are already underway in many of our offices. Currently, offices are gathering this information independently, but we have established a goal to begin sharing this information between office locations. We do have a global KPFF group within EC3 that allows us to share models amongst all KPFF engineers using EC3.

As we determine what reduction strategies are effective, we have begun to develop typical reduction language that can be used in our drawings and specifications. We have a goal to continue to share these resources between office locations as well as to further develop the framework for implementing reductions. Thus far, we have shared these resources during cross-office sustainability presentations; however, we will work to increase the availability of these resources on our KPFF Structural Sustainability MS Teams page.

For second year's ECAP and beyond, provide a narrative about what you have learned about embodied carbon reduction in the past year.

We will include this item in our future ECAPs.

Minimum (1) additional elective you undertook to reduce embodied carbon in your designs, why you chose the elective and its significance.

See below for electives selected.

#### ELECTIVES (Min. (1) required, recommended to achieve (4) per year):

Complete a system embodied carbon design comparison study during the project concept phase.

Comparative studies like this have been done on some projects. In particular, we have looked at bay studies that compare the embodied carbon impacts of different framing layouts. We will continue to do these sorts of studies; however, it is likely that as our internal database of comparative studies for whole building life cycle assessments grow, we will have better insight into the impacts without having to do as many individual studies.



- ☑ Participate in a project LEED design charrette and speak to potential design considerations impacting embodied carbon.

Structural engineers in our offices are often included in LEED design charrettes for projects. With LEED v4 and v4.1 we are often involved in the MR credits for Building Life-Cycle Impact Reduction, which can directly impact the embodied carbon of the project.

- ☑ Update your specifications and incorporate embodied carbon performance. Include embodied carbon in your submittal review requirements.

Requirements for limiting embodied carbon are already implemented for some materials in our different offices. The use of these requirements in our specifications or on our design drawings is dependent on the project goals as well as the availability of embodied carbon information available in the local markets where we have projects. For example, many of our offices have implemented specification language requiring 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. Thus far, we have taken a regional approach depending on the office.

We will continue to expand our use of embodied carbon-specific specification language in our designs and share knowledge across our offices.

- ☑ Get a new Environmental Product Declaration (EPD) created on a project.

On a recent large campus project, KPFF joined with the project owner and numerous architects, engineers, and construction firms in a letter sent out the multiple product manufacturers to request that they provide EPDs for materials being procured for the project.

- ☑ Incorporate biogenic materials on at least one project annually.

Many of our projects utilize wood framing in their design, and we have several projects that are pioneering unique ways to utilize wood to reduce the amount of higher carbon intensive materials used. We are also working to better understand the impacts of forest management practices and end-of-life waste pathways on the embodied carbon of these systems.

- ☑ Collaborate with your concrete supplier to reduce embodied carbon in a mix design.

Many of our offices are working directly with local concrete suppliers to figure out better ways to specify mixes that reduce embodied carbon. We have found that working closely with suppliers allows us to better understand the impacts of the reductions we are specifying to make sure that we are requiring achievable goals. Conversations with concrete suppliers also allow us to understand the schedule and mix characteristic implications of reduction levels, allowing us to better communicate the impacts to design teams, owners, and contractors.



## 4. Advocacy

### REQUIRED (All):

- Provide a narrative about how you plan to share knowledge and data to accelerate adoption of embodied carbon reduction.

Our approach to advocacy for embodied carbon reduction will focus on sharing our experiences, being advocates on our local projects, and being advocates in the wider industry.

As we have been developing our knowledge base for looking at embodied carbon in structures, we have tried to find ways to be active in local and national organizations. As noted in the elective section below, we have started to participate and present on embodied carbon topics related to structures in these organizations. We will continue to work on engaging and contributing in the coming year.

For our local projects, we can work through our interactions with architects, owners, jurisdictions, and contractors to discuss pathways to embodied carbon reduction. Often one of the biggest roadblocks to embodied carbon reduction is the reticence to change the way structures are constructed. We have found that by sharing evidence of successful implementation of low carbon strategies on past projects and by selectively implementing test runs of new materials or systems, we have been able to move the needle forward.

As structural engineers, we have many opportunities to engage with contractors and material suppliers on a wide range of materials for structural systems. We will continue to work to better understand how the manufacturing processes for these materials contribute to embodied carbon and find opportunities to advocate for new and effective solutions.

- Describe the value of SE 2050 to clients. At your option, attach any associated marketing materials.

When applicable, we will talk about the actions our offices are taking toward the goals of the SE 2050 Commitment. We have already had clients inquire about our adoption of the older SE 2050 Challenge program and will continue to highlight our adoption of the SE 2050 Commitment. Future ECAP submittals may include specific marketing materials developed as we work on our goals.

- Declare your firm as a member of the SE 2050 commitment on boilerplate proposal language.

Each proposal that we develop is unique to a particular project and client, so the design services we highlight within proposals vary from project to project. We have developed proposal language that describes our adoption of the SE 2050 Commitment and have made it available on our company-wide KPFF Structural Sustainability MS Teams page.



ELECTIVES (Not required, recommended to achieve (2) per year):

Give a quarterly external presentation on embodied carbon

Many of our offices have one or more structural engineers that are involved in their local CLF hubs. Examples of presentations given in 2020 include:

- Seattle CLF Hub: Shana Kelley has given talks on the topics of LCA Tool Overview, the Use of Tally as a Structural Engineer, and has an upcoming talk on Applying Embodied Carbon Requirements in Specifications.
- NCSEA: Nicholas Miley gave a webinar on Structural Design and Embodied Carbon.
- Portland CLF Hub: Shana Kelley co-presented on a Building Life Cycle Assessment Case Study.
- Structural Engineers Association of Washington Sustainability Committee: Givens Lam and Shana Kelley gave a presentation on the use of EC3.
- Portland Materials Transparency Collaborative Materials Summit: Matt Hoffman and Shana Kelley presented on Embodied Carbon in Structural Materials.

Share education opportunities with clients.

Many of our offices have initiated conversations with our current clients to discuss how we can partner with them on sustainability strategies on our projects. Clients have ranged from Architects, Developers, and General Contractors. Many of these conversations have led to KPFF giving educational presentations on embodied carbon and how we as structural engineers can help them reduce the embodied carbon of the overall project. If our clients have their own sustainability practice, KPFF has set up recurring meetings to share information and develop sustainable design strategies.

Provide a narrative of how you have encouraged industry and policy change incentivizing availability of low-carbon and carbon sequestration materials.

KPFF has worked previously for a large transit organization to rewrite their concrete specifications to require the submittal of EPDs for nearly all concrete on their projects. This action helped to increase the availability of EPDs in the market of this transit organization and has allowed the organization to start the process of setting limitations on embodied carbon for their concrete mixes. We continue to look for opportunities to support our clients to implement larger policies that aim to reduce the carbon emissions associated with the production of structures.

In addition, on a recent large campus project KPFF joined with the project owner and numerous architects, engineers, and construction firms to send a letter to the multiple product manufacturers to request that they provide EPDs for materials being procured for the project.

As noted above, KPFF is continually educating our clients on how we, as structural engineers, can help reduce embodied carbon on the project. We have found that this education helps us to have better project-specific responses to inquiries to reduce or eliminate sustainable design aspects due to cost and supply. This unified response often results in a higher probability that the sustainable design aspects remain and are implemented.