

SE 2050

Embodied Carbon Action Plan

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September 17, 2021

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1.0 Introduction

At the core of the structural engineering profession is improving and protecting the communities we live in. The far-reaching effects of climate change are just as much a threat to these communities as the earthquakes we have focused on for so long. If we are to continue preserving the past and building the future, we must consider how our actions now will affect the generations to come – we must be leaders of the change we want to see.

To meet the SE 2050 challenge and our own sustainability goals, F|E will pursue a variety of avenues to consistently track and reduce the environmental impact of our designs. We have created an internal Carbon Neutral Initiative (CNI) working group to support this aim. With the CNI, we will provide a holistic look at F|E's sustainability goals as part of our commitment to the greater community. We will dive into all aspects of the firm – how we develop projects, communicate with clients, and day-to-day operations – to make sustainability integral to the fabric of our company.

To allow for both breadth and depth, the F|E CNI is broken into four primary categories: external visibility, technical excellence, client collaboration, and office operations. The intent of this division is to allow each subgroup to provide a focus on their individual category and then collaborate as a team to achieve our goal of a holistic integration of sustainability into the firm. Descriptions of each subgroup are given below.

- External Visibility: Participation in the structural engineering community to both increase and share our knowledge regarding sustainable design.
- Technical Excellence: Educating our staff on sustainable materials, sustainable tools, latest thinking, technical papers, embodied energy calculations, and applying this to our office practices. This category also includes developing an office plan and implementation of carbon reduction strategies.
- Client Collaboration: Working with our clients to develop and implement sustainable design strategies on our projects.
- Office Operations: Changing the way we do things in the office to minimize our waste and reduce our carbon footprint.

The following pages describe F|E's plan to achieve the goals set out by SE 2050 and the F|E CNI. Each year will continue to bring new developments as we push towards a more sustainable future.

2.0 Education

F|E has developed an internal education program, F|E University (FEU), with the goal of sharing resources, insights, and knowledge from both within and outside of the firm. As structural engineers, we learn from each other and we hope to promote this learning and the growth that it fosters.

We will use FEU as a framework to integrate the goals of SE 2050 and our Carbon Neutral Initiative with employee training and awareness. Specifically, our objectives are the following:

- Educate our employees and clients on the importance of sustainable design, and
- Educate our engineers on how to incorporate carbon reduction strategies into the design process.

The commitments outlined in the following section serve as steps to reach these objectives. These commitments will grow and change with our knowledge and experience. As our firm develops and implements effective carbon reduction strategies, we hope to share this progress with the rest of the industry.

2.1 Commitments

FEU is made up of a number of educational tracks, including technical training, project experience, and project management. We have added a new track for sustainability, aiming to provide at least one presentation each quarter on sustainable design and embodied carbon. These presentations are in progress and include the “Embodied Carbon 101” Webinar and training on the use of the LCA tool chosen by the firm.

Along with presentations and training, FEU provides a method of sharing resources within the firm. Documents and references regarding embodied carbon and sustainable design will be added to the existing database. Employees can contribute to this database based on their own experience. A tracking system is being developed to document external involvement and attendance related to embodied carbon education, including events by SE 2050 and Carbon Leadership forum.

3.0 Reporting

Over the past year, F|E has invested time and resources into possible methods for reporting embodied carbon – among other environmental impacts – for various stages of a project. These methods have largely been focused on identifying and implementing the Life Cycle Assessment (LCA) tracking tool that we intend to implement on all of our new design projects. Additionally, we have begun to develop a comprehensive EPD dataset that provides reasonably accurate estimations of embodied carbon for structural materials to ensure that we are maintaining a uniform tracking process across our various projects.

3.1 LCA Tracking

After performing numerous trials, F|E has decided to implement the Revit plug-in Tally for everyday use on most projects, and may also utilize One Click LCA, EC3, and Athena depending on the needs of an individual project. Tally was selected because it can be easily implemented into current project workflow, its simple method for paring materials to EPDs, and the recent acquisition by *Building Transparency*. We anticipate that this acquisition will result in a significant EPD database expansion that would include the product specific EPD database that *Building Transparency* already has access to via EC3 in addition to the current industry EPD database. Our intent is to implement this tool for the upcoming year and then re-evaluate on an annual basis.

For most projects (unless a project requires otherwise), the TRACI methodology will be used, as it is currently part of LEED standards. The scope of the life cycle will focus on the product manufacturing and transportation stages (Cradle-to-Site, Stages A1-A4). For projects where information is readily available, F|E can also account for various end-of-life scenarios (C2-C4). Other stages, such as construction operations (A5) and various impacts during the use phase (B2-B5), will be documented by others, but F|E will help to support the design team when possible.

3.2 Other Commitments

The overall goal for the first year is to familiarize our engineers with LCA/Tally and use it regularly on projects, while also beginning to document embodied carbon on projects. As mentioned in the Education section, this has included an FEU presentation that reviewed how LCA works, gave background on the ISO 14040 framework, and made recommendations for how to make various assumptions that are required for an LCA. In addition to regularly educating staff on tracking embodied carbon, F|E commits to report LCA results from at least 2 anonymous projects on an annual basis.

4.0 Embodied Carbon Reduction Strategies

The primary focus for Embodied Carbon Reduction Strategies for the first year will be on educating staff on the most effective methods for reducing embodied carbon within our scope of work, and on positioning the company to implement these methods in the future. By beginning to track embodied carbon on our projects, F|E will be able to get a better sense of what areas of our practice we should focus on to ensure that the changes we make will have a thorough impact.

More specifically, F|E is committed to two goals that will help our office develop embodied carbon reduction strategies for both the present and future. The first is to complete an embodied carbon comparison study during the concept phase of a project, and the second is to begin to update the office's specifications to include embodied carbon performance.

4.1 Embodied Carbon Comparison Study

Over the course of the year, F|E is committed to performing an embodied carbon comparison study on an ongoing project. This project has been selected, and we are in the process of investigating the effect of light weight and normal weight concrete on the GWP. This effect will be studied in a design utilizing linear methods, as well as a design utilizing a nonlinear time history analysis. The intent of this study is to continue to become more familiar with performing LCA studies and with contextualizing the results of such studies. After completion, there will be an internal educational presentation to discuss lessons learned from the process and how the results of such a study can be most effectively communicated to a client.

4.2 Project Specifications

F|E is committed to requesting embodied carbon data as a part of its material specification process. We anticipate that this effort will continue well past this first year, so the focus will initially be to develop an approach for introducing such performance requirements into our standard specifications. Because of the widespread availability of concrete mix EPDs, we will make it standard to request an EPD and incorporate limits from the Marin Low Carbon Concrete Code into our specifications when possible. Since EPDs are still not as common from other material suppliers, F|E will determine an appropriate equivalent to an EPD that we will request as a part of our specifications for other materials. The goal of requesting this information is to familiarize our engineers with tracking this data and to create our own database to reference for the impact of the materials that our suppliers are currently using. We hope to encourage suppliers to provide EPDs as part of their standard material data and begin the discussion of how to decrease the GWP of their products.

5.0 Advocacy

Over the past year, we have updated our sustainable design brochure to include our commitment to SE 2050 and how we aim to achieve both our internal FE CNI goals and the SE 2050 goals. In addition, we will be distributing sustainability-specific internal resources and boilerplate language that the staff can utilize on their project proposals. We have publicly declared our commitment to SE 2050 on LinkedIn which was highlighted by the Carbon Leadership Forum in their [May newsletter](#).

5.1 Commitments

Our goal for the first year is to develop more sustainability-focused marketing materials and find new and innovative ways to share our knowledge with our clients, peers and the general public. Specifically, we intend to develop a 'Services Section' on our website dedicated to sustainability to highlight the role that structural engineers play in reducing embodied carbon. In addition, our structural engineers are active in code development committees, research and teaching, and professional organizations like the AIA Committee on the Environment (COTE) SF, and the SEAONC Sustainable Design Committee. We intend to use these platforms, our website, and other social media platforms to share our knowledge and data on a regular basis. External presentations at universities will also be conducted for student outreach. In our first year, we will aim to give at least one such presentation.

APPENDIX A – Tables of Requirements

Education

Must complete all requirements. A minimum of one elective is required, but it is recommended to achieve four per year.

Requirement/ <i>Elective</i>	Implementation
Distribute firm-wide announcement of your firm's pledge to join the SE 2050 Commitment	Our commitment to SE 2050 has been announced at a firm wide staff meeting where we will review the ECAP and our goals for the coming year.
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.	Our firm supports an internal education program, F E University (FEU). Through this program, we share resources, insights, and knowledge with our staff. Our goal is to incorporate embodied carbon reduction strategies into this program through a series of presentations.
Nominate an Embodied Carbon Reduction Champion for your firm.	Sydney Gallion is a structural designer at F E and will be acting as Embodied Carbon Champion. Sydney is part of F E's internal Carbon Neutral Initiative, and coordinates and curates the office FEU program.
Set a date within the first year to present an "Embodied Carbon 101" Webinar to your firm. Include this resource in your orientation/on-boarding programs.	The "Embodied Carbon 101" Webinar will be shown on September 22 nd , 2021 as part of an FEU series on sustainable design.
<i>Have one representative of your firm (any employee) attend quarterly external education programs provided by SE 2050, Carbon Leadership Forum (CLF), or other embodied carbon resources.</i>	<i>We have created a tracking system for external involvement and education attendance related to embodied carbon education. We will continue to post to the general office Microsoft Teams channel about events going on, as well as seminars.</i>
<i>Share the SE 2050 library of resources with technical staff.</i>	<i>This will be shared through FEU's library on the company's internal database.</i>
<i>Share embodied carbon reduction strategies with your firm as outlined in Top 10 Carbon Actions for Structural Engineers document produced by SE 2050.</i>	<i>This will be shared through FEU's library on the company's internal database.</i>
<i>Nominate a minimum of (1) employee per office to participate in a CLF Community Hub and/or task force.</i>	N/A
<i>Provide narrative outlining plans for minimum (2) firm-wide presentations per year on the topic of embodied carbon.</i>	<i>FEU is made up of a number of tracks, including technical training, project experience, and project management. We intend to add a new track for sustainability, aiming to provide one presentation each quarter on sustainable design and embodied carbon.</i>

<p><i>Present the document, “How to calculate embodied carbon” to all technical staff.</i></p>	<p><i>This will be presented in combination with the chosen LCA tool through FEU.</i></p>
<p><i>Attend a presentation or demo of an LCA-based tool used to calculate embodied carbon.</i></p>	<p><i>A demo of an LCA-based tool has been provided to the staff internally through FEU.</i></p>
<p><i>Initiate an embodied carbon interest group within your firm and provide a narrative of their goals.</i></p>	<p><i>F E has initiated the Carbon Neutral Initiative as an embodied carbon interest group within the firm. The goals of this group are outlined in Section 1.0 Introduction.</i></p>
<p><i>Provide a narrative of how the Embodied Carbon Reduction Champion will engage embodied carbon reduction at each office. (intended for multi-office firms)</i></p>	<p>N/A</p>
<p><i>Other actions you feel appropriate and a narrative for why.</i></p>	<p>N/A</p>

Reporting

Must complete all requirements. Electives are not required, but it is recommended to achieve one per year.

Requirement/ <i>Elective</i>	Implementation
Provide a narrative on how your firm plans to measure, track, and report embodied carbon data.	See Section 3.
Describe the internal training for embodied carbon measurement you provided or will provide.	Training for the chosen LCA tool will be provided through FEU. See Section 3 for more details.
Submit an annual minimum of (2) projects per U.S structural office but need not exceed (5) total projects for the firm to the SE 2050 Database.	At least (2) projects will be submitted to the SE 2050 Database.
<i>Submit all projects to the SE 2050 Database.</i>	<i>This will be considered for future years once the firm has gained familiarity with the LCA tool.</i>
<i>Meet your target average embodied carbon reduction from the previous year.</i>	N/A
<i>Report a greater percentage of projects than the preceding year.</i>	N/A
<i>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.</i>	<i>This will be evaluated on a project-by-project basis.</i>
<i>Other actions you feel appropriate and a narrative for why.</i>	N/A

Embodied Carbon Reduction Strategies

Must complete all requirements. A minimum of one elective is required, but it is recommended to achieve four per year.

Requirement/ <i>Elective</i>	Implementation
Set an EC reduction goal for the coming year and an implementation narrative. Qualitative goals focused on education are appropriate for the first year.	In this first year, we will focus on educating staff on the most effective methods for reducing embodied carbon within our scope of work, and on positioning the company to implement these methods in the future.
For second year's ECAP and beyond, provide a narrative about what you have learned about embodied carbon reduction in the past year. Describe successes and misses to help the program improve.	N/A
Minimum (1) additional elective you undertook to reduce embodied carbon in your designs, why you chose the elective and its significance.	See below.
<i>Incorporate data visualization into your ECAP. How are you looking at data to make informed design decisions and communicate design options to your clients?</i>	N/A
<i>Provide a project case study in your ECAP sharing embodied carbon lessons learned.</i>	N/A
<i>Create a project-specific embodied carbon reduction plan.</i>	N/A
<i>Complete an embodied carbon comparison study during the project concept phase.</i>	<i>We will complete an embodied carbon comparison study for an ongoing or new project. After completion, there will be an internal educational presentation to discuss lessons learned from the process and how the results of such a study can be most effectively communicated to a client.</i>
<i>Participate in a LEED, ILFI Zero Carbon, or similar project design charrette and speak to potential design considerations impacting embodied carbon.</i>	N/A
<i>Calculate your firm average benchmark for embodied carbon.</i>	N/A

<i>Update your specifications and incorporate embodied carbon performance. Include embodied carbon in your submittal review requirements.</i>	<i>In the first year, we will develop an approach for introducing performance requirements into our standard specifications.</i>
<i>Collaborate with your concrete supplier to reduce embodied carbon in a mix design.</i>	<i>Will be determined based on project-by-project basis.</i>
<i>Work with a contractor during material procurement to meet an embodied carbon performance criteria on at least (1) project.</i>	<i>Will be determined based on project-by-project basis.</i>
<i>Have an Environmental Product Declaration (EPD) created as a result of a project.</i>	<i>Will be determined based on project-by-project basis.</i>
<i>Incorporate biogenic materials on at least one project annually.</i>	<i>Will be determined based on project-by-project basis.</i>
<i>Provide a narrative of how circular economy has been used on your projects. Incorporate re-use or design for deconstruction into at least one project.</i>	N/A
<i>Quantify construction waste reduction on a project and the impact to embodied carbon.</i>	N/A
<i>Integrate embodied carbon mitigation strategies in your General Notes.</i>	N/A
<i>Other actions you feel appropriate and a narrative for why.</i>	N/A

Advocacy

Must complete all requirements. Electives are not required, but it is recommended to achieve two per year.

Requirement/ <i>Elective</i>	Implementation
Provide a narrative about how you plan to share knowledge and data to accelerate adoption of embodied carbon reduction.	Our structural engineers are active in code development committees, research and teaching, and professional organizations like the AIA Committee on the Environment (COTE) SF, SEAONC Sustainable Design Committee, and the U.S. Green Building Council.
Describe the value of SE 2050 to clients. How can we collaborate to drive adoption? At your option, attach any associated marketing materials.	Our marketing materials are tailored to our clients, explaining why sustainability is important to us and how we can help them achieve their goals.
Declare your firm as a member of the SE 2050 commitment on boilerplate proposal language.	All staff have been provided with resources and information to add to their proposal language.
Share your commitment to SE 2050 on your company website.	Our commitment to SE 2050 will be shared on our website.
<i>Give an external presentation on embodied carbon that demonstrates a project success or lessons learned (Tip: Get connected at a CLF local hub near you!).</i>	N/A
<i>Discuss with the Owner / Client the option of requiring that some of the structural materials come with facility-specific or product-specific EPDs.</i>	<i>Will be determined based on project-by-project basis.</i>
<i>Share education opportunities with clients.</i>	<i>Will be determined based on project-by-project basis.</i>
<i>Provide a narrative of how you have encouraged industry and policy change incentivizing availability of low-carbon and carbon sequestration materials.</i>	N/A
<i>Start an embodied carbon community of practice or mentorship program in your office.</i>	<i>The CNI has been established for this purpose.</i>
<i>Mentor a firm new to the embodied carbon space.</i>	N/A
<i>Other actions you feel appropriate and a narrative for why.</i>	N/A