

SE 2050 Embodied Carbon Action Plan

Year 2

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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.

In our first year as part of SE 2050, we have overcome many initial hurdles. We have gained familiarity with LCA programs and utilized them on a number of projects. We have set up an accountability framework and continued to develop our company initiative that drives this framework. We have developed resources for clients to encourage a focus on sustainability and advocated for changes that improve the sustainability metrics of our projects. With this background in place, we are ready to continue forward with implementing LCAs and other sustainability efforts in the design of our projects.

1.1 Internal Carbon Neutral Initiative

To meet the SE 2050 challenge and our own sustainability goals, F|E is continuing to 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 are providing a holistic look at F|E's sustainability goals as part of our commitment to the greater community. We are diving 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: community involvement, 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.

- Community Involvement: 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, the latest thinking, technical papers, embodied energy calculations, local and national building codes, 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 are using 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 Education Plan

FEU is made up of several educational tracks, including technical training, project experience, and project management. In the past year, a new track for sustainability has been added, aiming to provide at least one presentation each quarter on sustainable design and embodied carbon. This past year, we hosted several sustainability-focused presentations for the office, including a focus on designing with mass timber. These were a mix of presentations by our engineers and webinars, and included the following:

- Guidelines to using Tally for LCAs, hosted internally
- Everyday Sustainability Tips in F|E Practice, hosted internally
- The Structural Engineer's Role in Getting to Net Zero, hosted by SEAONC
- Embodied Carbon 101, hosted by BSA
- Mass Timber Considerations, hosted by WoodWorks
- Mass Timber Structural Design, hosted by WoodWorks
- Priming Mass Timber for Success, hosted by WoodWorks
- Case studies in sustainable timber design, hosted by Spearhead Inc.
- Sustainability in design, hosted by AS+GG

We would like to continue increasing engagement and cater to our company's and client's needs. Based on feedback, we are planning to maintain a focus on sustainable design with various materials. Currently, the presentations below are planned for the upcoming year. This list may change as we develop our desired focus.

- Summary of this year's ECAP, including lessons learned and future goals
- Summary of participation in external events, including conferences and committee involvement
- NRMCA Sustainable Concrete Specifications
- Sustainable Design with CMU

As part of the education plan, we are also planning to attend at least one sustainability focused conference. Although a limited number of engineers will be attending the conference, we will follow up by hosting an office FEU to share the knowledge the attendees have learned. Some conferences or topics we are considering include:

- Green Build
- Mass Timber related Conferences
- Living Building Challenge

3.0 Reporting

Over the past year, F|E has invested time and resources into developing the ability to track embodied carbon on past and present projects. The two primary goals of this tracking are:

- To increase the office's familiarity with embodied carbon metrics, and
- To determine how we can best use the information from LCA results to inform what sustainability targets we will make to reduce our embodied carbon impact.

Examples of this from the past year include creating an extensive user guide for our office to use on any project, and targeting embodied carbon comparison studies on particular aspects of the structural design. F|E aims to continue this work over the next year.

3.1 LCA Tracking

Previously, F|E had decided to implement the Revit plug-in, Tally, for everyday use on most projects. We are eager to see the result from the future release of TallyCAT, a tool that combines two of the most popular LCA tools, Tally and EC3, and hope that it is an even better option for our needs moving forward. Internally, we have begun work to develop a tool that can be used on a smaller scale to compare various components of a building as well as perform an Embodied Carbon comparison early on in a project. Additionally, we are researching an appropriate commercial tool that could be used for early stages of a project.

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 whenever possible.

In addition to regularly educating staff on tracking embodied carbon, F|E commits to report LCA results from at least three anonymous projects on an annual basis, an increase from the two submitted in the previous year. For all projects submitted to the database, we will ask the architect during the design phase if the project has sustainability goals.

4.0 Embodied Carbon Reduction Strategies

This past year, the primary focus for Embodied Carbon Reduction Strategies was 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. These efforts have been very successful. We began reviewing our specifications and have started down a path towards incorporating carbon reduction goals into them. We also have completed comparison studies on a component scale basis to compare the embodied carbon performance of structural systems. This year, we are looking forward to building on the progress we have made thus far.

This upcoming year, F|E is committed to two goals that will continue to help our office develop embodied carbon reduction strategies for both the present and future. The first is to share the information that we have been gathering and processing with our staff through data visualization methods and guides for contextualizing LCA results. The second is to continue to work on updating the office's specifications to include embodied carbon performance as a default for at least our concrete specifications, and draft language for other sections.

4.1 LCA Interpretation Guides

Over the past year, F|E has implemented a policy to run LCA on all new-building projects currently ongoing in the office that utilize Revit, as well as a number of past projects. This progress has led us to gain an idea of our typical project's embodied carbon portfolio across building use types, structural systems, and building size, among other parameters. This information has been shared with our office, and our goal for the coming year is to create guides on how to use this data at various stages in a project's design. In these guides, we also hope to provide some information on how to use embodied carbon as a metric along with other parameters such as material cost, weight, and strength.

4.2 Project Specifications

F|E is committed to requesting embodied carbon data as a part of its material specification process. This effort is an extension of last year's elective. This past year, we researched possible methods for incorporating embodied carbon targets and EPD requirements into our concrete specs. We will also continue to work on finding an appropriate equivalent to an EPD that will be requested 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. This year we plan to continue this work and begin to incorporate these changes into our typical specifications.

5.0 Advocacy

Over the past year, we have made significant improvements to our marketing collateral that focuses on sustainable design strategies, as well as creating new marketing material that promotes our involvement and commitment to SE 2050. In addition, we have distributed sustainability-specific resources that our staff can access and use for various client focused events like project proposals, and presentations. To increase awareness about common sustainability terms and questions that engineers might encounter on their projects, we organized an internal presentation. The intent was to help our engineers build the knowledge base needed to contribute to sustainability goals more effectively. Also, we have also acknowledged our commitment to SE 2050 on our firm's social media channels and our website.

5.1 Commitments

Our goal for the first year was 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. Our focus for this year is to develop a more informative Sustainable Design section. This section will highlight the work we are doing with SE 2050, as well as provide information on the role that structural engineers play in reducing embodied carbon. We will also declare our commitment to SE 2050 on this sustainability focused webpage. In addition, we will highlight some of the LCAs and internal studies that have been completed in the past year so that we can share our findings with our peers and clients.

In parallel with the website, we will share our knowledge and data on a regular basis through involvement in different committees. Our structural engineers are active in code development committees, research and teaching, and professional organizations like the AIA Committee on the Environment (COTE) SF, ASCE SEI and the SEAONC Sustainable Design Committee. In addition, external presentations to students and clients will be organized as the opportunity presents itself.

Internally, we will continue to educate our engineers and encourage project managers to attend and participate in sustainability kick-off meetings so they can actively contribute to and shape the project's sustainability goals.

APPENDIX A - Tables of Requirements

Education ECAP Requirements

Note that after Year 1, (2) electives are required and (4) are recommended.

Type	Description	2021	Year 1	2022	Year 2
Requirement	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.	X	Completed in Year 1.	
Requirement	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.	X	FEU will continue to be used to share knowledge surrounding sustainable design. See the ECAP for a full description.	
Requirement	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.	X	Sydney Gallion will remain EC Champion	
Requirement	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 was shown on September 22nd, 2021 as part of an FEU series on sustainable design.	X	Completed in Year 1.	
Requirement	Distribute ECAP within your firm upon publishing.	Completed in September, 2021.	-	This will be distributed during an FEU featuring lessons learned this past year as part of SE 2050.	
Requirement	Make (1) webinar focused on embodied carbon available to employees.	This has been provided through FEU. See the Year 2 ECAP for a list of provided presentations.	-	This will be provided through FEU. We currently have (4) presentations planned in 2022, which will be available to all of our staff.	

Elective	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.	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.	X	This will be incorporated into our FEU presentations this upcoming year. In addition, we will track employee attendance to any sustainability-focused events.	
Elective	Share the SE 2050 library of resources with technical staff.	This will be shared through FEU's library on the company's internal database.	X	This has been shared through FEU's library on the company's internal database.	
Elective	Share embodied carbon reduction strategies with your firm as outlined in Top 10 Carbon Actions for Structural Engineers document produced by SE 2050.	This will be shared through FEU's library on the company's internal database.	X	This has been shared through FEU's library on the company's internal database.	
Elective	Nominate a minimum of (1) employee per office to participate in a CLF Community Hub and/or task force.	N/A	-	N/A	
Elective	Provide narrative outlining plans for minimum (2) firm-wide presentations per year on the topic of embodied carbon.	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.	X	This will be provided through FEU's. We will be targeting a minimum of four sustainability-related presentations this year.	
Elective	Present the document, "How to calculate embodied carbon" to all technical staff.	This will be presented in combination with the chosen LCA tool through FEU.	X	Completed in Year 1.	
Elective	Minimum (1) employee attends a presentation or demo of an LCA-based tool used to calculate embodied carbon, such as Tally, Athena IEB, or One Click LCA.	A demo of an LCA-based tool has been provided to the staff internally through FEU.	X	Completed for all engineers in Year 1. Continuing training will be provided and will be incorporated into the onboarding of new employees.	

Elective	Initiate an embodied carbon interest group within your firm and provide a narrative of their goals.	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.	X	This was described in Year 1, see the full ECAP for a full description.	
Elective	Provide a narrative of how the Embodied Carbon Reduction Champion will engage embodied carbon reduction at each office. (intended for multi-office firms)	N/A	-	N/A	
Elective	Other actions you feel appropriate and a narrative for why.	N/A	-	N/A	

Reporting ECAP Requirements

Note that after Year 1, (1) elective is required and (2) are recommended.

Type	Description	2021	Year 1	2022	Year 2
Requirement	Provide a narrative on how your firm plans to measure, track, and report embodied carbon data.	See Year 1 ECAP.	X	See Year 2 ECAP for description.	
Requirement	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 ECAP for more details.	X	Completed in Year 1. This will be continued with new staff and new LCA tools.	
Requirement	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.	X	At least (3) projects will be submitted to the SE 2050 Database.	
Elective	Submit all projects to the SE 2050 Database.	This will be considered for future years once the firm has gained familiarity with the LCA tool.	-	This will be considered for future years once the firm has gained increased familiarity with the LCA tool.	
Requirement	Report a greater percentage of projects than the preceding year.	N/A	-	This Year, we will commit to submitting data from at least (1) additional project for at least (3) projects total.	
Elective	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.	This will be evaluated on a project-by-project basis.	-	For all projects submitted to the database, we will ask the architect during the design phase if the project has sustainability goals.	
Elective	Other actions you feel appropriate and a narrative for why.	N/A	-	N/A	

Reduction ECAP Requirements

Note that after Year 1, (1) elective is required and (4) are recommended.

Type	Description	2021-2022	Year 1	2022-2023	Year 2
Requirement	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.	X	This year, the focus is on sharing the data that we have developed in Year 1 with staff and building on our resources to inform the specifications that we provide.	
Requirement	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	-	When the client is motivated to reduce carbon, this greatly supports more innovative design methods and tracking carbon throughout a project. For projects where this isn't a client priority, we need to develop ways implement a cost-neutral approach to reducing carbon, and incorporate studies into our company workflow.	
Elective	Incorporate data visualization into your ECAP. How are you looking at data to make informed design decisions and communicate design options to your clients?	N/A	-	N/A	
Elective	Provide a project case study in your ECAP sharing embodied carbon lessons learned.	N/A	-	Two case studies are in progress, and they will be presented within the coming year.	
Elective	Create a project-specific embodied carbon reduction plan.	N/A	-	This will be assessed on a project-by-project basis.	

Elective	Complete an embodied carbon comparison study during the project concept phase.	We will complete an embodied carbon comparison study for an ongoing or new project. 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. Year 1: This is in progress for (2) projects.	X	This will be assessed on a project-by-project basis.	
Elective	Participate in a LEED, ILFI Zero Carbon, or similar project design charrette and speak to potential design considerations impacting embodied carbon.	N/A	-	N/A	
Elective	Calculate your firm average benchmark for embodied carbon.	N/A	-	N/A	
Elective	Update your specifications and incorporate embodied carbon performance. Include embodied carbon in your submittal review requirements.	In the first year, we will develop an approach for introducing performance requirements into our standard specifications.	X	We will build on our work from last year to continue updating our specification. See the Year 2 ECAP for details.	
Elective	Collaborate with your concrete supplier to reduce embodied carbon in a mix design.	Will be determined based on project-by-project basis. Year 1: Completed for (2) projects.	X	Will be determined based on project-by project basis, with a target minimum of at least 1 project.	
Elective	Work with a contractor during material procurement to meet an embodied carbon performance criteria on at least (1) project.	Will be determined based on project-by-project basis. Year 1: Completed for (1) project.	X	Will be determined based on project-by project basis, with a target minimum of at least 1 project.	
Elective	Have an Environmental Product Declaration (EPD) created as a result of a project.	Will be determined based on project-by-project basis. Year 1: Not completed.	-	Will be determined based on project-by project basis..	
Elective	Incorporate biogenic materials on at least one project annually.	Will be determined based on project-by-project basis. Year 1: Not completed.	-	Will be determined based on project-by-project basis.	

Elective	Submit a Circular Economy Narrative describing how the project supports the circular economy. This can be done by incorporating re-use or design for deconstruction into at least one project.	N/A	-	N/A	
Elective	Report weight and method of transportation of structural material. Track how much is processed for recycling/salvage and sent to landfill, including material generated during demolition and construction activity. Include at least four material streams (e.g. concrete, metal, wood, gypsum wallboard, paper and cardboard, plastic).	N/A	-	N/A	
Elective	Integrate embodied carbon mitigation strategies in your General Notes.	N/A	-	N/A	
Elective	Propose other embodied carbon reduction strategies and describe their value.	N/A	-	N/A	

Advocacy ECAP Requirements

After Year 1, (2) electives are required and (4) are recommended.

Type	Description	2021-2022	Year 1	2022-2023	Year 2
Requirement	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.	X	See Year 2 ECAP Section 5.1.	
Requirement	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.	X	Our marketing materials are tailored to our clients, explaining why sustainability is important to us and how we can help them achieve their goals. We are in the process of updating the company website to include more information about sustainability and highlight SE 2050.	
Requirement	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.	X	Completed in Year 1.	
Elective	Share your commitment to SE 2050 on your company website.	Our commitment to SE 2050 will be shared on our website.	X	Our commitment to SE 2050 has been shared on our website.	
Elective	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!).	N/A	-	N/A	
Elective	With the owner or client, discuss a facility- or product-specific EPD requirement for structural materials.	Will be determined based on project-by-project basis. Year 1: This was completed for (2) projects.	X	Will be determined based on project-by-project basis.	
Elective	Share education opportunities with clients.	Will be determined based on project-by-project basis.	-	Will be determined based on project-by-project basis.	

Elective	Encourage industry and policy change by promoting and using low-carbon and carbon-sequestering materials	N/A	-	Will be determined based on project-by-project basis.	
Elective	Start an embodied carbon community of practice or mentorship program in your office.	The CNI has been established for this purpose.	X	Continue to support the Carbon Neutral Initiative (CNI) group in our office, and encourage staff to be involved.	
Elective	Mentor a firm new to the embodied carbon space.	N/A	-	N/A	
Elective	Other actions you feel appropriate and a narrative for why.	N/A	-	N/A	