

BUEHLER

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Buehler's Embodied Carbon Action Plan | SE 2050

1. Education

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

An email announcement was distributed to all staff on July 20, 2021.

- ☒ 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.

In 2022 Buehler watched a presentation by BSA on embodied carbon, and the sustainable design committee presented on the topic of Life Cycle Assessment at our annual training day event. We also requested projects from staff to be included in the LCA database.

In 2023 the firm promoted embodied carbon education through our new hire training program by providing pre-recorded videos for staff to watch. We continued to gather projects for LCA studies.

In 2024 we continued to provide access to pre-recorded videos through our new hire training program. Data from LCA studies on Medical Office Buildings (MOB) is now a focus for our Sustainable Design Committee so that trends can be identified in this popular building type with the intention of sharing this information with our staff through monthly staff meetings.

The study on MOB's continued in the year 2025 with the goal of sharing results in a monthly engineering staff meeting.

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

Ryan Miller, SE, LEED AP | Associate Principal

Sacramento

Over the past 22 years, Ryan has been active within the structural engineering community. He is actively involved in the SEAOC Sustainable Design Committee and the lead for Buehler's Sustainable Design Committee. Ryan manages the embodied carbon tracking for Buehler's projects that will contribute data to the SE 2050 Commitment. As a strong advocate for sustainable design practices, Ryan became an early adopter of mass timber systems for the materials' inherent carbon sequestration and biophilic effects. He also acknowledges the adaptive reuse of existing buildings as an excellent way to reduce carbon emissions.

- ☒ 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.

Buehler watched BSA's Embodied Carbon 101 – Structure on January 25, 2022. This webinar has also been included in our New Hire Training manual that all new employees receive on their first day. A link to the video is provided on the company

intranet page.

- ☒ Electives - (2) required, (4) recommended per year. See below and insert the letter(s) corresponding to selected electives: A, B, C, D, E

Potential Education Electives

- A. Provide a narrative of how the Embodied Carbon Reduction Champion will engage embodied carbon reduction at each office. (required)
The ECRC is engaging each office through staff meetings and annual training day presentations.
- B. Present at least (1) webinar focused on embodied carbon and make a recording available to employees. This could be created internally, pulled from an external source (with permission), or pulled from a publicly available source such as the Boston Society for Architecture. Include this resource in your orientation and onboarding program. (required)
Buehler holds annual training day in the fall, and a topic related to embodied carbon or sustainability will be presented at each event. In January of each year the entire staff will watch recorded webinars on embodied carbon.
- C. Incorporate embodied carbon education in your onboarding process for all new employees.
Our new hire training program includes a link to pre-recorded webinars from BSA and provides an overview of our internal Sustainable Design Committee.
- D. Train all of your firm's structural engineers on the core concepts and skills required to measure, reduce, and report embodied carbon (reference SE 2050 resources).
The website link to the SE 2050 library of resources was included in the firm-wide email announcement. Staff will be reminded of this resource during our internal education events.
- E. Initiate and embodied carbon interest group within your firm and outline their goals. This group may more broadly address sustainability, but they must include embodied carbon.
Buehler formed a Sustainable Design Committee when we joined SE 2050. This committee is focused on reviewing aspects of embodied carbon and fulfilling the requirements of the SE 2050 Commitment. Goals of the committee include updating all specifications to prioritize sustainable practices.
- F. Create and 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.
- G. Engage with a CLF Regional Hub. This could mean attending presentations or working sessions and reporting back to the firm, or co-chairing a hub.
- H. Propose other actions promoting embodied carbon education and describe their value.

2. Reporting

- ☒ Provide a narrative on how your firm plans to measure, track, and report embodied carbon data. Here are some considerations to include:
- » How will you calculate embodied carbon for structural materials?
 - » Do you have access to product- or region-specific EPDs?
 - » What commercially available LCA software will you be using to quantify embodied carbon?
 - » What life cycle analysis (LCA) methodology will you use? Define where you plan to delineate scope (e.g. A1-A5, A-C, A-D), communicate inherent assumptions, etc.
 - » How will you calculate material quantities and how often?

Buehler intends to use Athena and the ECOM tool by SE 2050 to measure embodied carbon in selected projects. We will compare the output obtained from these two platforms to evaluate the consistency and sensitivity of the data. Material quantities will be obtained using modeled elements in Revit including some manual modifications where necessary when structural elements are not explicitly modeled in Revit. Quantities may be obtained at major project milestones as appropriate for the project, such as Schematic Design, Design Development, Construction Documents, and/or Material Procurement phases. Local or regional EPD's will be used when feasible depending on the project location, but will otherwise make rational assumptions on the use of EPD's. The life cycle analysis will focus on stages A1-A5, however we will evaluate each project to determine if an analysis beyond these stages is warranted.

A goal for 2026 is to study how the EC3 tool can be incorporated into the LCA process. We are also focusing on Medical Office Building projects as a project type that our office will be able to obtain greater amounts of data to help with the identification of areas for improvement.

- ☒ Electives - (1) required, (2) recommended per year. See below and insert the letter(s) corresponding to selected electives: **A, C**

Potential Reporting Electives

- A. 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. Firms are expected to follow the spirit of the SE 2050 program in determining how many total projects your firm must submit. You do not need to consider offices that only offer construction administration services or offices with fewer than (5) full-time employees.
(required)
Projects for our firm are submitted through the Database upload portal on the SE 2050 website. We will provide at least (5) projects each year.
- B. For multi-office firms, describe how each office is measuring and reporting embodied carbon. For single-office firms, describe how different project teams or managers are measuring and reporting embodied carbon.
- C. Compare the embodied carbon emissions from multiple projects across your firm. Analyze and document what data or pieces of information are most important and communicate the findings to your firm.
The comparison of data from multiple projects began in 2024 once we had enough projects completed and will continue as we do more projects. Results will be shared with the firm through engineering staff meetings.
- D. Include all structural material quantities in your submissions to the SE 2050 database.
- E. Propose other actions that promote the reporting of embodied carbon data and describe their value.

3. Embodied Carbon Reduction Strategies

- ☒ Set an EC reduction goal for the coming year and an implementation narrative. Qualitative goals focused on education are appropriate for the first year.

Our goal is to review LCA data from our projects and look for patterns in the data which would inform areas where carbon reduction can most likely be achieved.

- ☒ 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.

Our focus right now is on compiling more data for Medical Office Building projects. Our initial study of about 12 MOB projects found that the results had large variation for reasons that were not immediately evident. Our committee decided that we needed more projects to inform the data and that we needed more metrics about the project such as seismic criteria to understand the difference in embodied carbon.

- ☒ Electives - (1) required, (4) recommended per year. See below and insert the letter(s) corresponding to selected electives: **A, D**

Potential Embodied Carbon Reduction Strategy Electives

- A. Set a clearly stated, firm-wide reduction target in the short-term (<1 year) and long-term (>5 years). (required)
Our short-term goal is to understand the data we are receiving from the LCA. We are still in a learning phase and hope to move into the reduction strategy targets in the coming year.
- B. 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.
- C. Develop and implement a workflow that makes it easier to make early design decisions based on embodied carbon.
- D. Update your specifications to incorporate embodied carbon performance. Include embodied carbon in your submittal review requirements.
Our specifications now include embodied carbon metrics. Our goal is to improve upon these metrics and expand their use into other material specifications.
- E. Communicate the embodied carbon impacts of different design options to clients with creative and effective data visualization. You are welcome to include these visualizations in your Elective Documentation, though it is not required if your firm would prefer to keep marketing materials private.
- F. Compare different design options with embodied carbon as a performance metric during the project concept phase. Explain what you did and what the results changed (if anything).
- G. Participate in a LEED, ILFI Zero Carbon, or similar project design charrette and speak to potential design considerations impacting embodied carbon.
- H. Collaborate with your concrete supplier to reduce embodied carbon in a mix design below an acceptable baseline (e.g. NRMCA regional baseline values). Discuss what you found and what it means in your market.
- I. Have an Environmental Product Declaration (EPD) created for a project. Get a project or client to require the creation of an Environmental Product Declaration (EPD) that did not exist before.
- J. Incorporate sustainably harvested biogenic materials in at least one project.
- K. Propose other embodied carbon reduction strategies and describe their value.

4. Knowledge Sharing Narrative (Advocacy)

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

Buehler's initial approach to advocating for sustainable structures will be very similar to our own internal education. We can advocate for reduced embodied carbon simply by having conversations with clients about our efforts. We can share the data that we have collected on past projects, explain how carbon was reduced or could be further reduced, and show how much or how little that effort is different than "business as usual." By sharing our knowledge with our internal staff, it equips each of us with the information needed to start a conversation with our clients, and hopefully the importance of reducing embodied carbon will be embraced by the design and construction team.

We have a mass timber presentation that we have been presenting to architect clients a few times per year, which has a component of sustainability in using the timber material. This helps architects to become more familiar with mass timber.

- ☒ Describe the value of SE 2050 to clients. How can we collaborate to drive adoption? At your option, attach any associated marketing materials.

As described above, the value of SE 2050 and carbon reduction starts with a conversation. Many of our clients may find a flier, case study, or other information material helpful to their understanding of carbon reduction. Buehler has prepared a one-page summary of our intentions and capability as a signatory firm to SE 2050 that can be used in project pursuits. This will not only be useful for advocating to our clients, but also to our own staff.

- ☒ Electives – (2) required, (4) recommended per year. See below and insert the letter(s) corresponding to selected electives: [A](#), [B](#)

Potential Advocacy Electives

- A. Describe the value of SE 2050 to clients. See checkbox and description above. (required)
- B. Publicly declare firm as a member of SE 2050. See checkbox and description above. (required)
- C. Give an external presentation on embodied carbon that demonstrates a project success or lessons learned. Get connected at a CLF regional hub hear you and be sure to post the recording.
- D. Mentor a firm new to the embodied carbon space. Describe how you identified their needs and what improvements were made.
- E. Engage with structural material suppliers in your region to communicate the importance of Environmental Product Declarations (EPDs) and low-carbon material options.
- F. 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.
- G. Propose alternative methods for advocacy and describe their value.

5. Lessons Learned

Provide a summary of what the firm has learned over the previous year of embodied carbon reduction. Use this to inform strategies for the coming year.

From the time of our commitment in July of 2021 until the time of writing this ECAP update in March 2026, our main focus has been learning about embodied carbon and how to measure it using an LCA tool. The time invested in running an LCA can vary greatly depending on the project and how well the building was modeled in Revit. At some point it would be best to update Revit best practices to better facilitate the data output for material quantities. We have also found that it can be a slow process to grasp the concepts of embodied carbon.

Our approach for the 2026 year will be to continue to run LCA's on projects and also get started on trying to better understand the data. Our focus is on MOB's since our firm has been doing a lot of these projects lately and they are constructed of materials that are easy to track using Revit quantities. We will look for methods to streamline the data export and manipulation process with the end goal that all engineers in our office can run an LCA on their projects. In an effort to be consistent with the data, we are using the ECOM tool since it is easy and fast to use. We are excluding exterior skin and interior wall framing to keep the comparisons similar.

We are hoping to set up a process where people can discuss projects that have sustainability aspects so we can learn from each other. It would be beneficial to understand what discussions lead to decisions about specifications and project detailing.

We will continue to look for opportunities for learning and educating our staff and advocating with our clients. Maintaining momentum on the internal education events has been difficult given the heavy project workload that we all are confronted with.