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Embodied Carbon Action Plan – 2021

Submitted to the SE 2050 Committee on January 13, 2021

Introduction

We are pleased to submit our first Embodied Carbon Action Plan. Equilibrium has been involved in sustainable design for many years, particularly with our work in timber. We have been expanding our internal knowledge base on embodied carbon in recent months and years. The SE 2050 program is coming at a great time to help keep us moving in the right direction, and we enthusiastically embrace the goals of the program.

This ECAP is broken down into four parts per the guidance from the Program Requirements document: Education, Reporting, Embodied Carbon Reduction Strategies, and Advocacy. Items marked with [R] are required per the SE 2050 Commitment whereas items marked with [E] are electives.

Part 1 – Education

The term "embodied carbon" is still unknown to many practicing engineers, architects, and owners. At Equilibrium we are increasing our carbon literacy, but still have much to learn. We plan to take the following steps in order to educate ourselves.

- [R] Distribute firmwide announcement of Equilibrium's pledge to join the SE 2050 Commitment.
    - This has been done. We will be keeping the company in the loop with the rest of our progress as well, such as distributing our ECAP internally.
- [R] "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."
    - Equilibrium is currently about twenty people most of whom are structural engineers. We have an internal sustainability committee with a current roster of six engineers and one BIM technician. This group meets regularly to discuss sustainability-related topics and through discussion, collaboration, and sharing of information, we advocate to raise awareness of sustainability matters. This group periodically holds sessions with the rest of the firm to keep everyone in the loop as to our progress and to educate the whole team on embodied carbon, SE 2050, and related initiatives. We also produce internal-facing documents summarizing our learnings to share with the group and post them to our intranet for reference and consumption by all.
    - Equilibrium shares an office and regularly collaborates with Michael Green Architecture. We participate in regular shared discussions in the space of embodied carbon and sustainable design, which allows us to keep up to date with industry discussions not directly related to structural engineering.
- [R] Establish an Embodied Carbon Reduction Champion.
    - Our Embodied Carbon Reduction Champion for the SE 2050 Commitment, also the author of this plan:

      Matt Kantner, PE, SE. Matt is a senior engineer with the firm and is based out of Atlanta, GA. Matt has been working as a structural engineer in Atlanta since 2012 and has worked on a wide variety of projects in all structural materials. Working on the Kendeda Building at Georgia Tech inspired an interest in mass timber and structural sustainability which led him to Katerra and then

Equilibrium where he now focuses primarily on large mass timber projects. Matt is a member of SEI's Sustainability Committee and the SE 2050 Committee.

- [R] Set a date to present an "Embodied Carbon 101" Webinar.
    - We have scheduled this for January 20, 2021.
- [E] "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."
    - Most members of the sustainability committee already regularly attend webinars on the topic of sustainability and will continue to do so.
- Share embodied carbon documents and resources within firm, including but not limited to the following:
    - [E] Share the SE 2050 library of resources with technical staff.
    - [E] Share embodied carbon reduction strategies with your firm as outlined in Top 10 Carbon Reducing Actions for Structural Engineers document produced by SE 2050.
    - [E] Present the document, "How to calculate embodied carbon" to all technical staff.
- [E] "Initiate an embodied carbon interest group within your firm and provide a narrative of their goals."
    - Our sustainability committee serves this function. The committee's mission statement reads "To design more sustainable buildings by decreasing the environmental impact of buildings' structural systems. In doing so, we will become subject matter experts and sustainability resources for our clients. Ultimately, we will elevate the profile of Equilibrium and establish ourselves as leaders in structural sustainability. More importantly we'll be doing our part to mitigate the climate crisis."

Part 2 – Reporting

- [R] "Provide a narrative on how your firm plans to measure, track, and report embodied carbon data."
    - We are attempting to decrease the carbon footprint on all of our projects, and there are small things that we can do on virtually every project to achieve reductions; however, it is not currently feasible for us to perform full Life Cycle Assessments on all projects, particularly small ones with small budgets. For projects where we are planning to perform LCAs and track embodied carbon more closely, we have developed a process to do so. At key milestones throughout each project we plan to perform an LCA on the building's structure, then use the results to identify hot spots for potential carbon reduction and optimization. We are developing a standardized report to convey results to the rest of the project team and ownership at these key stages. The key quantitative result in the report will be the embodied carbon per building area. For timber projects this will be reported both with and without consideration of biogenic carbon. The report will also list embodied carbon hot spots and opportunities for reduction.
    - In most cases we will rely on the Life Cycle Inventory within Tally to get embodied carbon data for structural materials. We do have access to other EPDs via EC3 and through other sources in cases where we'd prefer to use something other than what is built into Tally.
    - We are using Tally (and the EPDs embedded within its LCI) to perform our LCAs.
    - While Cradle-to-Grave (A-C) GWP is the number we will highlight in reports, we will also report an intermediate stage (likely A1-A5) as the near-term releases of CO2 into the atmosphere are the most critical.

    - Material quantities will be extracted from our Revit model. We plan to have scheduled meetings between the project manager and the BIM Technician / Life Cycle Analyst to ensure that all significant contributors to embodied carbon are included in the analysis (e.g. steel connectors in mass timber frame buildings are not modeled but will be "faked out" for inclusion in the LCA).
- [R] "Describe the internal training for embodied carbon measurement you provided or will provide."
    - All members of our sustainability committee have learned a great deal about embodied carbon in the past year. In its simplest form the only two things we need to get right in order to have a quality LCA are the material quantities and material assignments in Tally. All of us, including Ben McKinnon, our BIM Technician / Life Cycle Analyst, have been educating ourselves on LCAs and Tally by reading papers such as IStructE's "How to calculate embodied carbon", Carbon Leadership Forum's "Live Cycle Assessment of Buildings: A Practice Guide", and more. We are also able to access some great LCA knowledge within our sister company, Michael Green Architecture, and parent company, Katerra. Being tied into the SEI Sustainability Committee and SE 2050 Committee also provides us with great resources.
- [R] Submitting project data for the SE 2050 database.
    - Equilibrium is somewhat unique amongst other SE 2050 firms in that we are a Canadian-based firm with just a handful of employees scattered around the US. We will be sure to meet the minimum of two projects per year but will strive to submit each large project that we work on.
- [E] "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."
    - We intend to do this on some of our projects moving forward.

Part 3 – Embodied Carbon Reduction Strategies

This year we can't check off too many of the boxes in this category since we've yet to establish a baseline for embodied carbon in our projects. As we establish our baseline this year, we'll still be looking for many ways to reduce embodied carbon on our projects.

- [R] "Set an EC reduction goal for the coming year and an implementation narrative. Qualitative goals focused on education are appropriate for the first year."
    - As this is the first year of the program and we have no established baseline, we'll have to focus primarily on the other aspects of the program this year. We'll continue our internal education and advocacy. We'll continue implementing carbon reduction strategies on our projects and will implement new ones as our knowledge increases throughout the year. In particular, we are planning to take the following action this year.
        - Revamping our concrete specifications and general notes. We are planning to set cement / embodied carbon limits similar to the Marin County Concrete Code. This is challenging because we do work throughout North America and around the world, but we are a fairly small firm. We'll do our best to implement these on projects where it makes sense.
        - Another internal initiative is also related to concrete: we will be evaluating our "typical" slabs-on-ground. While we are known for some of our larger mass timber projects, Equilibrium still does a number of smaller projects, especially in timber. For these smaller projects the foundations and slabs-on-ground have an outsized role in the carbon

footprint of the building. We intend to study carbon reduction strategies for these elements and implement changes to our standards this year.

- We will continue undertaking sustainability reviews on all significant projects with the aim of incorporating our sustainability best practices to reduce embodied carbon and waste.
- We aim to get involved with early design decisions on projects with a sustainability focus so that we are able to influence the design at an early stage.

- [E] "Complete an embodied carbon comparison study during the project concept phase."
  - We have the tools and know-how to do this and hope to do so on a project this year. We don't always get to influence the overall structural system, but we often have opportunities to do so on our mass timber projects. In the mass timber world the "optimal" framing scheme is still very much up for debate. We have used many different schemes in the past decade including simple post-and-beam, composite slab, composite girder, staggered deck, etc. As we are choosing schemes for future projects, we'll aim to consider embodied carbon as a consideration.
- [E] "Update your specifications and incorporate embodied carbon performance. Include embodied carbon in your submittal review requirements."
  - As mentioned previously, we intend to do this for concrete.
- [E] "Collaborate with your concrete supplier to reduce embodied carbon in a mix design."
  - As we all know, you can specify whatever you want, but if the industry is not capable of providing it (for a reasonable price) you won't get it. We are excited to overhaul our concrete specifications, but we know that we'll have to work with suppliers on individual projects in order to achieve the best outcomes. We have a large project with a very sustainability-minded client that is slated to go into construction later this year in California. We will absolutely be working with the concrete supplier to reduce embodied carbon on this project.
- [E] "Incorporate biogenic materials on at least one project annually."
  - This is quite an easy one for us as most of our projects are timber. We will continue advocating for mass timber on our projects (they don't all end up going that way) and within the larger building community.

Part 4 – Advocacy

- [R] "Provide a narrative about how you plan to share knowledge and data to accelerate adoption of embodied carbon reduction."
  - At this time, we believe that the best thing we can share is knowledge. The AEC community at large still knows very little about embodied carbon. Individuals within the firm have begun making posts on LinkedIn to educate our networks about embodied carbon and SE 2050. These posts are typically promoted by the Equilibrium LinkedIn account in order to spread them to a wider audience. As we start to compile meaningful data from our research and LCAs we will share this as well. A longer-term goal would be the development of an external-facing lunch-and-learn on embodied carbon and how we are measuring and reducing it on our projects.
  - Tangentially, it is clear to us that carbon sequestration in buildings, especially in long lifecycle materials such as the structure itself, is one of the best strategies for lowering embodied carbon (and eventually getting to zero). So by advocating for mass timber in buildings and by designing

buildings with mass timber frames, we believe we have been promoting low carbon solutions for many years already and will continue to do so.

- [R] “Describe the value of SE 2050 to clients. How can we collaborate to drive adoption? At your option, attach any associated marketing materials.”
    - For our US projects, especially those with forward-thinking clients, we will certainly extol the virtues of the SE 2050 program. When appropriate, we will attach SE 2050 marketing materials.
- [R] “Declare your firm as a member of the SE 2050 commitment on boilerplate proposal language.”
    - For US projects, and perhaps even for Canadian projects with a sustainability focus, we will add this to our boilerplate proposal language.
- [E] “Share your commitment to SE 2050 on your company website.”
    - We are currently revamping our website. When it rolls out (hopefully Q2 this year) it will feature a page on sustainability where we will proudly promote our commitment to SE 2050.
- [E] “Share education opportunities with clients.”
    - We will do this. One source that immediately comes to mind is the Atlanta CLF hub, which is quite active and has done a great job so far in educating attendees about embodied carbon.
- [E] “Start an embodied carbon community of practice or mentorship program in your office.”
    - We essentially already have this with our sustainability committee. Our main area of focus is embodied carbon; and a major goal of the committee is to educate the wider team and industry peers.

We are pleased that most of these goals for 2021 are in alignment with internal goals that we had already set for ourselves. We are happy to have the SE 2050 Commitment as a means of tracking our progress and to have the resources and network that we are developing through the Commitment / Committee to help us along the way. And most of all, we are happy to be part of something that we truly hope will help to transform the industry.

-Matt Kantner, PE, SE