



KFSE Embodied Carbon Action Plan (ECAP)

April 29, 2024

Introduction:

Kurt Fischer Structural Engineering, Inc (KFSE), is a 15-person firm with offices in Encino, CA, Irvine, CA, and Portland, OR. KFSE is proud to commit to the SE 2050 Program to reduce the impact of building construction on the environment. We support the vision that all structural engineers shall understand, reduce, and ultimately eliminate embodied carbon in their projects by 2050.

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715 SW MORRISON ST, SUITE 907 • PORTLAND, OR 97205



Education Plan

- KFSE Carbon Champion for 2024:
Carl Kloos, S.E., LEED AP is continuing as KFSE's Carbon Champion. Carl is a Vice President and leads KFSE's Portland, OR office. He has 20 years of experience in structural engineering, and has been a LEED Accredited Professional since 2013. From 2017-2023 Carl was member of the Structural Engineering Institute's (SEI) Sustainability Committee, participating in the Disaster Resilience working group.

Within 1 year of signing the SE 2050 commitment, KFSE will:

- Distribute ECAP within your firm upon publishing.
KFSE will distribute the ECAP immediately via email once finalized.
Completed 4/22/2022
- Make (1) webinar focused on embodied carbon available to employees.
KFSE will show the webinar "Embodied Carbon 101: Structure" at one of our monthly lunch-n-learn meetings in the first year of joining.
Completed 2/23/2023

Action items for 2024:

- Share (1) webinar focused on embodied carbon during our monthly lunch-n-learn series.
- Provide a narrative of how the Embodied Carbon Reduction Champion will engage embodied carbon reduction at each office. (intended for multi-office firms).

Additional potential electives for future years:

- 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.
 - Completed for 2023, KFSE has regularly attended the Quarterly SE 2050 Signatories calls.
- Share the SE 2050 library of resources with technical staff.
- Share embodied carbon reduction strategies with your firm as outlined in Top 10 Carbon Reducing Actions for Structural Engineers document produced by SE 2050.
- Nominate a minimum of (1) employee per office to participate in a CLF Community Hub and/or task force.
- Provide narrative outlining plans for minimum (2) firm-wide presentations per year on the topic of embodied carbon.
- Present the document, "How to calculate embodied carbon" to all technical staff.
- 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.
- Initiate an embodied carbon interest group within your firm and outline their goals.
- Provide a narrative of how the Embodied Carbon Reduction Champion will engage embodied carbon reduction at each office. (intended for multi-office firms).
- Propose other actions promoting embodied carbon education and describe their value.

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Reporting Plan

Each year KFSE will:

- 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. Offices less than 5 FTE are excluded.

KFSE will submit (2) projects to the database each year.

- Completed for 2023. Analysis for (2) projects ready for upload on 7/25/2023*
 - Completed for 2024. Analysis for (2) projects ready for upload on 3/14/2024*
- * Upload occurred at a later date as the Database website was down.

Additional potential electives for future years:

- Submit all of your firm's projects to the SE 2050 database.
- Report a greater percentage of projects than you did the previous 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.
- Propose other actions that promote the reporting of embodied carbon data and describe their value.

Embodied Carbon Reduction Plan

Within 1 year of signing the SE 2050 commitment, KFSE will:

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

KFSE will update our specification templates to include provisions to document and/or reduce embodied carbon.

- Not Completed in 2023, this is still a goal and we hope to implement for 2024.

Action Items for 2024:

- Update our specifications to incorporate embodied carbon performance. Include embodied carbon in your submittal review requirements.
- Set clearly stated, firm-wide reduction targets in the short-term (5 years)

Additional potential electives for future years:

- Communicate the embodied carbon impacts of different design options to clients with creative data visualization. Include these visualizations in your Elective Documentation.
- Project case study sharing embodied carbon reduction successes and lessons learned
- Create a project-specific embodied carbon reduction plan.
- Complete an embodied carbon comparison study during the project concept phase.
- Participate in a LEED, ILFI Zero Carbon, or similar project design charrette and speak to potential design considerations impacting embodied carbon.
- Calculate your firm average benchmark for embodied carbon.
- Collaborate with your concrete supplier to reduce embodied carbon in a mix design.
- Work with a contractor during material procurement to meet an embodied carbon performance criteria on at least (1) project.
- Have an Environmental Product Declaration (EPD) created for a project.

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- Incorporate biogenic materials on at least one project.
- 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.
- 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).
- Integrate embodied carbon mitigation strategies in your General Notes.
- Propose other embodied carbon reduction strategies and describe their value.

Advocacy Plan

Within 1 year of signing the SE 2050 commitment, KFSE will:

- Describe the value of SE 2050 to clients. How can your design teams collaborate to reduce embodied carbon?
KFSE will discuss the SE 2050 commitment with clients.
 - Partial Credit for 2023. We've had discussions with some clients, but will strive for more discussions in 2024.
- Declare your firm as a member of the SE 2050 Commitment with boilerplate proposal language.
KFSE will review our proposal template to see if the SE 2050 commitment can be included. We will request examples from other SE 2050 signatories. For RFPs that request a qualifications package, we will include a section declaring our firm's commitment to SE 2050.
 - Completed for 2023. We've added language referencing SE2050 in our RFP documents.
- Share your commitment to SE 2050 on your company website.
KFSE will add a section about SE 2050 to our website.
 - Not Completed for 2023, will be a to do item for 2024.

Action Items for 2025 Reporting Period :

- Describe the value of SE 2050 to clients. How can your design teams collaborate to reduce embodied carbon?
KFSE will continue to discuss the SE 2050 commitment with clients.
- Discuss SE 2050 and Carbon Reduction in a presentation to an architecture firm
 - Completed for 2024. On 4/18/24 KFSE had a professional development presentation in an architect's office, in that presentation we covered SE 2050, Carbon Reduction, and showed the architect the structural embodied carbon for one of the projects that we worked on with the firm.

Additional potential electives for future years:

- 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!).
- With the owner or client, discuss a facility- or product-specific EPD requirement for structural materials.

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- Share education opportunities with clients.
- Encourage industry and policy change by promoting and using low-carbon and carbon-sequestering materials.
- Start an embodied carbon community of practice or mentorship program in your office.
- Mentor a firm new to the embodied carbon space.
- Propose alternative methods for advocacy and describe their value.

Lessons Learned/Progress Update

Getting started in SE 2050, the first big task was to determine what method and tools we would use to calculate the embodied carbon for our project. This took longer than expected, but we were able to report our first two projects in July of 2023 (actually uploaded in December due to Database website being down). Our second two project were ready for reporting in March 2024.

To calculate the embodied carbon for our projects, we decided to use a combination of in-house Revit aids and excel combined with EC3. The in-house Revit aid allow us to calculate the material quantities for primary framing members and slabs. We combined this with additional excel tools to efficiently determine the remaining material quantities for each selected project.

We looked at other methods, but since our clients have not yet been requesting this information we settled on using EC3 since it is free to use and thus not an additional overhead cost. We are hoping to team in the future with clients that are involved in AIA 2030, and when that happens we will likely shift to a program like Tally when our carbon reporting becomes a client deliverable.

The next step was to import the data to EC3, which was a straight forward process. After that, we got he embodied carbon data, downloaded the data into an excel file, and then uploaded to the SE 2050 Database.

The four projects we chose to submit to SE 2050 are shown below:

1634 20th Street (161.3 kgCO₂e/m²) – 114,790 sf, 5 over 2 light framed on concrete podium with 1 level subterranean parking. 78 units of affordable housing. Submitted 2023

Trancas Canyon Residence (402.9 kgCO₂e/m²) – 3,500 sf 1-story single family residence, with concrete flat slab roof and concrete walls. The project was built entirely of concrete following the Malibu fire which completely destroyed the prior house on this site. Submitted 2023.

Manhattan (186.0 kgCO₂e/m²) – 104,143 sf, 5 over 2 light framed on concrete podium with 1 level subterranean parking. 60 units. Submitted 2024.

Gooseberry Trails (96.4 kgCO₂e/m²) – 50 units of townhomes up to 3 levels. All light framed wood construction. One 4-unit 7,895 sf, 3-story structure with daylight basement from the development was submitted. Submitted 2024.

Our four reported projects can be seen in the diagram below from the SE 2050 website (Figure 1).

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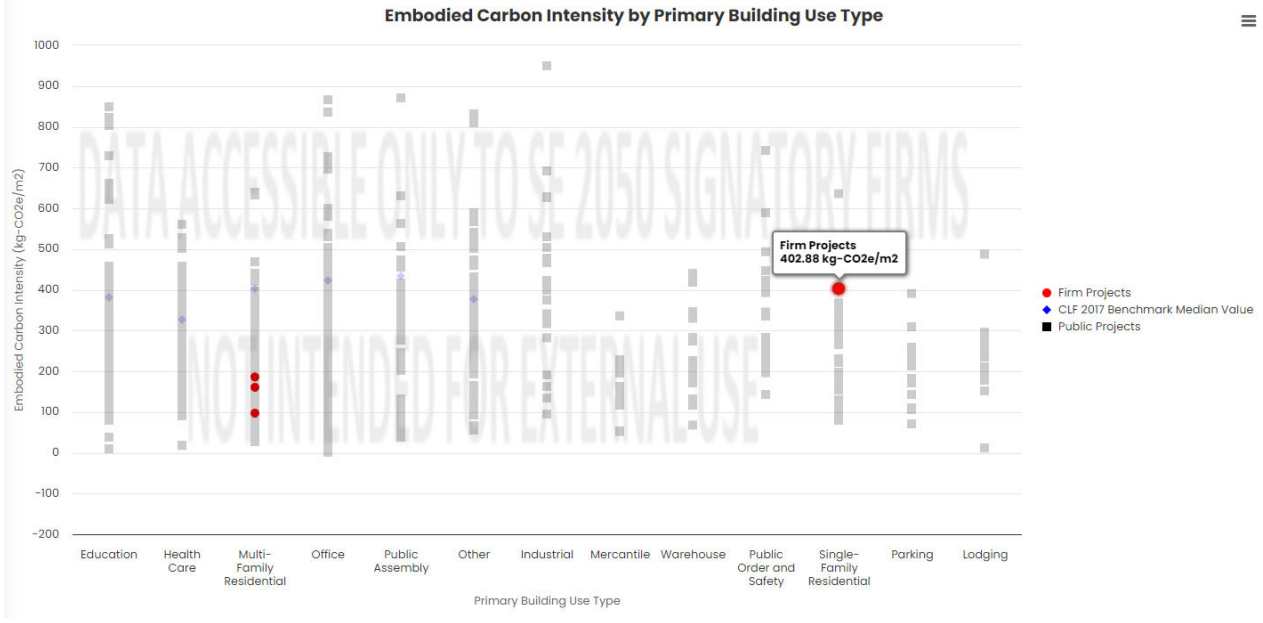


Figure 1 - Embodied Carbon Intensity KFSE Projects as of 4-26-2024

As expected, the all concrete single family residence was one of the more carbon intensive single family residences in the database. Otherwise we are pleased to see that out three multi family projects are on the lower end of the carbon intensity range. The two podium projects have an intensity of 161 kgCO2e/m2 & 186 kgCO2e/m2. As expected, the all light framed wood townhomes have the lowest carbon intensity of 96.4 kgCO2e/m2. Most of the carbon is from the foundations, including the concrete walls in the basement for the daylight basement.

To summarize our carbon intensity findings to clients, we have developed an Embodied Carbon summary sheet. An example can be found in Appendix A.

The example in Appendix A shows the 1634 20th st project, which is 5 levels of wood over 2 levels of concrete podium with one level of subterranean parking. Wood framing accounted for 54% of the gross area, while concrete was the remaining 46%. As expected, the wood framing, while occupying more area, is a small fraction of the carbon intensity vs the concrete floors. Wood framing accounted for only 8% of the embodied carbon while concrete and rebar was the remaining 92%. It's known that light framed wood construction is be less carbon intensive than concrete, but this serves as a good reminder that whenever possible it is better from an embodied carbon standpoint to reduce the number of concrete levels in podium construction.

Appendix A – Embodied Carbon Summary Sheet:



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Structural Embodied Carbon Summary (Primary Structure Only)

Project Name: 1634 20th Street
Project Number: 21297.00

Engineer: JH/CK
Date: 4/28/2024

Project Information

Architect: KFA Phase: Construction Documents LCA Stages: A1-A3
Floor Area: 60,235 SF Gross Area: 114,790 SF
Summary: 5 Levels type III light framed wood construction over 2 level concrete podium with 1 level subterranean parking. 78 units affordable housing.

LCA Results

Embodied Carbon By Material:

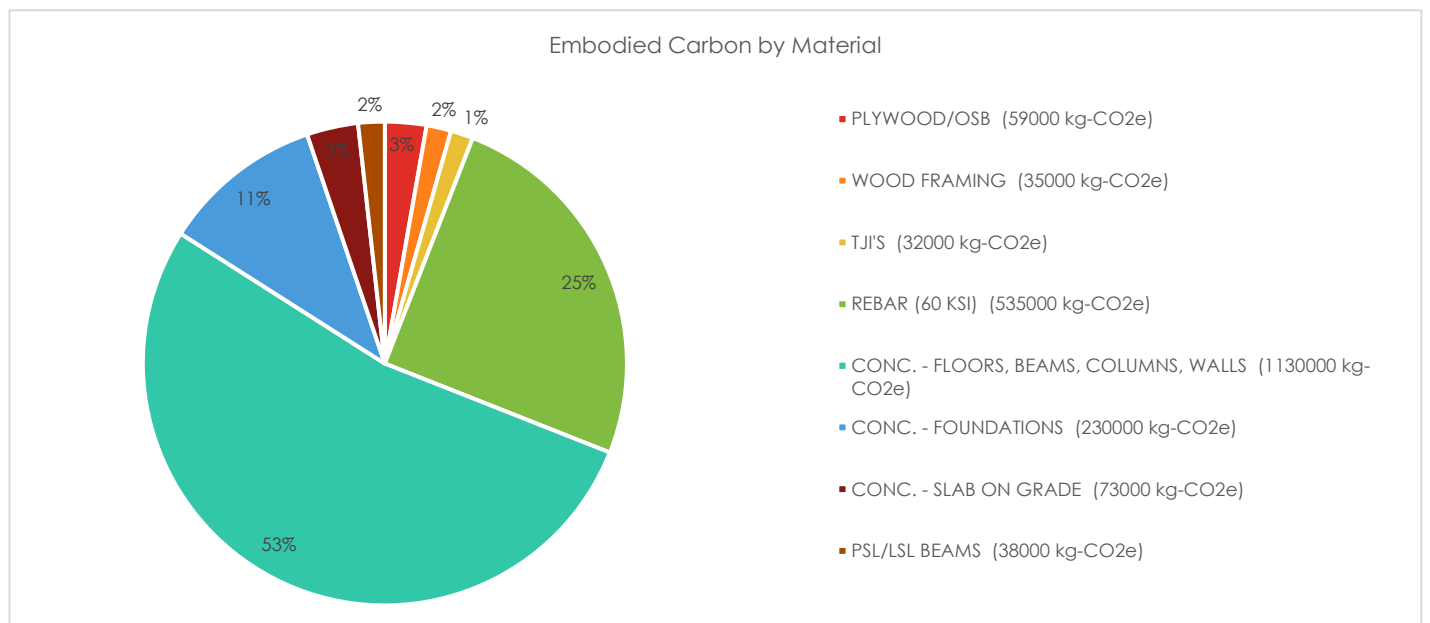
PLYWOOD/OSB	59000 kg-CO2e
WOOD FRAMING	35000 kg-CO2e
TJI'S	32000 kg-CO2e
REBAR (60 KSI)	535000 kg-CO2e
CONC. - FLOORS, BEAMS, COLUMNS, WALLS	1130000 kg-CO2e
CONC. - FOUNDATIONS	230000 kg-CO2e
CONC. - SLAB ON GRADE	73000 kg-CO2e
PSL/LSL BEAMS	38000 kg-CO2e

Embodied by Masterspec Division:

03 21 00 Reinf. Bars	534559 kg-CO2e
03 30 00 C.I.P. Concrete	1430764 kg-CO2e
06 11 00 Wood Framing	34547 kg-CO2e
06 16 00 Sheathing	58593 kg-CO2e
06 17 00 Shop-Fabricated Structural Wood	37752 kg-CO2e
06 17 33 Wood I-Joists	32438 kg-CO2e

TOTAL 2132000 kg-CO2e

GWP Intensity 199.9 kg-CO2e/m2





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Structural Embodied Carbon Summary (Primary Structure Only)

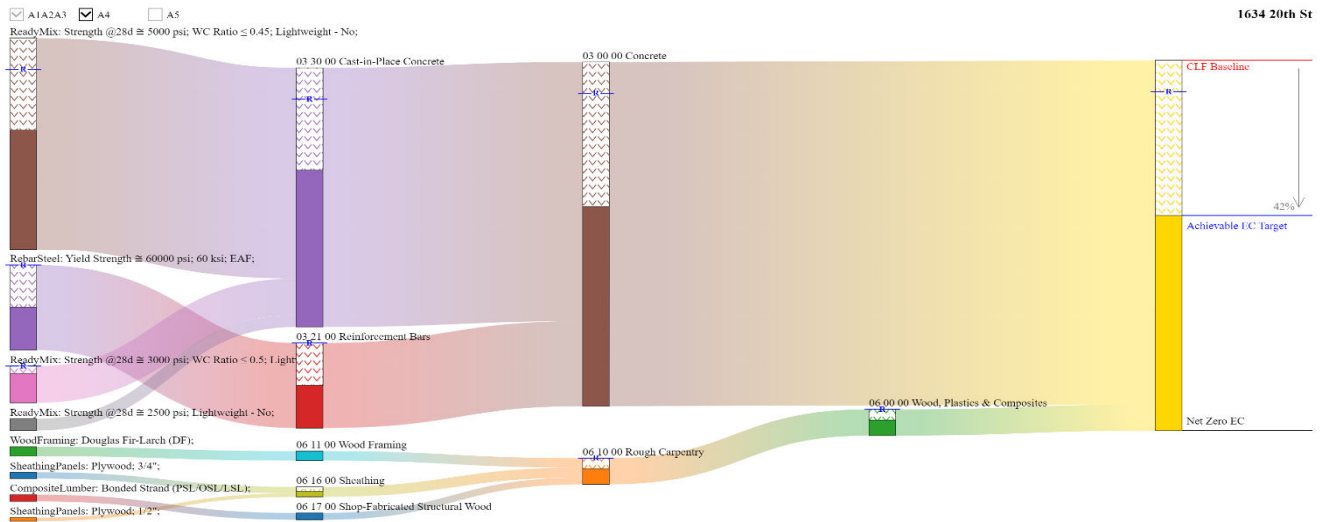
Project Name: 1634 20th Street

Engineer: JH/CK

Project Number: 21297.00

Date: 4/28/2024

GWP SANKEY DIAGRAM



1634 20TH STREET - (KFSE PROJECT NUMBER 21297)