EA Structural Engineering

Embodied Carbon Action Plan (ECAP)

SE 2050 Commitment

Carbon Conscious Design

This ECAP outlines EA Structural Engineering's approach to understanding, measuring, and reducing embodied carbon in structural design. It reflects our commitment to thoughtful engineering, material efficiency, and collaboration in support of a more sustainable built environment.

Commitment Overview

Commitment Letter

In 2025, EA Structural Engineering formally joined the SE 2050 Commitment to align our structural design practice with the profession's shared responsibility to reduce embodied carbon. This commitment reflects our belief that thoughtful structural engineering focused on performance, efficiency, and material awareness can meaningfully influence the environmental impact of the built environment.

01

Internal Announcement

EA Structural Engineering shared its SE 2050 Commitment firmwide, establishing awareness and support for integrating embodied carbon considerations into our work.

02

Motivation for joining SE 2050

EA Structural Engineering delivers high performance structural solutions and joined SE 2050 to better understand, measure, and reduce embodied carbon in alignment with project goals and client priorities.

03

Embodied Carbon Champion

EA Structural Engineering's SE 2050 efforts are led by Erin Alders, who serves as the firm's embodied carbon champion and oversees integration, learning, and reporting efforts.

Internal Engagement & Education Plan

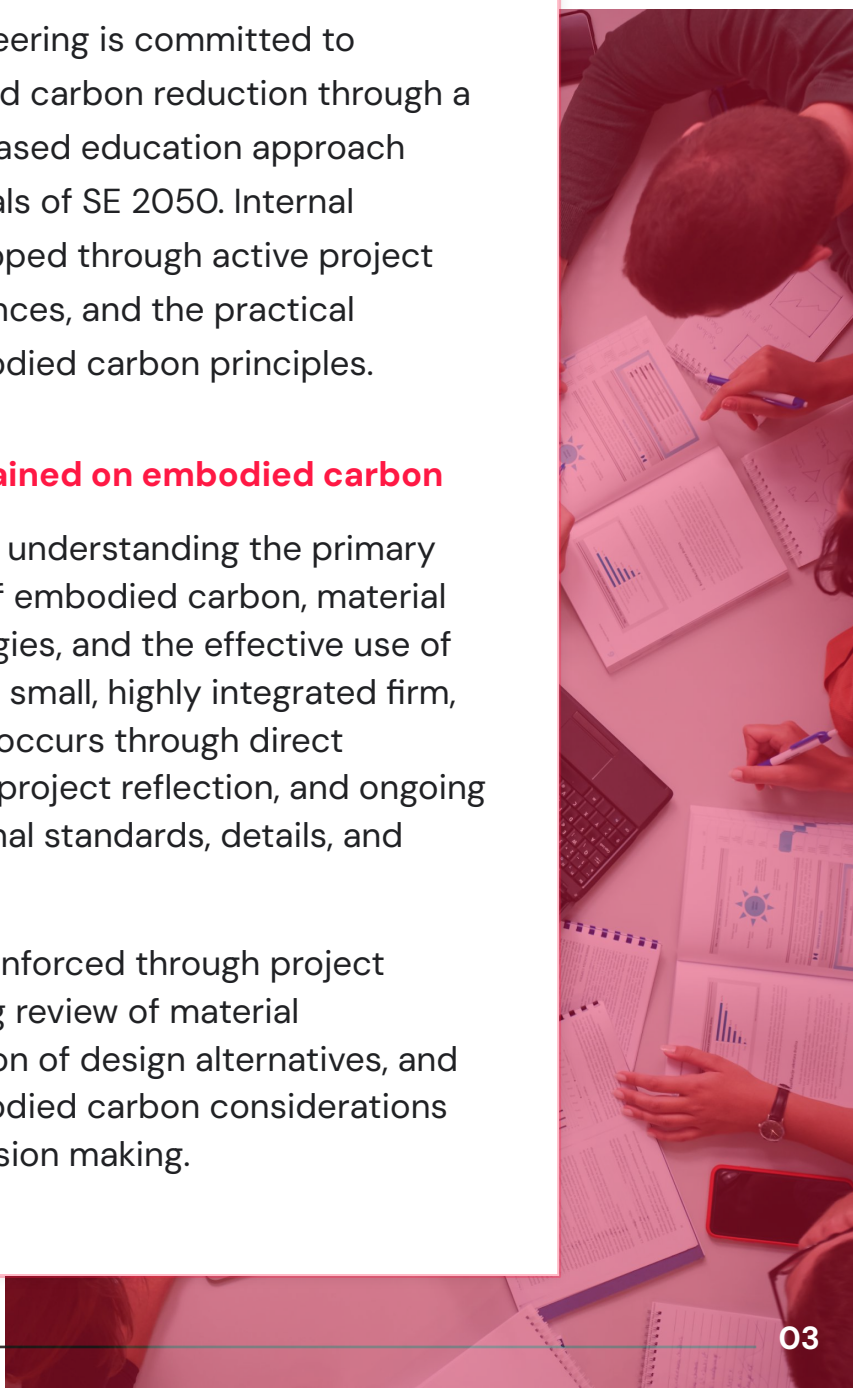
Education

EA Structural Engineering is committed to advancing embodied carbon reduction through a firm wide, project based education approach aligned with the goals of SE 2050. Internal knowledge is developed through active project work, shared references, and the practical application of embodied carbon principles.

How staff will be trained on embodied carbon

Training focuses on understanding the primary structural drivers of embodied carbon, material optimization strategies, and the effective use of available tools. As a small, highly integrated firm, knowledge sharing occurs through direct collaboration, post project reflection, and ongoing refinement of internal standards, details, and specifications.

This approach is reinforced through project execution, including review of material quantities, evaluation of design alternatives, and integration of embodied carbon considerations into structural decision making.



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Promoting a firm wide education program

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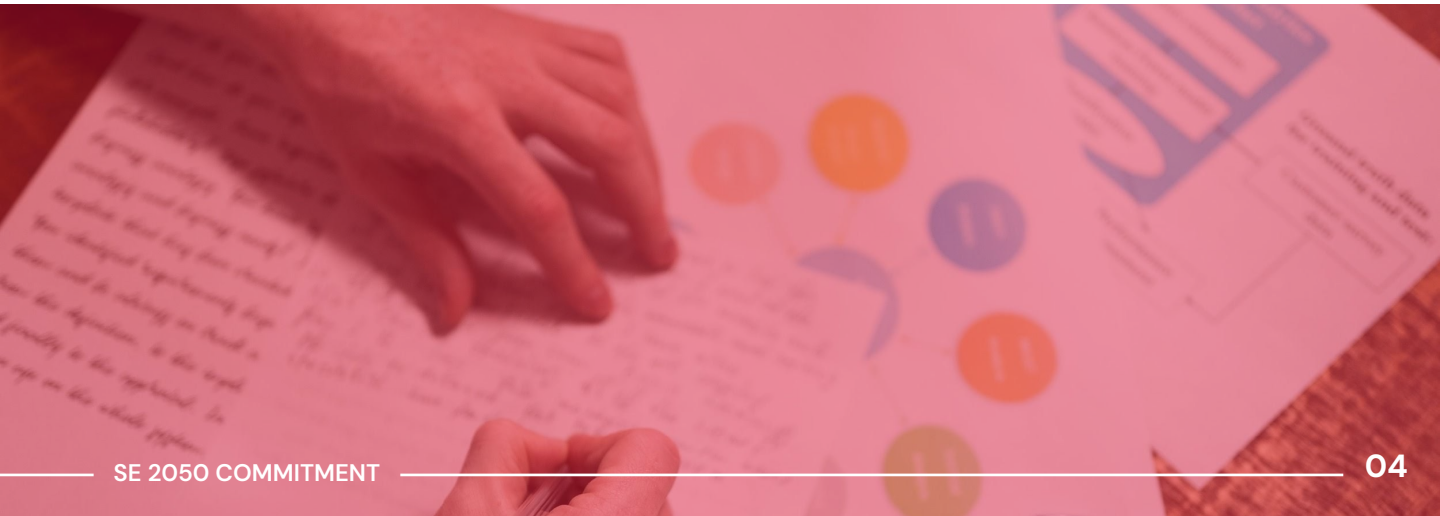


Electives Summary: Education

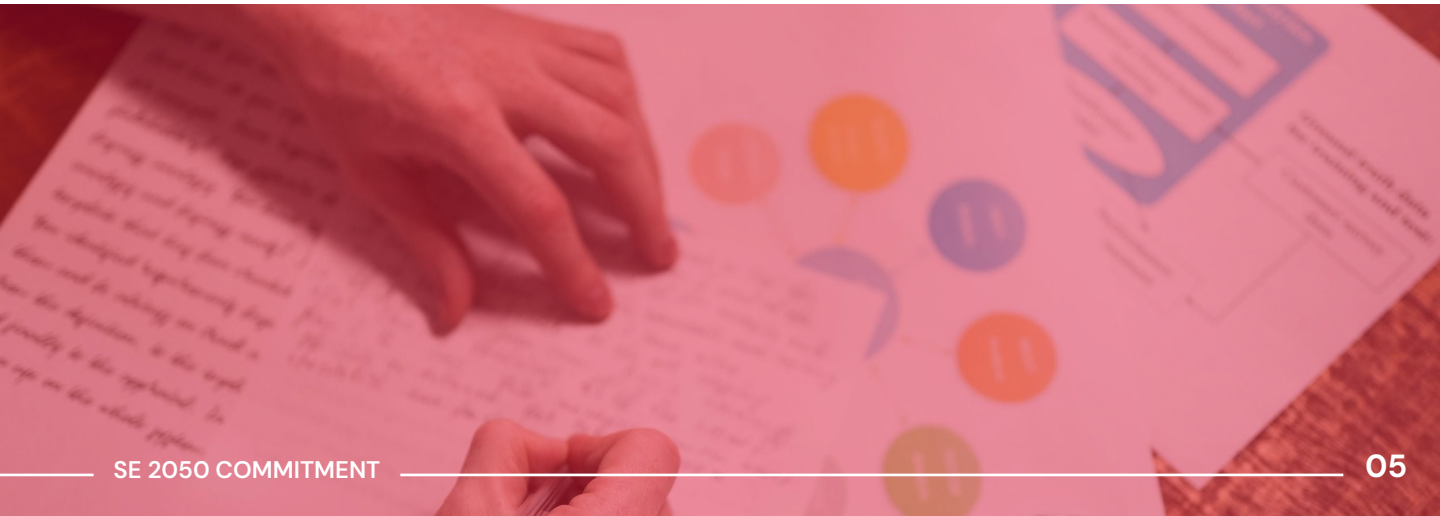
Have one representative attend quarterly external education programs (e.g. webinar, workshop) provided by SE 2050, Carbon Leadership Forum (CLF), or other embodied carbon resources.

Share embodied carbon reduction strategies as outlined in Top 10 Carbon Reducing Actions for Structural Engineers document produced by SE 2050.

Present the document, “How to measure and report embodied carbon” to all technical staff.

Attend a presentation or demo of an LCA based tool used to calculate embodied carbon.

➔ EA Structural Engineering will build embodied carbon knowledge through internal discussion, targeted research, and evolving industry guidance, focused on practical application in material selection and structural systems.



Reporting & Measurement Plan

Tools and Methodology

EA Structural Engineering will measure and track embodied carbon using SE 2050 aligned tools and methodologies, including the SE 2050 Embodied Carbon Estimator (ECOM), to estimate impacts and inform practical design decisions based on project constraints and available materials.

Data sources

Embodied carbon data will be documented and submitted to the SE 2050 database as projects are completed or reach appropriate milestones. Reporting will serve as a learning tool to establish internal reference points, evaluate system options, and improve future project outcomes.

Project stages

Assessment will occur at select project stages, prioritizing early design phases where system decisions have the greatest impact, with follow up as needed to support implementation. Material quantities will be derived from design documents and models using consistent assumptions to support analysis and inform future projects.

Measurement efforts will prioritize consistency and clarity, focusing on capturing key assumptions, quantities, and system selections to inform design decisions and strengthen internal reference points over time.

Electives Summary: Reporting

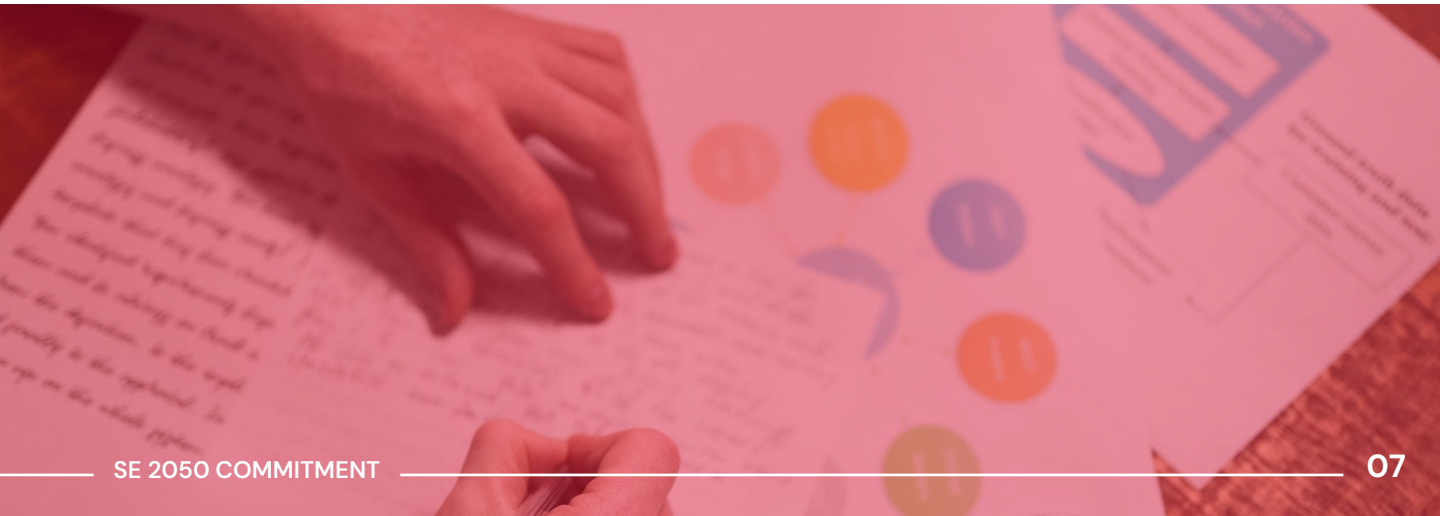
Meet target average embodied carbon reduction from the previous year.

Report a greater percentage of projects that the preceding year.

For a project submitted to the database, ask the Architect or Owner if the project has a carbon budget or established project sustainability goals

EA Structural Engineering will build embodied carbon knowledge through internal discussion, targeted research, and evolving industry guidance, focused on practical application in material selection and structural systems. Reporting will be used to establish internal reference points, track progress over time, and inform future project decisions, with reported data supporting ongoing refinement rather than fixed assumptions.

Reduction efforts will focus on early design phases, system efficiency, and material optimization, evaluated on a project by project basis, with outcomes documented to inform future projects and refine internal approaches. The firm will also support embodied carbon reduction through client education and collaboration with project partners, with advocacy occurring through project coordination, system level insights, and selective industry engagement.



Embodied Carbon Reduction Goal

EA Structural Engineering aims to achieve embodied carbon intensities below 10 lb CO_2 per square foot in structural systems over the coming year, where feasible, based on project constraints and material availability.

Reduction Strategy

Content intent:

How the firm will share progress externally

EA Structural Engineering will actively share embodied carbon progress with clients, design partners, and industry peers through project coordination, presentations, and case studies.

Client education

EA Structural Engineering will support clients by sharing embodied carbon insights and quantified comparisons to inform early design decisions and structural system selection.

Industry leadership

EA Structural Engineering will contribute to industry dialogue by sharing lessons learned, project experience, and practical, implementable approaches to embodied carbon reduction, including material optimization and strategies to increase the effective use of supplementary cementitious materials in regional markets.

Public facing strategies

Progress and key insights will be shared through case studies, website content, and select industry platforms to support transparent, carbon conscious design.

Lessons Learned & Continuous Improvement

Over the past year, EA Structural Engineering has gained a clearer understanding of where embodied carbon reduction efforts can have the greatest impact. Through project based analysis, it has become evident that the **concrete foundation system** is the primary driver of embodied carbon in typical residential structures, making it the most effective area to focus reduction strategies.

A key takeaway has been that meaningful reductions are highly dependent on regional material availability and construction practices. While strategies such as increased use of supplementary cementitious materials and optimized mix designs can significantly reduce embodied carbon, their implementation is not always feasible in all markets. This has highlighted the importance of aligning reduction strategies with locally available materials and supplier capabilities.

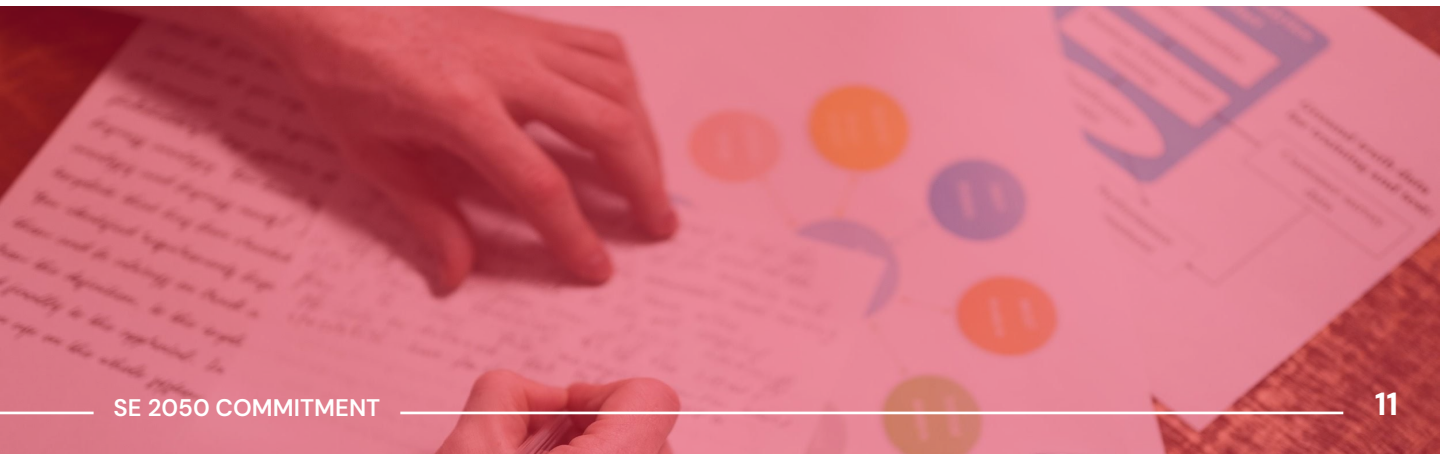
Successes over the past year include integrating embodied carbon considerations into project evaluations, improving understanding of structural material impacts, and identifying practical opportunities for optimization. In particular, early stage awareness of carbon drivers has supported more informed decision making, even when full implementation of reduction strategies is not achievable.

Challenges have primarily centered on the variability of material availability and limited access to lower carbon concrete options in certain regions. These constraints have made it difficult to consistently apply more advanced reduction strategies across all projects.

Overall, the firm has developed a more practical and systems based approach to embodied carbon reduction, focusing on identifying the highest impact opportunities and adapting strategies to project specific conditions. Moving forward, efforts will continue to focus on early design integration, improved coordination with suppliers, and expanding the range of feasible reduction strategies as material availability evolves.

Electives Summary: Embodied Carbon Reduction Strategies

- Incorporate data visualization into ECAP.
- Provide a project case study in ECAP that captures a reduction of embodied carbon or some lessons learned (see slide 13).
- Create a project specific embodied carbon reduction plan.
- Complete a system embodied carbon design comparison study during the project concept phase.
- Calculate the firm's average benchmark for embodied carbon.
- Update specifications and incorporate embodied carbon performance. Include embodied carbon in submittal review requirements.
- Collaborate with 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 as a result of a project.
- 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.
- Quantify construction waste reduction on a project and the impact to embodied carbon.
- Integrate embodied carbon mitigation strategies in General Notes.



Embodied Carbon Reduction Strategies

EA Structural Engineering is integrating embodied carbon considerations into project workflows through a combination of analysis, documentation, and coordination with project partners. Data driven decision making is supported through use of carbon estimation tools and system level comparisons, allowing embodied carbon to be evaluated alongside cost and constructability during design. Project case studies and internal tracking are used to build reference points, communicate design options to clients, and inform future work.

Reduction strategies are implemented through early phase system evaluation, material optimization, and incorporation of embodied carbon considerations into project specifications, general notes, and submittal review processes. Where feasible, the firm collaborates with concrete suppliers and contractors to explore lower carbon mix designs and align material procurement with performance goals.

Efforts also include development of project specific reduction approaches, evaluation of alternative systems, and ongoing refinement of internal standards. Opportunities for material efficiency, reuse, and reduced construction waste are considered where appropriate, with the goal of improving both carbon and cost outcomes over time.

Overall, these efforts reflect a practical, project based approach to embodied carbon reduction, focused on identifying the highest impact opportunities and implementing strategies that align with project constraints and available resources.

Knowledge Sharing and Data

EA Structural Engineering plans to share knowledge and embodied carbon data through its website and technical blog content, using project based insights and case studies to support broader adoption of embodied carbon reduction in structural systems.

A central focus of this work is clarifying where the greatest opportunities for reduction occur. Through ongoing project evaluation, it has become clear that concrete is often the primary driver of embodied carbon, and that meaningful reduction typically requires substantially higher levels of supplementary cementitious materials than are commonly used in standard practice. Content will therefore focus on practical strategies for concrete mix optimization, material selection, and early structural decision making, while also acknowledging the constraints created by regional material availability and construction practices.

By sharing clear examples and applied project insights, EA Structural Engineering aims to support more informed decisions by clients, design partners, and industry peers and help accelerate adoption of realistic, high impact embodied carbon reduction strategies.

Looking Ahead

SE 2050 provides a framework for understanding and reducing embodied carbon in structural systems, which directly supports more efficient and intentional design. For clients, this often translates to both environmental and economic value, as many embodied carbon reduction strategies align with material efficiency and cost optimization.

EA Structural Engineering collaborates with clients and project teams by integrating embodied carbon considerations early in design, evaluating structural system options, and identifying opportunities to optimize concrete and material use. By aligning carbon reduction with constructability and cost, the process supports informed decision making without compromising project goals.

Through this approach, SE 2050 becomes not only a sustainability initiative, but a practical tool for delivering efficient, high performing, and cost effective structural solutions.

Case Study: Single Family Residence, Rural Site

Project #1 Case Study: Foundation Design as the Primary Lever for Embodied Carbon Reduction

Project #1 was evaluated to understand how structural design decisions influence embodied carbon and where meaningful reductions can be achieved. Using project based carbon estimation tools, the structure was assessed to identify primary drivers and opportunities for improvement within typical residential construction constraints.

The analysis identified an estimated embodied carbon intensity of approximately 12.96 lb CO_2 per square foot, with the concrete foundation system contributing the majority of emissions, accounting for roughly three quarters of the total. This significantly outweighs contributions from framing, sheathing, and reinforcing steel and aligns with broader industry patterns, where cement content within concrete mixes represents the largest single source of emissions in low rise construction.

As a result, the most effective path toward reduction lies in the foundation system. Potential strategies include optimizing concrete mix designs to reduce cement content, increasing the use of supplementary cementitious materials where regionally available, and refining reinforcement strategies. These approaches can be implemented without fundamentally altering architectural intent but require coordination and access to suppliers capable of supporting more advanced mix designs.

To understand the potential impact of these strategies, a range of concrete mix scenarios was considered based on increasing levels of supplementary cementitious material (SCM) substitution. A modest mix incorporating approximately 15% SCM content, corresponding to an assumed 10% reduction in concrete related emissions, would reduce total project intensity to approximately 12 lb CO_2 per square foot. Increasing SCM content to approximately 30%, with an estimated 20% reduction in concrete emissions, would lower total intensity to approximately 11 lb CO_2 per square foot. At approximately 45% SCM content, corresponding to an estimated 30% reduction in concrete emissions, total intensity would be reduced to approximately 10.1 lb CO_2 per square foot. In regions where higher SCM replacement is feasible, mixes approaching 70% SCM content, with an assumed 45% reduction in concrete emissions, could reduce total structural intensity to approximately 8.6 lb CO_2 per square foot. These results demonstrate that even moderate increases in SCM content can produce meaningful reductions, while more substantial reductions require higher levels of cement replacement.

Additional reductions may be achieved through efficient material use across the structure. In select applications, alternative enclosure strategies, such as rigid insulation systems, may reduce reliance on traditional wood sheathing while maintaining performance. These types of decisions benefit from being considered early, when system selection remains flexible.

In smaller or rural markets, implementation may be limited by material availability and standard construction practices. However, even where full optimization is not feasible, this analysis provides a clear understanding of where the largest impacts occur and how future projects may be improved as more options become accessible.

Overall, the project demonstrates structural carbon analysis can identify practical, high impact opportunities for both carbon and cost optimization. By aligning design decisions with available materials, embodied carbon reduction becomes a coordinated and achievable part of the design process.

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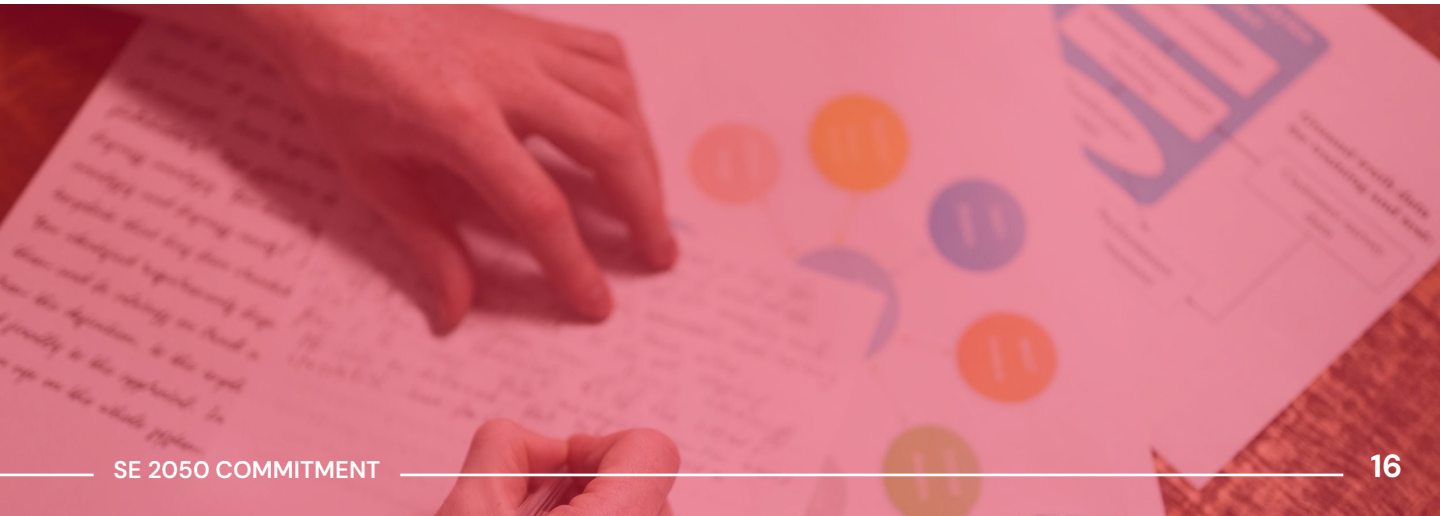
Electives Summary: Advocacy

Electives:

- Share your commitment to SE 2050 on your company website
- Discuss with the Owner / Client the option of requiring that some of the structural materials come with facility specific or product specific EPDs.
- Share education opportunities with clients.
- Provide a narrative of how you have encouraged industry and policy change incentivizing availability of low carbon and carbon sequestration materials

EA Structural Engineering communicates its commitment to SE 2050 through its website and client facing materials, reinforcing a focus on embodied carbon reduction as part of its design approach. The firm engages clients in discussions around material selection, including the option to specify facility or product specific Environmental Product Declarations to improve transparency and support informed decision making.

Education is shared through project discussions and targeted content, helping clients understand how structural choices influence both carbon and cost outcomes. In parallel, the firm supports broader industry progress by promoting practical strategies for low carbon material use and encouraging increased availability of optimized concrete mixes and carbon sequestering materials through ongoing collaboration and engagement with project partners.



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SE 2050 affiliation badge