KEAST & HOOD
STRUCTURAL ENGINEERS

EMBODIED CARBON
Action Plan

Submitted
March 2025

2025

Keast & Hood's

Commitment

Keast & Hood joined the SE 2050 commitment in February of 2021, recognizing the effect the construction industry has on global carbon emissions contributing to climate change.

As engineers, we have a responsibility to consider the impact of our work on both the surrounding community and the natural environment. We are hopeful that through collaboration, cooperation, and innovation, our industry will rise to the challenge of minimizing climate change.

We are encouraged and excited by the growth of the SE 2050 program since we first joined in 2021. It is through collaboration with other firms and resource sharing that we, as a profession, can elevate the conversation and collectively drive change. Our profession will have a powerful impact on the reduction of carbon emissions produced by the construction industry.

Since joining the SE 2050 commitment, Keast & Hood's sustainability committee has focused our efforts on educating our technical staff about life cycle analysis methods and developing processes for internal data tracking. It's been encouraging to hear from our staff that more clients and owners are asking about embodied carbon reduction possibilities, and that our staff is able to knowledgeably participate in those conversations. In the coming year, we are working to further develop our standards for new construction projects and to establish a baseline for our major renovation projects.

We also strongly believe that change cannot happen in a vacuum, so we continue to actively participate in organizations in the Philadelphia area that advocate for carbon reduction. We strive to be advocates for carbon reduction on our projects, in collaboration with contractors and material local suppliers, and in conversations with local policy-makers. We continue work towards change, both internally and within the industry.

Respectfully Submitted,
Keast & Hood Sustainability Committee

Denise Richards, PE, Partner
Brian Wentz, PE, Director of Hist. Pres.
Arieto Seraphin, PE, Senior Project Manager
Raphael DeLassus, PE, Project Manager
Sena Savaskan, PE, Structural Engineer
Elena Millett, Designer

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Keast & Hood's

Education Plan

Education Plan

Keast & Hood's approach to educating employees about embodied carbon involves three aspects:

1. **Weekly Communication from the Sustainability Committee**

   Keast & Hood's Sustainability Committee shares updates on our sustainability initiatives during regularly occurring design discussions and via our messaging platform. The goal of our communication is to keep sustainable design practices at the forefront of our design team member's minds.

   - Every Monday, a member of the committee shares information about new information and resources available.
   - As the committee becomes aware of webinars or other workshops, we share links for registration and promote attendance through firmwide communications.

Education Plan

2. **Sustainability Section of the Mentorship Program**

   New members of the Keast & Hood design team are introduced to sustainability initiatives through a dedicated section of our mentoring program. This includes basic education about embodied carbon and how we, as structural engineers, have a role in reducing it. The mentorship program aims to expose new engineers to the basics of embodied carbon and introduces them to the calculations and processes that we are trying to implement more broadly in the office to quantify our impact.

3. **Quarterly Lunch & Learn Internal Education**

   Our firm has a long history of knowledge sharing during internal lunch sessions that have become more formal. These sessions are held monthly, and the Sustainability Committee aims to present topics at least once a quarter such as calculation methods, data collection, and updates to internal specifications.

4. **In-Depth Training of Life Cycle Analysis Methods**

   We have introduced targeted internal training sessions where the sustainability committee members guide staff on the data collection and analysis methods to gether data using the life cycle assessment tool Tally. The goals of these sessions are to increase familiarity with the tools and to enhance our data collection efforts.

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Knowledge Sharing

Keast & Hood's external initiatives to advance the conversation on embodied carbon reduction fall into two categories:

1. **Communication with clients and stakeholders on project teams.**
   Since joining the SE 2050 Commitment, our firm more frequently participates in Sustainability Discussions with project teams.

   A. Proposals for new projects highlight our participation in the SE 2050 commitment.

   B. On an increasing number of projects, we are participating in the sustainability workshops and discussing strategies to reduce the embodied carbon of structural systems.

   C. We have advocated for the incorporation of low-carbon concrete mixes in projects and have participated in discussions with the contractors and owners to demonstrate the level of carbon reduction that can be achieved with alternate mix designs.

   D. After requesting EPD's from several concrete suppliers over the course of several projects, the supplier acknowledged that this "wasn't going away". The inquiries from our firm, combined with other structural firms, convinced the supplier to develop EPD's for their concrete mixes. This is a great example of the collective action of the structural engineering community influencing the actions of suppliers.

Knowledge Sharing

2. **Participation in industry organizations**
   We continue to participate in a variety of organizations that aim to advance the conversation on embodied carbon reduction.

   A. We participate on the National NCSEA Sustainability Committee. As part of that committee, we assisted with the development of language to incorporate sustainability as one of the metrics in the annual NCSEA Design Awards.

   B. We participate on the National NCSEA Sustainability Committee's Policy Subcommittee, where engineers from different parts of the country share information about embodied carbon legislation enacted in other jurisdictions.

   C. We lead the DVASE Sustainability Committee periodic meetings and share information about local suppliers and policies with the goal of educating members.

   D. We attended Greenbuild 2024 in Philadelphia, where two of our projects were featured in a tour titled "Historic Preservation and Adaptive Reuse in Higher Education". We also participated in a panel discussion "Saving the Old to Teach the Young at Penn".

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Reduction Strategy

Keast & Hood has developed short term (<1 year) goals & long term (>5 years) goals to assess our firm's progress in reducing embodied carbon.

Short Term

A. Increase internal data collection efforts to establish our firmwide baseline for new builds within the next year.

B. Increase the percentage of new construction projects with LCA calculations completed to 90% at the milestone phases.

C. Increase the percentage of renovation projects with LCA calculations completed to 30%, knowing that the extent of structural work varies greatly with each project.

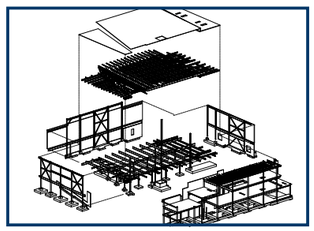
D. Standardize specification language to include low embodied carbon materials and to request environmental product declaration submittals.

E. Implement LCA calculations as part of the firm's QA/QC process.

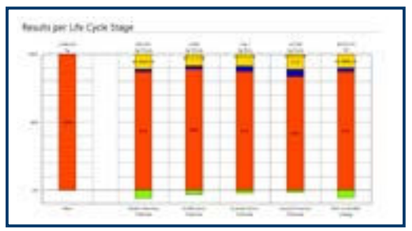
Long Term

A. Reduction target over the next 5 years of 10% below the baseline set at the end of the next year for new construction projects.

B. Continue implementing LCA calculations as part of the standard project workflow for all projects.



Sample Revit® model used to quantify concrete volumes for GWP calculations.



Sample Tally® output chart

Keast & Hood's

Reporting Plan

To track our firm's progress in achieving our reduction goals, Keast & Hood has developed a detailed reporting plan for both data collection and review.

Data Collection

A. Keast & Hood's drawings undergo a thorough quality control review before being finalized and issued. This year, the sustainability committee began incorporating life cycle assessments using Tally for all new construction projects. The life cycle assessment process has been integrated into the firm's QA/QC procedures.

B. The Sustainability Committee has developed an internal tracking spreadsheet, using the SE 2050 database upload spreadsheet as a template. The Keast & Hood LCA project data is imported to the internal spreadsheet for use in future comparisons.

C. In addition to the LCA project data, the Sustainability Committee collects data on the use of low-embodied carbon language on specifications and drawings during the design phase, and the information provided with submittals during construction.

Data Review

A. Keast & Hood's internal spreadsheet is used for comparison of the LCA project data within the firm to national averages.

B. On a quarterly basis, the sustainability committee will review the internal database to understand whether calculations are being completed and to look for trends to help identify areas of improvement.

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Elective Documentation

Education

Provide a narrative of how the Embodied Carbon Reduction Champion will engage embodied carbon reduction.

Our EC Champion will continue to provide the office with updates on the activities of the Sustainability Committee and convey information about upcoming events and useful resources on a weekly basis. The embodied carbon champion should also become a resource for staff who are looking for more information about specifications, suppliers, or other information on embodied carbon reduction. This will help to ensure that there is consistency in the information being conveyed to staff.

Present at least (1) webinar focused on embodied carbon and make a recording available to employees.

We shared two webinars this past year, including, "Measuring Embodied Carbon for Structures" and "Specifying Low Carbon Materials for Structures" presented by SEA MASS.

Train all of your firm's structural engineers on the core concepts and skills required to measure, reduce and report embodied carbon.

This year, our firm introduced Tally, a life cycle assessment tool, as the standard for data collection and analysis. The Sustainability Committee has created a firm-wide template for using Tally and hosted several lunch-and-learn sessions to ensure staff are proficient in leveraging Tally for data collection. Looking ahead, our goal for the upcoming year is to implement Tally on all new construction projects and expand the number of projects using the tool for data collection.

Keast & Hood's

Elective Documentation

Education

Incorporate embodied carbon education in your onboarding process for all new employees.

Our firm's sustainability committee has made significant efforts to implement embodied carbon education to our mentorship program. Mentors have shared valuable insights with mentees during onboarding and actively encouraged their involvement in the committee's sustainability initiatives.

Engage with a CLF Regional Hub.

Keast & Hood participates in the Philadelphia Chapter of the Carbon Leadership Forum, and in past years has assisted in organizing construction site tours of Philadelphia's first mass-timber building.

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Reporting

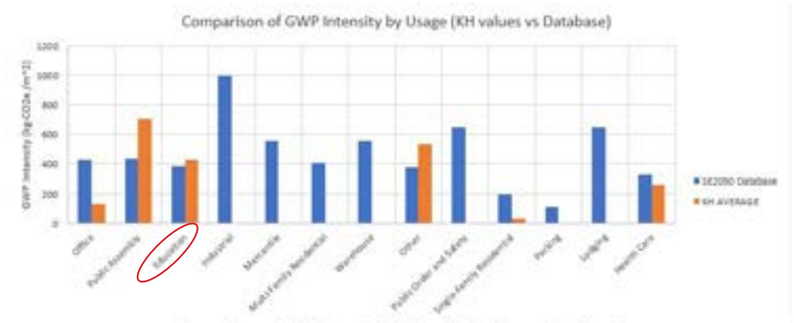
Submit a minimum of (2) projects to the SE 2050 Database.

Keast & Hood is uploading multiple projects to the database, some of which include LCA's completed at different project phases.

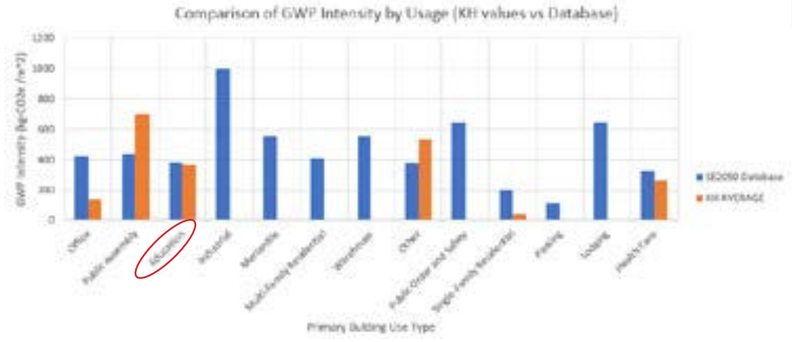
Compare the embodied carbon emissions from multiple projects across your firm. Analyze & document what data or pieces of information are most important and communicate the findings to your firm.

Upon reviewing the two charts below, KH is pleased to report a reduction in the GWP intensity for educational use buildings compared to last year. Although this chart does not encompass all educational projects within the firm, it serves as a strong indicator of our ongoing efforts to reduce environmental impact.

2024



2025



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Elective Documentation

Reduction

Set clearly stated, firm-wide reduction targets in the short-term (<1 year) and long-term (>5 years)

The short term goal is to set internal firm benchmarks at the end of 2025, after gathering data internally. The long term goal is to reduce the carbon footprint of new construction projects by 10% over the next 5 years. See the "Reduction Strategy" narrative section of the ECAP for additional information.

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).

We have developed a spreadsheet tool to quantify the embodied carbon footprint on a per-square-foot basis for a typical bay of framing. The tool provides calculations for multiple materials: steel, concrete, and wood. This will allow the carbon footprint to be evaluated early in the project. We have started to implement this tool, but to date we have found that cost and schedule remain the primary drivers to decide framing systems.

Collaborate with your concrete supplier to reduce embodied carbon in a mix design below an acceptable baseline. Discuss what you found and what it means in your market.

We have found that while concrete EPD's have not typically been readily available in the Philadelphia market, this is finally changing. We have been asking concrete suppliers for EPD's for several years, and for a long time the answer was "no, we don't have them". After multiple engineers requesting EPDs, and suppliers watching the landscape for embodied carbon reduction gain momentum across the country, concrete suppliers have responded. This is one of the reasons we believe that SE 2050 is a success.

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Reduction

Participate in a LEED, ILFI Zero Carbon,or similar project design charrette and speak topotential design considerations impacting embodied carbon.

On more projects we are being invited to participate in sustainability groups and clusters at the early stages of goal-setting. This allows us to work with a variety of stakeholders on projects to understand concerns related to lower carbon concrete and other materials, and to work through roadblocks to their incorporation in the project. There has been a mix of success and frustration on different projects, but we are happy to report that low-carbon concrete has made it to the finish line on a large project in central PA.

Advocacy

Describe the value of SE 2050 to clients. How can your design teams collaborate to reduce embodied carbon? Attach any associated marketing materials.

Clients are looking to improve their own sustainability initiatives, and they are starting to look towards embodied carbon as the next "front" in this effort. For many owner clients, this involves learning about embodied carbon since their efforts to date have focused on other sustainability metrics such as energy reduction and LEED categories.

Our marketing materials include a statement within typical proposals acknowledging our participation in the SE 2050 program, and our firm profile also highlights the program.

Tally has been an invaluable tool to help us quantity and share with our clients the embodied carbon impact of different materials for an entire project. It allows us to come up with different sustainable design options and present them in an informative way to the client and show in real time the impact of each option on a project's overall carbon footprint.

Rowan University | Chamberlain Student Center
Glassboro, NJ

Mass Timber Roof

Keast & Hood's

Elective Documentation

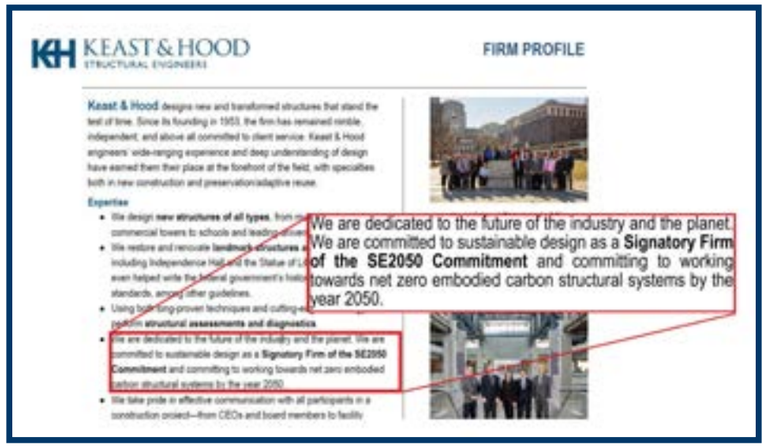
Advocacy

Publicly declare your firm as a member of the SE 2050 commitment however you see fit.

Our website, proposals, and firm profile describe our status as an active signatory firm for SE 2050. We have also posted social media about our efforts as part of the SE 2050 Commitment.

Engage with supplier in your region to communicate the importance of EPDs and low-carbon material options.

Through our participation in last year's Greenbuild conference, we gathered information related to alternative concrete materials. We intend to invite some of these suppliers to present to the NCSEA Philadelphia Chapter's Sustainability Subcommittee.


KEAST & HOOD
STRUCTURAL ENGINEERS

FIRM PROFILE

Keast & Hood designs new and transformed structures that stand the test of time. Since its founding in 1953, the firm has remained nimble, independent, and above all committed to client service. Keast & Hood engineers' wide-ranging experience and deep understanding of design have earned them their place at the forefront of the field, with specialties both in new construction and preservation/adaptive reuse.

Expertise

- We design **new structures of all types**, from
- We restore and renovate **landmark structures**
- Using both long-proven techniques and cutting-
- We are dedicated to the future of the industry and the planet. We are committed to sustainable design as a **Signatory Firm of the SE2050 Commitment** and committing to working towards net zero embodied carbon structural systems by the year 2050.
- We take pride in effective communication with all participants in a construction project—from CEOs and board members to facility

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SEI ASCE STRUCTURAL ENGINEERING INSTITUTE

SE2050 COMMITTING TO NET ZERO

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Lessons Learned

☑ We have learned that persistence is key to achieving actual reductions in embodied carbon on our projects. Many times, the ultimate decision on whether low-carbon products are included in the final construction involve multiple stakeholders outside our office. Owners and contractors who are familiar with embodied carbon are more likely to be on board with following through with the low-carbon approach. Early discussions with both the owner and contractor can help demonstrate that the low-carbon approach can have minimal impact on the schedule and budget, particularly if planned from the beginning.

☑ We have also learned that embodied carbon can't be stressed often enough internally. Engineers often become busy with project deadlines, so embodied carbon is not at the front of their minds. We are looking for ways to standardize the embodied carbon processes and language so that it's part of our normal project delivery procedures.

☑ **COMMUNICATE EARLY & OFTEN!**

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