

SE 2050 COMMITMENT PROGRAM EMBODIED CARBON ACTION PLAN 2022



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INTRODUCTION

The international scientific community has demonstrated that nations must reduce their collective greenhouse gas emissions to control the effects of global warming.

People in countries across the world are being negatively impacted by climate change as rising sea levels, extreme weather patterns, and rising temperatures stress our ecosystems, infrastructure, and health.

Globally, the construction and operation of buildings accounts for approximately 40% of energy-related carbon dioxide emissions. As building energy use is reduced through design improvements and the energy grid's transition to more sustainable resources, the embodied carbon of construction materials makes up a growing percentage of the overall impact that the built environment has on global greenhouse gas emissions.

Reducing the embodied carbon of the built environment is the responsibility of the design team, including structural engineers. We pledge our support for this effort by committing to the SE 2050 Commitment Program and submitting this Embodied Carbon Action Plan.

MARTIN/MARTIN'S RESPONSIBILITIES

Globally, it is important to commit to an initiative that prioritizes the future of our planet and people. We provide designs that benefit our clients and community now and consider their well-being in the future.

Carbon emissions already directly negatively impact the health of our communities. Wildfire smoke lowers our air quality, rising temperatures increase the likeliness and severity of heat-related illness, and water scarcity stresses our agricultural systems. Reducing embodied carbon in our structures will improve the health of our communities if implemented on a large-scale basis.

We understand the large role that the building industry has historically played in contributing to climate change. It is our responsibility as a design firm to do our part in reducing embodied carbon and the harmful impacts of climate change.

Our collaborative communication and file-sharing software can be utilized to create an embodied carbon interest group to share relevant research and new embodied carbon reduction strategies. Martin/Martin also has a history of giving back to our community, and our participation in this program is another way we can help better the world around us. We look forward to collaborating with other structural firms, architects, owners, contractors, and consultants to be at the forefront of developing proactive, sustainable, and effective solutions to reduce embodied carbon.





LOOKING TO THE FUTURE

Martin/Martin has a solid foundation in a wide range of structural engineering applications which will enable our firm to serve as an industry leader in embodied carbon reduction. These include: project sustainability, technical material specifications, innovative material uses, structural systems in various locations, demands of small and large-scale projects, and LEED project design.

The Martin/Martin SE 2050 team has joined the SE 2050 Commitment Program and has formed sub-committees. These committees will further our education, share our embodied carbon reduction methods, and establish a project baseline using Whole Building Life Cycle Analysis tools to evaluate structures and enclosure materials for future work.

Structural baselines are being established by considering the building material, project size, and location and comparing these values to national data. Each sub-committee is focused on creating goals to improve performance from the established baselines. A milestone for the Martin/Martin SE 2050 team is to understand the company's current project baseline for carbon emissions to improve in the future.

The remainder of this Embodied Carbon Action Plan (ECAP) is subdivided into four sections as described by the SE 2050 Program Requirements: Education, Reporting, Embodied Carbon Reduction Strategies, and Advocacy.





EDUCATION

Summary:

In order for Martin/Martin to be successful in the SE 2050 Commitment Program, we need participation from our engineers. Fortunately, Martin/Martin is already committed to the development and growth of our staff and has systems in place that the SE 2050 team can utilize to engage and educate our engineers. Our structural department weekly continuing education classes provide a great opportunity to introduce SE 2050 to the entire structural department. These classes will explain the benefits of reducing embodied carbon, as well as provide our engineers with the technical tools and information they need to make sound engineering decisions regarding embodied carbon.





EDUCATION

Requirements:

Distribute firm-wide announcement of your firm's pledge to join the SE 2050 Commitment Program. After the first year, make an announcement sharing your ECAP from the previous year.

- Announce Martin/Martin's participation in the SE 2050 Commitment Program via our monthly employee newsletter.
- Make a structural department continuing education presentation introducing SE 2050, outlining our involvement, and encouraging participation.

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.

- Provide continuing education classes detailing carbon reduction strategies and reporting tools to familiarize our engineers with actions they can take to participate in the initiative.
- Utilize Martin/Martin's Education Committee to promote successful projects, share relevant articles, and introduce new strategies and ideas.
- Establish a Martin/Martin Carbon Reduction Award to celebrate the team or project that can reduce the most embodied carbon each year with a focus of establishing a baseline in the first year.

Nominate an Embodied Carbon Reduction Champion for your firm. Include a 1-page brief profile (name, office, title, optional picture, and bio) in your ECAP.

McKenzie Glass leads the Martin/Martin SE 2050 initiative and will act as the point
of contact for collaboration. McKenzie works as a structural project engineer and
sustainability manager at Martin/Martin's Lakewood, Colorado office. She looks
forward to supporting Martin/Martin in reducing embodied carbon in structures
and working with others in the industry to develop effective solutions to reduce
the harmful effects of climate change.

Set a date within the first year to present an "Embodied Carbon 101" Webinar to your firm (present your own or use an existing from BSA or equivalent). Include this resource in your orientation/on-boarding programs.

- We presented our SE 2050 introduction continuing education class on October 18, 2021, which incorporated elements of "Embodied Carbon 101".





Electives:

Share the SE 2050 library of resources with technical staff.

- The SE 2050 library of resources was provided in the continuing education class on October 18, 2021.

Share embodied carbon reduction strategies with your firm as outlined in the "Top 10 Carbon Reducing Actions for Structural Engineers" document provided by SE 2050

- The top 10 strategies were provided in the continuing education class on October 18, 2021, and the monthly employee newsletter.

Initiate an embodied carbon interest group with your firm and provide a narrative of their goals.

- Create a Microsoft Teams group of employees specifically interested in embodied carbon information.
- Provide embodied carbon resources the Teams group.
- Notify of events related to embodied carbon.
- Participate in the Carbon Leadership Forum.

Provide narrative outlining plans for minimum (2) firm-wide presentations per year on the topic of embodied carbon.

- The introductory continuing education class will be followed with a more technical class in the summer of 2022 focused on embodied carbon reduction strategies and the basics of calculating embodied carbon.
- An internal continuing education class will be presented in fall of 2022 with an introduction of Tally to project managers.
- A technical class and webinar presented by a progressive manufacturer working on new lower carbon technology will be explored to be presented in 2022.



REPORTING

Summary:

Reducing the environmental impact and increasing the sustainability of the built environment will require careful measurement and reporting of building materials' embodied carbon. After reviewing a variety of industry Life Cycle Assessment (LCA) software packages, Martin/Martin has elected to utilize Tally in conjunction with EC3 as our primary method of measuring and reporting embodied carbon.

Initially, Martin/Martin will focus its efforts on cradle-to-gate analysis and will only perform LCA on completed designs. Once a baseline has been established, Martin/Martin aims to expand the LCA to later life cycle stages for a more accurate estimation of embodied carbon. Likewise, engineers will perform the LCA analysis at SD, DD, and CD phases in order to define the change in embodied carbon as the design progresses, thus evaluating the effectiveness of any applied reduction strategies and informing future designs.





Reporting

Requirements:

Provide a narrative on how your firm plans to measure, track, and report embodied carbon data. Here are some considerations you may want to include:

How will you calculate embodied carbon for structural materials? Do you have access to product- or region-specific Environmental Product Declarations (EPDs)?

- We will use commercial software compatible with Revit to calculate material quantities and embodied carbon. Through Tally and EC3, we have access to industry-wide, region-specific, and product-specific EPDs. We will also utilize the UL Spot Database for additional EPDs as needed.

What commercially available LCA software(s) will you be using to quantify embodied carbon?

- Tally will be used in conjunction with EC3 as the primary tool for the first year of reporting as our embodied carbon baseline is defined. This decision was made since material quantities can be directly pulled from Revit models and there is an option for manual entry to adjust or add quantities as needed.
- We will consider using One Click LCA and Athena in the future, which could be valuable during the design stage of projects when we have the greatest opportunity to impact how much embodied carbon the structure will have.

What life cycle analysis (LCA) methodology will you use? Define where you plan to delineate scope (e.g. A1-A5 or whole life cycle), communicate inherent assumptions, etc.

- For the first year of reporting, we will focus on the Cradle to Gate stages (A1-A3). For the Product State, A1 is the Raw Material Supply, A2 is Transport, and A3 is Manufacturing. This will allow us to pull all the relevant information from the Revit models of completed projects. Since most of the embodied carbon is produced in steps A1-A3, focusing on this phase will cover the majority of what we have a say in as structural engineers and simplify the reporting process.
- If time permits, we plan to complete stages A1-A5 for one of these projects.
 For the Construction Stage, A4 is Transport and A5 is Construction Installation
 Process. These two additional steps will require us to review shop submittals and

RFIs and possibly reach out to the general contractor to better understand their means and methods for the specific project.





- In the future, we plan to extend the reporting to further stages such as B1-B7 (Use stage), C1-C4 (End of Life), and D (Reuse). These stages will be valuable in determining the Whole Building LCA, but will require assumptions and coordination with other disciplines. We will be better equipped to make these assumptions after gaining experience in the preliminary stages.
- Within the A1-A3 stages, we will limit our review of embodied carbon to structural elements. For example, we would include exterior cold-formed steel walls, but exclude non-structural interior stud walls. Clearly delineating scope with the architect and design team will be important for accurate Whole Building LCAs.

How will you extract material quantities and how often? (currently for internal use and not required in SE 2050 Database).

- We plan to pull material quantities from Revit models directly using Tally, while structural elements not modeled in Revit will be manually added to EC3.
- Initially, we will only pull material quantities from completed projects to establish a baseline. In future years, we plan to pull quantities at the SD, DD, and CD phases so that fine-tuning can be made to reduce embodied carbon.

Describe the internal training for embodied carbon measurement you provided or will provide.

- The SE 2050 Reporting Subcommittee will perform all initial embodied carbon calculations for Martin/Martin. In the future, this team will serve as in-house specialists and train other Martin/Martin engineers.
- A variety of training methods will be used, including classes, webinars, instructional videos, and/or internal user guides. We will curate existing educational resources from Tally and EC3 and supplement them with internal documentation to be placed on Martin/Martin's intranet or Microsoft Teams page where they can be accessed by all employees.

Submit an annual minimum of (2) projects per U.S. structural office but need not exceed (5) total projects for the firm to the SE 2050 Database.

- Projects will be submitted in August 2022.

Electives:

The first year will focus on collecting data to establish a baseline in an effort to create a target for embodied carbon reduction in the future years. Electives will be considered in future years.



EMBODIED CARBON REDUCTION STRATEGIES

Summary:

Reduction of embodied carbon in buildings is a challenge best tackled in a collaborative manner with members of Martin/Martin's entire structural department; with other structural engineers, architects, and owners in our local/regional community; and with manufacturers, suppliers, and builders. Until baseline data is available to properly measure embodied carbon reductions, Martin/Martin aims to initiate change through modifications to our standard practices and through team member engagement and education. The aim is to promote a company-wide collective understanding that every project has an opportunity to reduce the embodied carbon of the structure.

Internally, Martin/Martin plans on introducing the SE 2050 Commitment Program to its structural department; presenting strategies project managers can use to reduce embodied carbon in structures. Such strategies will include the following at a minimum:

- Revise contract drawings and specifications with recommendations for embodied carbon reductions in concrete, steel, timber, and masonry.
- Optimize structural designs to limit the quantity of required structural materials.
- Promote existing building reuse and salvage of existing facilities.

Locally, Martin/Martin will work with manufacturers, suppliers, and builders on methods to reduce structural embodied carbon. Such reductions may include alternate construction means and methods, utilizing materials with lower embodied carbon impacts, and adjusting material specifications. Additionally, Martin/Martin has and will continue to reach out to competing structural engineering firms to share ideas and develop local standard practices.

From a material standpoint, drawings and specifications will be revised to include

maximum embodied carbon limits. Reducing embodied carbon from Martin/Martin's baseline will come with strategies which will be shared with project managers to communicate the benefits of these recommendations and how to implement them. Such material revisions may include the following:

For concrete, example recommendations may include:

- Specify minimum fly ash content
- Specify Portland limestone cement where available and appropriate
- Allow increased concrete cure times to attain design requirements
- Require Environmental Product Declaration (EPD) submittals for concrete materials or performance specification of maximum global warming potential
- Investigate using recycled concrete as aggregate
- Specify minimum recycled content for concrete reinforcing
- Optimize reinforcing quantities, thicknesses, material strengths, etc. to meet minimum structural requirements

For steel, example recommendations may include:

- Specify minimum recycled steel content for various steel materials
- Require EPD submittals in bid packages for domestically fabricated hot-rolled structural sections, steel plates, and hollow structural sections
- Optimize steel designs and perform concept studies to determine steel framing schemes that minimize embodied carbon
- Incorporate design considerations for reuse and flexibility for future use
- Investigate the use of salvaged material, such as reclaimed piping and structural shapes, in the construction of new projects
- Encourage steel that is manufactured using an Electric Arc Furnace

For wood framed structures, example recommendations may include:

- · Recommend wood structures where it can be properly implemented
- Optimize designs and perform concept studies to determine wood framing schemes that minimize embodied carbon
- Specify lowest wood grades meeting minimum structural requirements
- Encourage local sourcing from sustainably managed forests to reduce transportation and environmental impacts

For masonry structures, example recommendations may include:

- Specify lowest masonry strength, which is locally available and still meets the minimum structural requirements
- Optimize mortar and grouts to meet minimum structural requirements
- Optimize reinforcing sizing and spacing to meet minimum structural requirements
- Investigate other building materials that could be used in lieu of masonry



EMBODIED CARBON REDUCTION STRATEGIES

Requirements:

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

 Until baseline data is available to set specific embodied carbon reduction goals, Martin/Martin will strive to incorporate reduction strategies through modifications to our standard practices and through team member engagement and education. Martin/Martin will measure the implementation of embodied carbon reduction strategies first by quantifying how many projects utilize the proposed strategies. We can then begin to understand the effectiveness of each effort to embodied carbon reduction from the developed baseline.

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.

- Over the course of the first year, Martin/Martin will record what we have learned during each embodied carbon calculation for use in the following year's narrative.
- Consider collaborating with a subconsultant that performs Whole Building LCAs to better understand how various strategies affect structural and non-structural components.





Electives:

Calculate firm average benchmark for embodied carbon:

- Martin/Martin will utilize an accepted industry standard embodied carbon calculator on a selected cross section of projects designed over the past few years to determine the firm's average benchmark.
- Data gathered by the company for SE 2050 reporting purposes will be analyzed to establish and track over time an embodied carbon baseline (in lb C02e/sq ft). This benchmark will be established company-wide, as well as for specific project types and materials as applicable.

Update specifications for embodied carbon performance:

 Martin/Martin will update specifications to include maximum embodied carbon limits, fabricator disclosures, minimum recycled content, and other embodied carbon reduction strategies.

Update general notes with embodied carbon reduction strategies:

 Martin/Martin will update the general notes and required material strengths of concrete to include maximum embodied carbon limits. Updated general notes may include minimum fly ash percentages, longer cure times for concrete mixes, optimized material strengths meeting minimum structural requirements, etc.



ADVOCACY

Summary:

The efforts of structural engineers reducing embodied carbon will be rewarded when the industry as a whole accepts the challenge of lowering embodied carbon in buildings. For this reason, advocacy will be a key role in the success of the SE 2050 Commitment Program. As a part of the advocacy initiative, we will call attention to embodied carbon reduction to our clients and industry associates through SE 2050 in a variety of methods.

Martin/Martin will focus on initiating conversations about reducing embodied carbon early in the project design phase, engaging and collaborating with local and regional professional groups and manufactures to spread awareness and change to a larger audience, and building upon our previous sustainable project experience.

Our Martin/Martin narrative will be shared on our established embodied carbon reduction goals through our structural department practice and company initiatives. Opportunities will also be identified for individuals, both in-house and industry wide, interested in learning more about SE 2050 or embodied carbon reduction. Ultimately, facilitating shared knowledge through a common goal will allow Martin/Martin to join other design firms in leading the industry to a more sustainable and promising future.





ADVOCACY

Requirements:

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

- Share our SE 2050 commitment and knowledge posts on social media (LinkedIn, Instagram).
- Send an announcement via an electronic newsletter to our design partners, owners, developers, architects, contractors, and agencies announcing our involvement in the SE 2050 Commitment Program.
- Engage with local and regional professional groups and manufacturers to spread awareness to a larger audience through their respective publications (ULI, AIA, CSI, etc).
- Reach out to local suppliers to promote a reduction of embodied carbon in products.

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

- SE 2050 is a vital resource to clients who are needing informed project decisions regarding embodied carbon reduction. With benchmarks created through the collaboration and data of SE 2050, design partners and clients can better evaluate their design and embodied carbon impacts, especially during the early phases of a project. This information also drives to inform and promote tax or area trade policies, which will help clients embrace embodied carbon in their project goals. The option to gather embodied carbon information for studies could be provided as part of our standard contract.

Declare your firm as a member of the SE 2050 Commitment on boilerplate proposal language.

 Martin/Martin will include our commitment to SE 2050 on our website and in marketing materials for the first year, and develop language to add to proposals in the following years.





Electives:

Share your commitment to SE 2050 on your company website.

- Create a commitment statement to the Martin/Martin company website. Highlight as one of the Martin/Martin splash-page images for a short period.

Share education opportunities with clients.

- Create a Martin/Martin embodied carbon lecture for clients.
- Educate architectural clients through the American Institute of Architects Continuing Education Services program (AIA CES)





MISSION STATEMENT

Exceptional engineering solutions through our culture of integrity, service, creativity, and quality to benefit our clients, employees, and community.

SUSTAINABILITY