MARTIN/MARTIN
CONSULTING ENGINEERS

SE 2050 COMMITMENT PROGRAM EMBODIED CARBON ACTION PLAN 2024

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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 proudly 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. It is equally as important to work alongside other organizations in the industry to collaborate and develop progressive, sustainable practices for the betterment of our environment.

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.

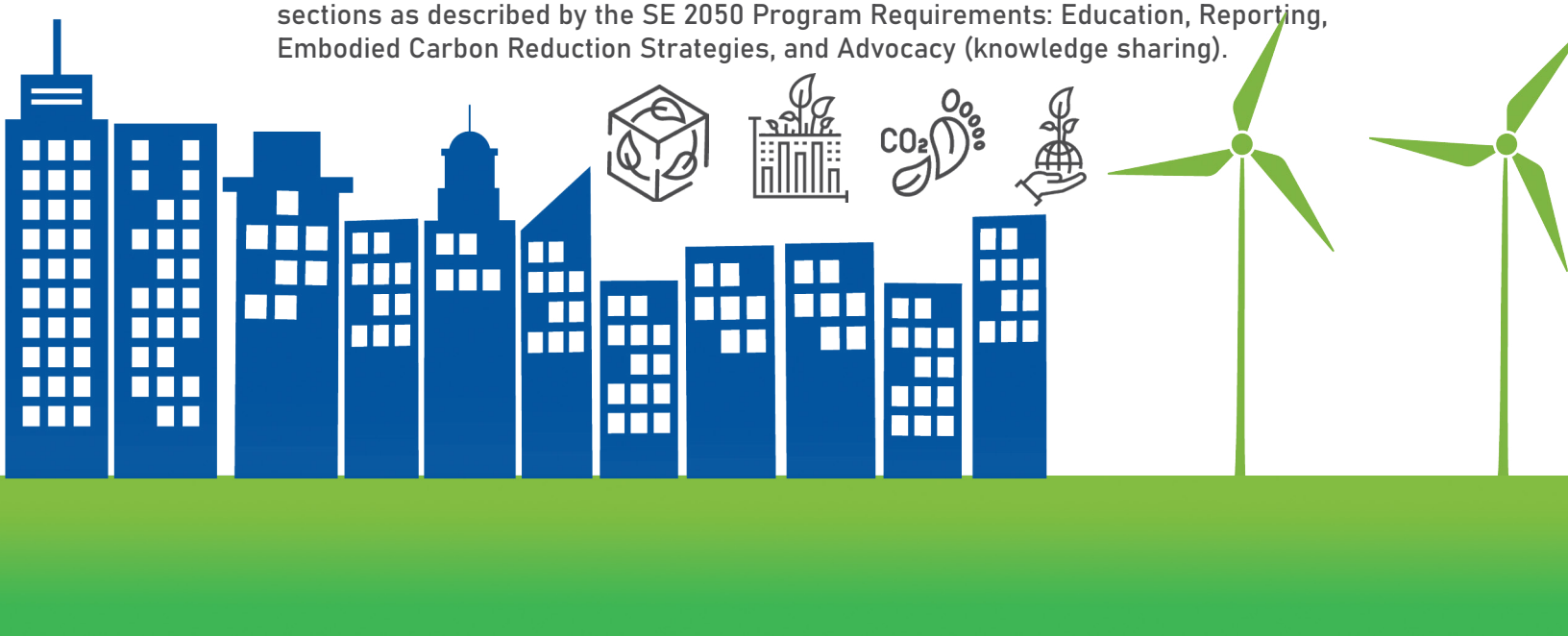
LOOKING TO THE FUTURE

Martin/Martin has a solid foundation in a wide range of structural engineering applications, both regionally and around the United States, which will enable our firm to serve as an industry leader in embodied carbon reduction. To name a few, 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. With our continued experience participating in the SE 2050 Program, Martin/Martin has been motivated even further to expand on our previous goals and keep pushing our initiatives forward. We are excited for all that we plan to accomplish in 2024!

The Martin/Martin Sustainable Design team joined the SE 2050 Commitment Program in 2021 and has formed sub-committees to impliment the initiatives. These committees will further our internal education, share industry-specific sustainability information with outside organizations, develop our embodied carbon reduction methods, and establish an embodied carbon 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 upon 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 (knowledge sharing).



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.

In 2023, Martin/Martin continued our robust education program to provide our engineers with the expertise to reduce embodied carbon in our designs. We completed training to establish the importance of reducing our carbon footprint and taught our designers the fundamentals of Life Cycle Assessments.

In addition to our internal training program, we attended webinars offered by nationally renowned engineering and sustainability education programs, toured material manufacturing facilities that are committed to doing their part to reduce embodied carbon, and hosted lectures by internationally recognized experts in sustainable materials.

Our efforts in educating our staff will bolster the other components of our SE2050 commitment by inspiring our engineers to advocate for carbon-reduction strategies with other members of the design team. We will continue these efforts in 2024 and develop new educational materials to further enhance our engineers' expertise.


Design Options
Option 1 - Corrugated Shingle
Option 2 - Panel (primary)
Manufacturing
05 - Metals
06 - Wood/Plastics/Composites
07 - Thermal and Moisture Protection
08 - Openings and Glazing
09 - Finishes
Maintenance and Replacement
05 - Metals
06 - Wood/Plastics/Composites
07 - Thermal and Moisture Protection
08 - Openings and Glazing
09 - Finishes
End of Life
05 - Metals
100%
50%
Eutrophication Potential
Global Warming Potential
Primary Energy Demand
Analysis software data

EDUCATION

2023 Year in Review:

- Announced our ongoing participation in the SE 2050 commitment.
- Provided continuing education classes for Martin/Martin employees.
  - February 2023 - LC3 Project Virtual Presentation discussing a new cement type that has the potential to reduce C02 emissions for concrete by up to 40%
  - May 2023 - Arcelor Mittal Presented on the latest developments in steel products to make structures stronger, lighter, and greener
  - June 2023 - Internal presentation highlighting our firm's "Sustainability Guide" document, introduction to Denver Green Code and Buy Clean Colorado Acts
  - December 2023 - Internal presentation to showcase our Embodied Carbon Estimator tool, recap of our tour of a recycled steel manufacturing plant
- McKenzie Glass served as the leader of Martin/Martin's SE 2050 initiative.
- Continued to add relevant content to our firm's internal resource repository (MILO) for employees to access
- Improved our existing "Sustainability Guide" document by adding resources, processes, terms and definitions, embodied carbon reduction strategies, and other useful information that our employees need easy access to

2023 Lessons Learned:

- We learned that there are numerous educational opportunities available to engineers who are interested in learning more about sustainable materials and design practices.
- We learned that sustainable design in engineering can be a complicated issue, involving material science, design principals, new methods of quantifying materials, and policy-making with stakeholders, architects, and other consultants.

2024 Action Plan:

- Required
  - The Embodied Carbon Reduction Champion will enable our SE2050 committee to organize educational opportunities for employees to learn about embodied carbon reduction strategies.
  - We will present at least 1 webinar focused on embodied carbon and will make the recording available to employees.

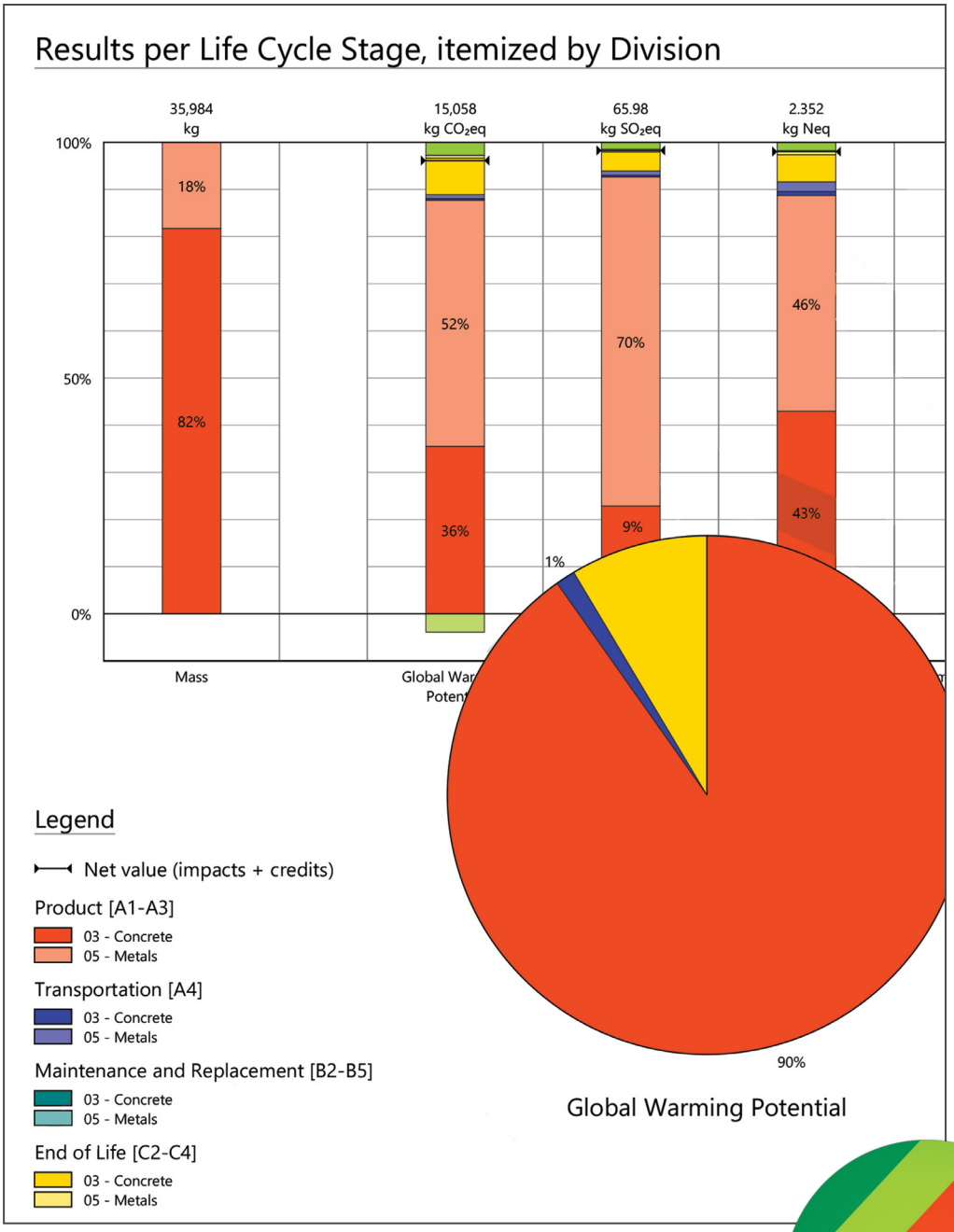
Electives:

- We will deliver an internal presentation titled “Sustainability 101” to review the core concepts, basic terminology, methods, and strategies used to reduce embodied carbon in our designs.
- We will incorporate a presentation about our sustainability practices in our on-boarding process. This will be achieved by presenting the goals of the SE2050 initiative to all incoming new employees and describing how our firm is working towards achieving those goals.
- We will continue to improve our internal digital resource platform by adding content such as articles, case studies, EPD’s, and other relevant information.
- We will identify one employee to engage in our CLF Regional Hub. This employee will attend events put on by the CLF and report back to the firm.
- We will continue to improve our internal Sustainability Guide by adding relevant content, including specific examples of embodied carbon calculations and reduction strategies.
- We will organize and present a week-long “Earth Day” celebration to acknowledge this important holiday. The celebration will include activities meant to educate our employees on sustainable lifestyles, such as compositing, alternate means of transportation, and reuse of products

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. Martin/Martin will continue to utilize Tally in conjunction with EC3 as our primary method of measuring and reporting embodied carbon.

Martin/Martin will continue to focus on cradle to gate analysis and will use this to inform active projects to reduce our environmental impact. We will also perform the LCA analysis at SD, DD, CD, and as-built phases in order to record the change in embodied carbon as the design progresses, thus evaluating the effectiveness of any applied reduction strategies and informing future designs.


Results per Life Cycle Stage, itemized by Division
35,984 kg
15,058 kg CO_2eq
65.98 kg SO_2eq
2.352 kg Neq
100%
50%
0%
18%
82%
52%
36%
70%
9%
46%
43%
1%
90%
Mass
Global War
Poten
Legend
Net value (impacts + credits)
Product [A1-A3]
03 - Concrete
05 - Metals
Transportation [A4]
03 - Concrete
05 - Metals
Maintenance and Replacement [B2-B5]
03 - Concrete
05 - Metals
End of Life [C2-C4]
03 - Concrete
05 - Metals
Global Warming Potential

REPORTING

2023 Year in Review:

- Developed a Martin/Martin-specific embodied carbon calculator to be used in conjunction with Tally and EC3, early stage design, and to provide comparisons of design options.
- Calculated the cradle-to-gate embodied carbon for (5) new construction projects using Tally and EC3 and submitted the results to the SE 2050 database.
- Expanded Tally How To Guide for internal use, (Stages A1-A3 only).
- Taught an internal class to educate our staff on how to complete simple embodied carbon calculations using our company embodied carbon order of magnitude tool.
- We were contracted to provide cradle to gate embodied carbon analyses for (2) projects. For one of these projects, we also provided a sustainability report to use our embodied carbon results to establish a baseline for future projects and provide recommendations for ways reduce embodied carbon.

2023 Lessons Learned:

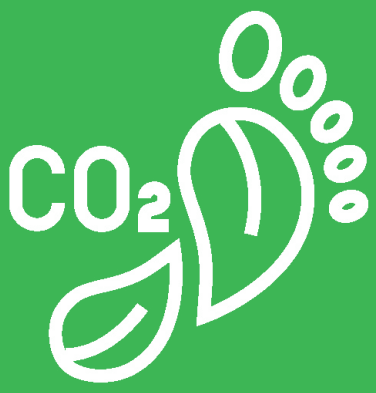
- We learned that we can complete cradle to gate embodied carbon calculations and reduction recommendations as a service to clients in a cost effective manner.
- We learned that completing life cycle assessments of retrofits to existing structures involves calculating the values for the existing structure and then comparing the existing structure with retrofits to these values.
- We learned that TallyCAT can be used to integrate EC3 into Tally.

2024 Action Plan:

- We will continue to calculate embodied carbon using Tally and EC3. Tally calculates material quantities automatically by pulling data directly from Revit. Often, we export projects (and therefore material quantities) directly from Tally to EC3. When calculating the embodied carbon of components not modeled in Revit (including reinforcing bar splices and miscellaneous metals), quantities will be calculated by hand and manually added to EC3.
- We will use the regional average EPD data available in Tally and the product-specific EPDs available in EC3, when applicable.
- We will calculate embodied carbon at the Schematic Design (SD), Design Development (DD), Construction Documents (CD), and as-built phases for (1) project in 2024. For the rest of our projects, we will only calculate embodied carbon at the CD phase.
- We will submit (7) projects to the database in 2024. Target areas include the following:
  - (1) project will be adaptive reuse
  - (1) project will include wood materials
  - (1) project will be tracked at the SD, DD, CD, and as-built phases
  - If EPDs of repair compounds become available in 2024, it is our goal to calculate the embodied carbon of a concrete repair project.

Electives

- We will submit (1) additional project to the database beyond the required (6) projects, thus increasing percentage of projects from the previous year.
- We will increase our capacity by educating our staff and increasing the number of engineers who are capable of calculating embodied carbon.
- We will review options for automating our LCA process by coordinating with our Innovation Committee to determine uses for Rhino and Grasshopper and processes to streamline the material quantities in Revit. The purpose is to better inform design decision with real time embodied carbon data.



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 structural department; with other structural engineers, architects, and owners in our local/regional community; and with manufacturers, suppliers, and builders. Martin/Martin has continued this process by evaluating changes we can make to our standard operations which recognize embodied carbon and our impact on the environment. Efforts include addition of sustainability goals to project requirements, optimization of structural systems, educating architectural partners of the material impacts of their design vision, and more importantly, education of our project managers and senior staff on the importance of these strategies towards achieving our sustainability goals. The objective is to promote a company-wide collective understanding that every project has an opportunity to reduce the embodied carbon of the structure.

EMBODIED CARBON REDUCTION STRATEGIES

2023 Year in Review:

- Updated specifications and drawing notes for concrete and steel materials with significant changes to how we specify these materials and communicate the sustainability goals for which the company aims. Revisions include requirements for EPD submittals, more optimistic recycled content goals, and information on embodied carbon goals.
- Met with local and national material suppliers for both concrete and steel to understand their embodied carbon goals, innovative technologies being developed, and their perspective on how the designer can dictate sustainability. This provided good insight into the contractor and supplier perspective on the aims of SE 2050 and gave our team an opportunity to highlight the importance of the pledge we have made to improve sustainability efforts.
- Presented reduction strategies and highlighted the importance of structural efficiency in building design to clients via AIA classes and other project specific sustainability goals.
- Began evaluating and incorporating provisions of local and state sustainability measures into our specifications and drawing notes to ensure that we can readily comply with new mandates and more easily provide a framework of project sustainability goals to interested clients.

2023 Lessons Learned

- We learned that there are numerous options and strategies which can be used to target embodied carbon in concrete and steel, and we were pleased to feel the energy behind these efforts coming from concrete suppliers and steel fabricators. Our committee believes that this is in part due to concrete suppliers and steel fabricators having been on board with embodied carbon reductions for a number of years and an increase in recognition which improves their practices and promotes innovation.
- We learned that a lot of the success in the embodied carbon world is driven by material suppliers and contractors, especially through the innovations they choose to pursue. If our company does not get a supplier or contractor excited about collaborating on a reduction effort, there is little chance of making a difference without strategies. Thus, having partners in the effort outside of our simple design strategies is critical.
- As more states pass sustainability legislation and as more local jurisdictions institute sustainable building codes, we have realized that maintaining an awareness of code developments in sustainability is key for future success. It is important not only to understand current sustainable building requirements, but to understand the trajectory of these new and rapidly developing regulations, so that we can better prepare ourselves for the future.
- An important lesson from this year's efforts is that the success of any measure and strategy taken towards reducing embodied carbon requires a great amount of thought and time to educate and gather buy-in from clients, company staff, and management. To achieve anything, we need to clearly communicate what these efforts are and why they matter or else the strategies we develop will be unlikely to make a difference.

2024 Action Plan:
Continue to perform embodied carbon comparison studies during project concept phases:

- Communicate the embodied carbon impacts of design options to clients with creative data visualizations.
- Martin/Martin will seek out projects where owners and clients will be receptive to a study of the embodied carbon reduction potential of a project. These types of studies are a natural progression from our practice of studying project design options in the concept phase for cost or material reduction purposes and can be incorporated into regular project workflows with training of project manager staff and practice.

Update specifications to incorporate embodied carbon performance and submittal requirements:

- Martin/Martin will continue to revise and update project specifications to include maximum embodied carbon goals, recycled content goals, fabricator disclosures, and EPD submittal requirements. Focus will be on materials not yet evaluated such as masonry and wood. We will also monitor the response from owners, clients, contractors, and product suppliers to tailor sustainability requirements for project needs.
- Martin/Martin will continue to revise and update drawing General Notes to include maximum embodied carbon goals, recycled content goals, and other embodied carbon reduction strategies. Focus will be on materials not yet evaluated such as masonry and wood.

Incorporate biogenic materials in a project:

- Martin/Martin will collaborate with clients and owners to utilize a biogenic material in a project. We will investigate industry innovations and available products, particularly in our typical local markets, to work with those suppliers on incorporating their products into a project and to aid in their development.

LEED/Green Globes/CHPS:

- Martin/Martin will collaborate with with clients and owners to achieve LEED/Green Globes/CHPS accreditation on a project.

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 partners 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 manufacturers to spread awareness to a larger audience, and building upon our previous sustainable project experience.

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.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ADVOCACY

2023 Year in Review:

- Shared our SE 2050 Commitment posts on social media, (LinkedIn and Instagram).
- Included our commitment to the SE 2050 Program on our website along with additional company sustainability information.
- Engaged with other industry professionals by presenting our AIA Sustainable Design Class (8) times.
- Reached out to local contractors to provide feedback for our specification updates.
- Reached out to other industry professionals, such as material suppliers and manufacturers, to provide feedback on our specification updates.

2023 Lessons Learned:

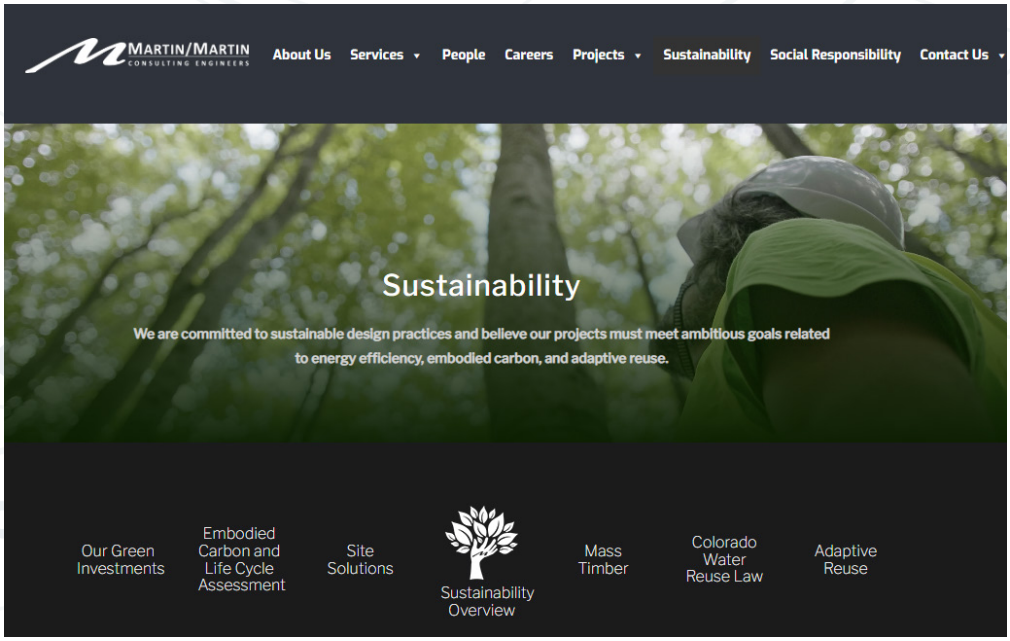
- We learned that there is momentum towards writing sustainability into legislation at the Federal, State, and Local levels. Denver is one of the first cities in the US to adopt sustainable requirements into its legislation with the introduction of the Denver Green Code.
- We learned that developers and other stakeholders have concerns about the effect this will have on the financial viability of their projects. As design professionals we will be relied upon to use our expertise to navigate these new requirements in order to deliver compliant designs.
- We learned that many architects are involved in AIA 2030, a program similar to SE 2050, and are familiar with the concept of calculating and reducing embodied carbon in building designs. The AIA 2030 commitment is more broad, encompassing a framework of 10 different design principals, including reduced energy consumption as well as social impacts, and well-being.

2024 Action Plan:

- We will offer an AIA Continuing Education Course in Sustainability, where we describe the value of SE 2050 to our clients, and explain how we can collaborate on projects to reduce embodied carbon.
- We will release our 2024 Embodied Carbon Action Plan on our website and on social media (LinkedIn, Instagram) reaffirming our commitment to reduce embodied carbon in our designs as members of the SE 2050 commitment program. Our declaration is stated on our website, (see image below).

Electives:

- We will create and deliver an external presentation featuring a case study of an adaptive reuse project showing how the conversion of an existing structure resulted in embodied carbon savings.
- We will advocate for embodied carbon reduction by delivering our AIA Continuing Education Course to a minimum of 8 architecture firms both locally and nationally through our branch office locations.
- We will engage with local material suppliers, encouraging them to obtain Environmental Product Declarations for their materials when possible. These documents are not only an important accountability tool for validating reduction efforts, but are becoming more prevalant to fulfill legislative requirements showing that reductions have been achieved.



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MISSION STATEMENT

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

SUSTAINABILITY