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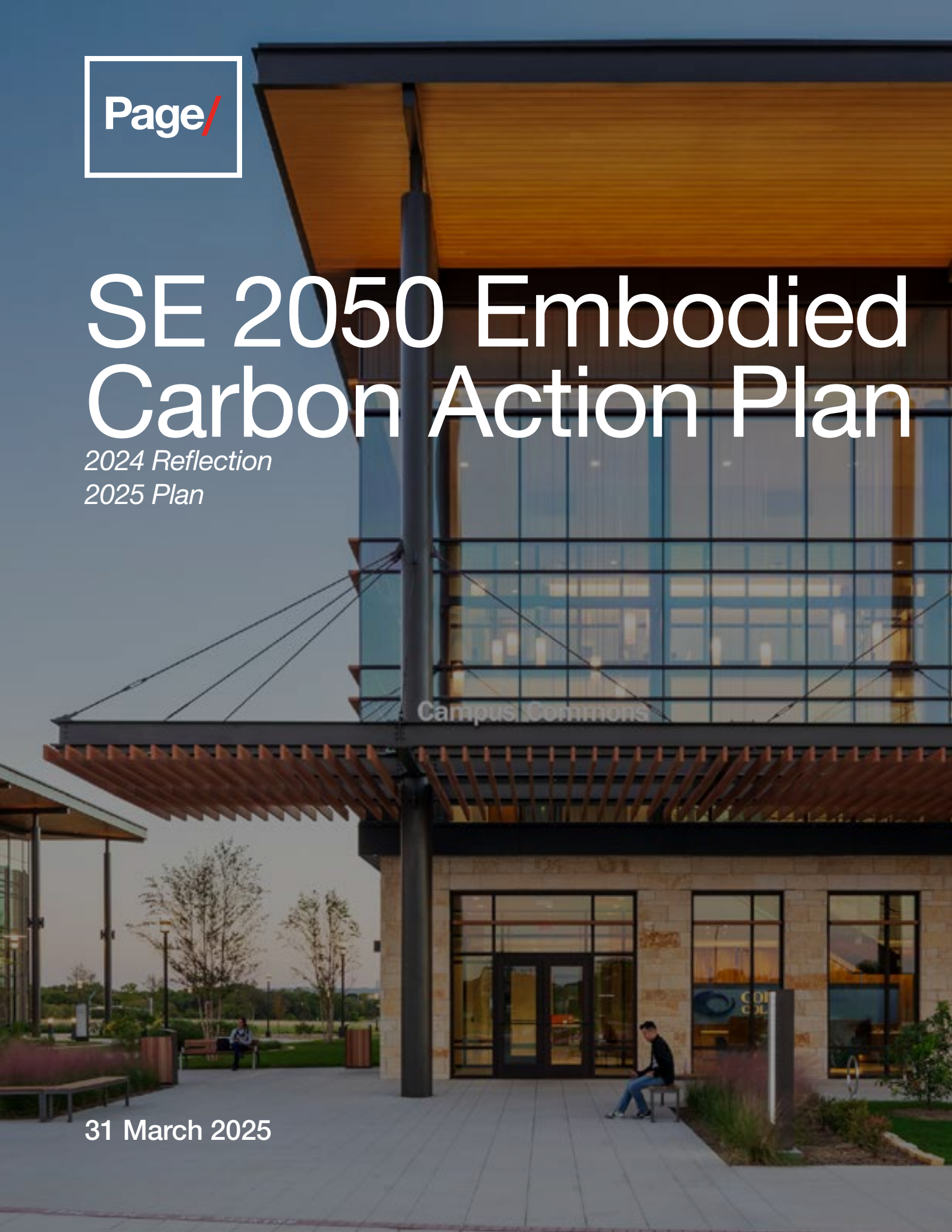
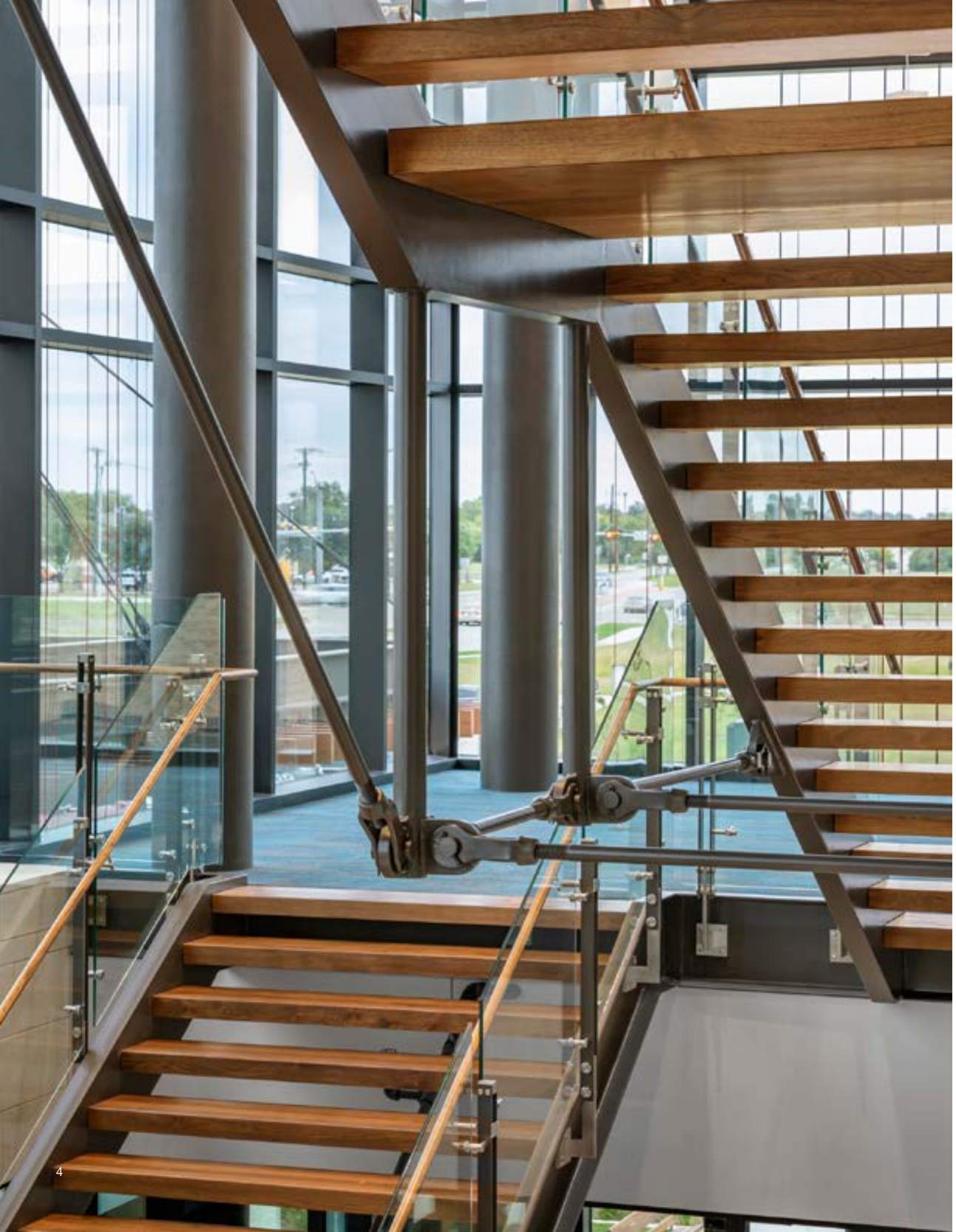
SE 2050 Embodied Carbon Action Plan

2024 Reflection
2025 Plan



31 March 2025

Performance x Design



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Thomas McCarthy, AIA, LEED AP
CEO

31 October, 2024

Laura Champion
Director, Structural Engineering Institute

Letter of Commitment to the SE 2050 Program

Dear Laura:

Page, a 1,400-person architecture and engineering firm located in 20 locations throughout North America, is proud to commit to the SE 2050 Commitment Program. We support the vision that all structural engineers shall understand, reduce, and ultimately eliminate embodied carbon in their projects by 2050.

As designers, architects, engineers, and planners, we have a tremendous impact on the world around us and we take that responsibility seriously. As a 125-plus-year-old firm and one of the first large firms to sign the AIA 2030 Commitment in 2009, we are committed to designing high-performing, healthy, and resilient projects that reduce the impact on our environment through regenerative thinking, processes, and solutions. Measuring carbon emissions associated with material selection and finding ways to reduce them is critical to reducing our environmental impact.

We therefore commit Page to take the following steps which are part of the SE 2050 Commitment Program:

- Within six months and annually henceforth, we commit to reporting an Embodied Carbon Action Plan (ECAP) and permit the ECAP document or form be made public on the SE 2050 website. We currently do this annually as a section of our Design for Impact report (see here) and will continue to build on this plan.

- Within one year and annually henceforth, we commit to submit data to the SE 2050 project database in a collaborative effort to understand embodied carbon in structural engineering projects and to set attainable targets for future projects.

We look forward to joining this coalition and industry effort to achieve the goals of the SE 2050 Program.

Sincerely,

Thomas McCarthy, AIA, LEED AP
CEO

CC: Julie Rusk, COO / John Clegg, CIO / Wendy Dunnam Tita, CPO,

Jill Kurtz, Director of Building Sciences / Brad Chesire, Structural Engineering Director

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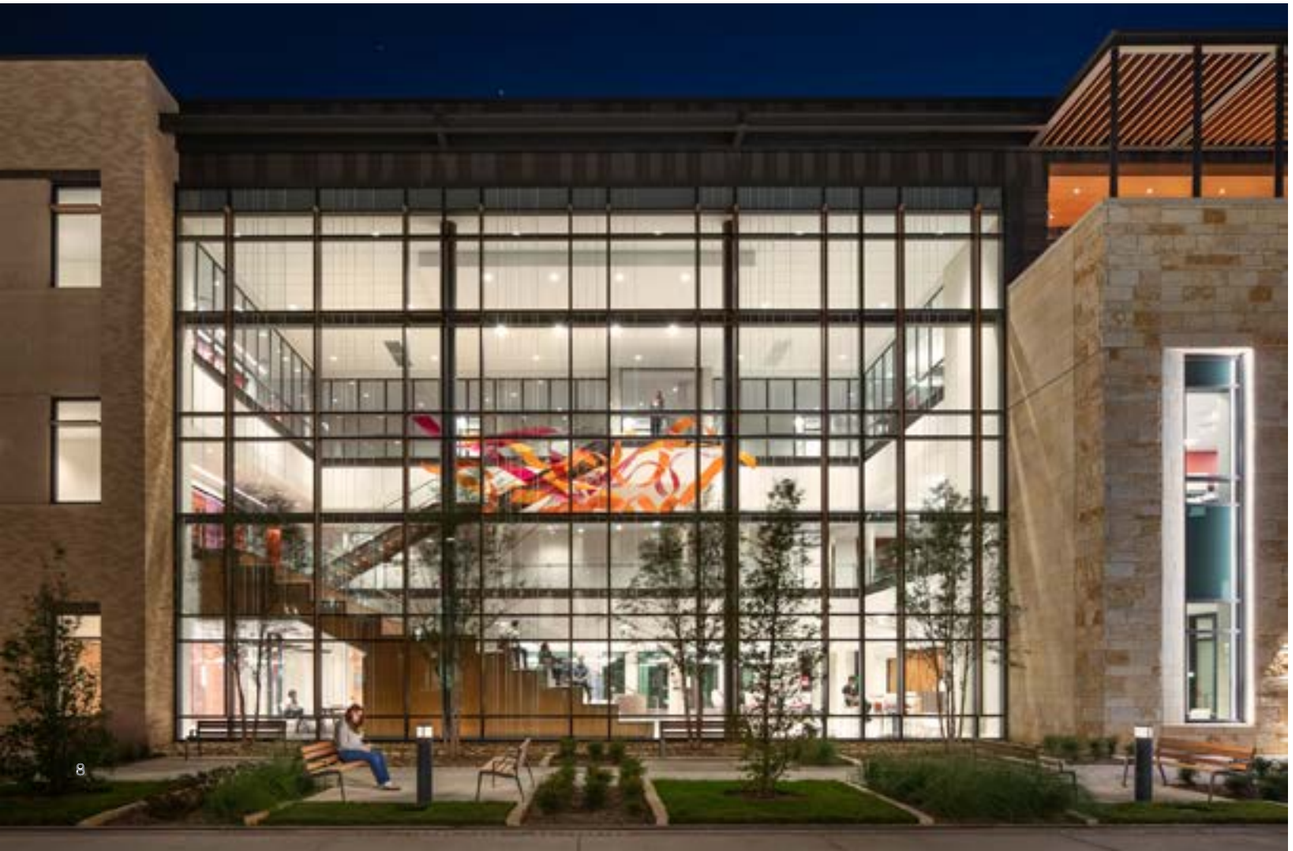


Who We Are

Page is a multidisciplinary design, architecture and engineering firm with 1,400+ talented staff in 20 offices in the U.S. and abroad. Our work consists largely of complex projects that benefit from our integrated disciplines, with work spanning a multitude of project types. At Page, we hold ourselves accountable to the highest standards of environmental and social responsibility. Our commitment to creating lasting, positive change is woven into every project, every decision, and every partnership we forge. We believe in full transparency—not just in reporting our achievements but in openly evaluating our progress to ensure we are continually aligning our work with our values.

Structural Engineering at Page

Page's structural engineers have extensive experience designing many types of projects, including laboratories, hospitals, central plants, utility distribution infrastructure, petrochemical facilities and microchip manufacturing facilities. We have the tools to analyze, investigate and design highly efficient structures of steel, concrete, masonry and wood.

The Structural Engineering team at Page designs structures which are conducive to the intended use, regarding load capacity and vibration performance, while maintaining structural efficiency. Our focus is on the realization of the design intent whether said intent is of a purely functional nature or related to an architectural or social goal. Our engineers, who thrive on opportunities to solve complicated problems, have been instrumental leaders in the effort to develop a carbon-integrated design culture within their practice.

Building Sciences at Page

Page approaches sustainable and regenerative design through the interdisciplinary lens of building science to create higher-performing, healthier, more resilient buildings. Page's Building Sciences team is a dedicated and dynamic group focused on driving sustainability and high-performance building design across the firm. Actively engaged in teaching, enhancing standards, developing innovative tools, and advancing research, the team plays a key role in reducing embodied carbon across Page's architectural and structural design projects. Through Life Cycle Assessment (LCA) services, we continually study embodied carbon impacts and seek material optimization, ensuring continuous improvement. The Building Sciences team is committed to supporting our Structures team in achieving ambitious embodied carbon reduction goals, reinforcing Page's pledge to SE 2050.

An Ongoing Commitment to Reducing Embodied Carbon

Page has been growing our embodied carbon expertise for several years and officially signed the SE 2050 Commitment in 2024. Each year, Page publishes a Design for Impact Report which outlines our firm's environmental and social commitments, including our commitment to embodied carbon reduction throughout our range of service areas. We have included our framework for Design for Impact as well as the high level strategies for reducing Embodied Carbon identified in the report in "Appendix A" of this Action Plan.

Education

Page maintains offices with structural engineering services in Austin, TX; Dallas, TX; Phoenix, AZ; and Mexico City, MX. Each office's structural team pursues and supports work locally as well as collaborates with other design disciplines across various projects and initiatives.

Structural teams across offices work together to strengthen collaboration and build a common knowledge base across the practice area. This is facilitated structurally through our leadership teams and organically through our practice area internal collaboration software. The ability to quickly communicate across the practice area allows for quick responses on message boards, improvement of shared resources, and sharing of best practices. On these foundational systems, we will be working to advance and improve education.

First Steps: Engaging Carbon Reduction

To streamline communication and enhance access to embodied carbon expertise, each structural engineering office will have a point of contact, responsible for connecting their local office-mates with the right tools and resources to investigate carbon emissions on their projects. These individuals are known as our structural engineering practice area Embodied Carbon Reduction Champions.

Internal education and knowledge sharing are important to Page and reinforce the firm's commitments to practice leadership, design, and research. During our first reporting year, two of Page's offices with structural engineering services appointed a designated, local Embodied Carbon Reduction Champion. These champions are Patricia Young, PE, Project Structural Engineer in Dallas, TX and Lara Journeay, PE, Project Structural Engineer in Austin, TX. Our goal for the upcoming year is to identify Champions for the Phoenix and Mexico City offices, so that each structural engineering office is served by a dedicated Champion.

Our Embodied Carbon Reduction Champions focus on creating educational resources and directly engaging with engineers through webinars. Champions will also collaborate with the Building Sciences team to establish standards for new projects, including standard specifications and best practice guides. The Champions will also continue to identify new avenues of internal engagement, honing our education strategy further.

Digital Carbon Resources

Page operates an intranet, Louie, developed in 2023, as a company-wide resource to facilitate information sharing across all offices. Page announced our commitment to SE 2050 to the firm via Louie in February 2025. Also in early 2025, the firm launched a page dedicated to embodied carbon on Louie. This page allows anyone within the firm—whether in structural engineering or another department—to learn about embodied carbon and explore strategies for reducing it in all projects. The page includes helpful tools and resources, as well as contact information for team members across the firm who can provide assistance when more specialized knowledge is needed.

External Knowledge Sharing

Our Commitment

Embodied carbon is an emerging concept within the Architecture, Engineering, and Construction industry, and data on the subject is rapidly becoming more available. Page is committed to closing the gap in understanding of embodied carbon concepts within the industry. As a result, broadly accessible education should remain a primary focus of practitioners with carbon reduction knowledge.

The mission of SE 2050 underscores the nature of this work as an industry-wide collaboration. Page is committed to playing our part in this collaboration, using the lessons we learn to help others build their own knowledge and perspective.

Page's Knowledge Sharing Plan, outlined below, identifies three strategies representing crucial avenues for action, aiming to help advance collective industry fluency with carbon reduction.

Show our work

Each year, Page publishes the Design for Impact Report, a narrative of our environmental and social commitments, including our commitment to embodied carbon reduction throughout our range of service areas. This report includes case studies, updated year after year, that highlight recent successes. As we join SE 2050, we commit to using this existing platform to share information explicitly related to both the commitment and to structural design decarbonization in general.

Conferences and other industry events provide valuable opportunities to discuss our work among a broad group of design professionals. Page plans to showcase our work at these important venues, giving us an opportunity to share successes and have meaningful conversations with other practitioners about our work.

Make space for discussion

As a large national firm, Page maintains venues within its offices that are capable of hosting industry events. This allows us to host our local professional communities in events that foster learning, growth and discourse. We take our responsibility to make space for these discussions seriously. The firm has hosted several events to date touching on embodied carbon topics, including Metropolis magazine's Climate Action Expo, geared to interior design professionals. Moving forward, we plan to expand this type of engagement, hosting similar events at our offices geared to carbon reduction in structural design.

Be a resource to others

External teaching opportunities are a way to bring the individual expertise of embodied carbon practitioners within our firm to venues outside our organization. Our professionals work with leading industry voices, such as OneClick LCA, to deliver online seminars. Continuing these collaborations is a critical means of disseminating knowledge of best practices and processes.

Documented, publicly available project case studies allow us to share information specific to a project's carbon achievements in an accessible format. As we deepen our structural decarbonization commitment, Page plans to generate case studies that include both anecdotal and technical information about how our structural designs achieve better carbon performance.

Reduction Strategy

Design Strategies

Page's embodied carbon reduction strategy will focus on updating our standard specifications and developing workflows that encourage discussion on embodied carbon. Our main effort will be to introduce new, standardized specification templates across the structural department. We will write performance-based concrete specifications rather than lean on prescriptive requirements for mix designs to allow for flexibility in achieving embodied carbon reduction goals. Our goal is to ensure all mixes we specify achieve reduced global warming potential (GWP) evaluated against NRMCA (National Ready Mix Concrete Association) benchmarks. Our target for concrete mixes is a 20% reduction in GWP relative to NRMCA regional averages. The team can determine further GWP reduction measures on a project-by-project basis consistent with client goals or certification requirements.

Another key initiative will be considering American Society for Testing and Materials (ASTM) A913 steel, which is a high strength, low-alloy steel. The process of manufacturing this grade of steel is lower in energy intensity than the traditional ASTM A992 steel. A913 steel is fabricated in an electric arc furnace which can use renewable energy sources instead of traditional fossil fuel powered steel mills. The tradeoff is A913's limited availability, which in some cases may lead to a higher embodied carbon footprint arising from greater transportation distances. We will assess the carbon impacts of A992 vs. A913 holistically for each project, considering shipment impacts, to select the lowest impact option for the project.

Process Strategies

Process changes will include training all structural department members on embodied carbon principles and reduction strategies, with additional training for Embodied Carbon Reduction Champions in each office to serve as local resources. We will also ensure structural engineers participate in project sustainability kick-off meetings with specific agenda items for embodied carbon of the structural system.

These early project meetings will serve as the groundwork for the project's Design for Impact Action Plan which will include a section on embodied carbon reduction, the Embodied Carbon Execution Plan. This document will be used as a reference throughout the project and when onboarding new project members. The Embodied Carbon Execution Plan will clearly state our project execution strategy including certification goals, concrete embodied carbon reduction goals, steel grade, points of contact for design and life cycle analysis, any additional material changes necessary for designers and engineers to work on the project. Each year, our goal will be to analyze/report embodied carbon impact on more Page structures projects than the last year. We strive to one day report embodied carbon data for 100% of eligible Page Structures projects.

Collaboration

Page's Structural Engineering Practice Area is committed to providing more feedback to project teams early on and communicating goals early on to make space for the embodied carbon improvements we want to see in our structural design.

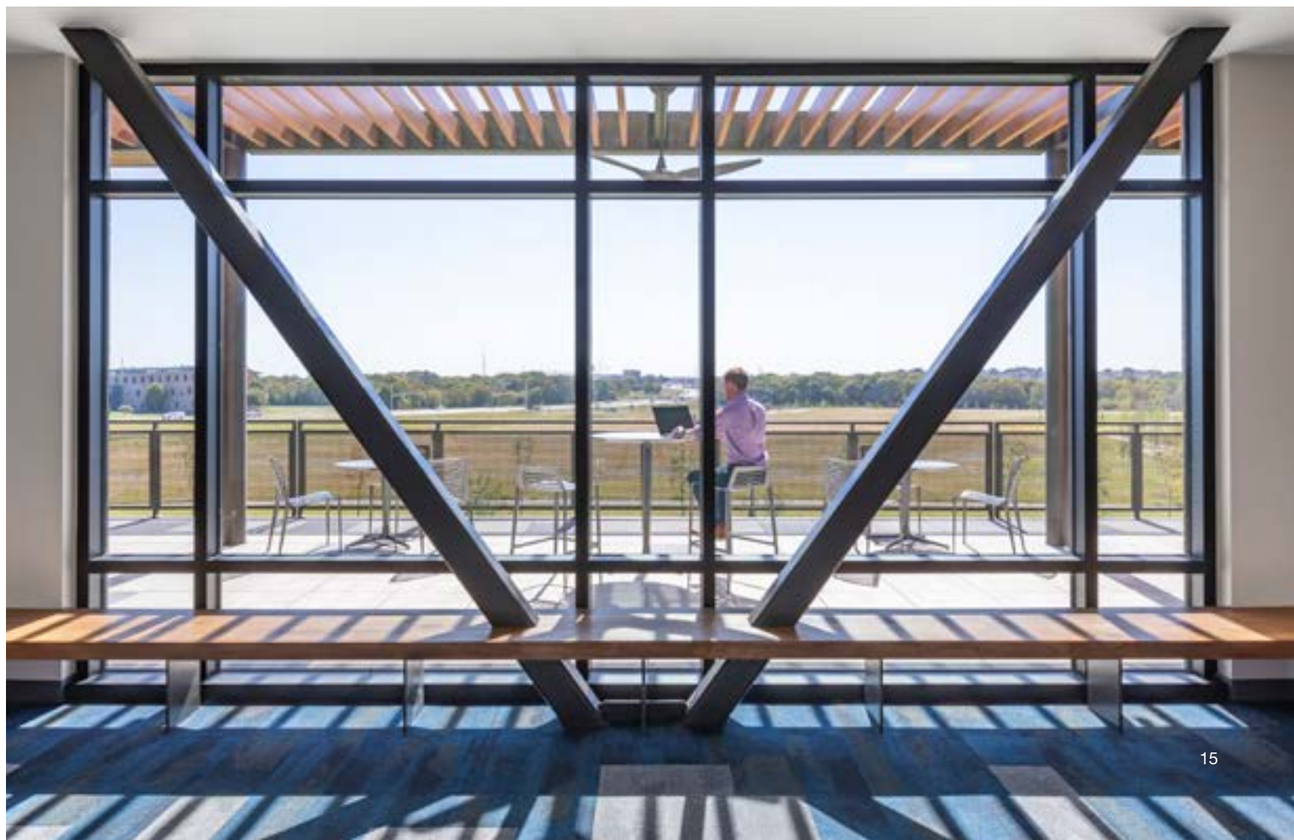
Reporting

Our Methods

Page is reporting structural embodied carbon data for five (5) projects for 2024: two (2) from our Austin, TX office, two (2) from our Dallas, TX office and one (1) from our Phoenix, AZ office. Page utilizes Whole Building Life Cycle Assessment (LCA) tools: One Click LCA and Tally, to estimate the embodied carbon impact of our structural systems. Our LCAs are cradle to grave, inclusive of all stages, A1-A5, B1-B7, C1-C4, and D.

When product or region-specific Environmental Product Declarations (EPDs) are available, we integrate the data into our models. We utilize the LCA software's custom mix capabilities to account for project specific mix designs. We calculate material quantities from the Revit model. We use the Tally and One Click Revit plug-ins to pull quantities from our Revit model and make assignments as appropriate.

Page regularly runs LCAs as part of our regular practice for Page projects (both our architectural and structural design projects), as noted in our Design for Impact Report 2024. Page is committed to staying up to date on the latest in embodied carbon evaluation tools and softwares. We are committed to updating our approach as needed to align with industry best practices.



Advocacy

The Value of SE 2050 to Clients

We are committed to performance-based design and reducing embodied carbon in our projects. Expressing the value of this is part of our professional responsibility to our client.

Our commitment to SE 2050 is a new tool that will be added to our toolbox, enabling us to showcase our dedication to carbon reductions while also providing a new framework for tracking progress and ensuring accountability in our projects.

Our Design for Impact Report communicates both our commitment to reducing embodied carbon and our transparency with the rest of the industry. This report is publicly available and often shared as part of our qualification for our clients. It sets the stage for collaboration and engages our clients who are also trying to reduce their own carbon footprint. By aligning with us in this commitment, we can achieve meaningful progress together toward a more sustainable built environment.

Additionally, by participating in industry conferences and events, Page can advocate for embodied carbon reductions on a broader scale. These platforms allow us to connect with industry professionals, exchange ideas, and reinforce the importance of taking action to reduce embodied carbon in structural systems.

Public Declaration of SE 2050 Participation

Page announced on our social media platforms in March of 2025 that we have committed to the SE 2050 Challenge. We hope that this announcement will inspire other firms to follow suit and embrace embodied carbon as a shared goal on their projects.

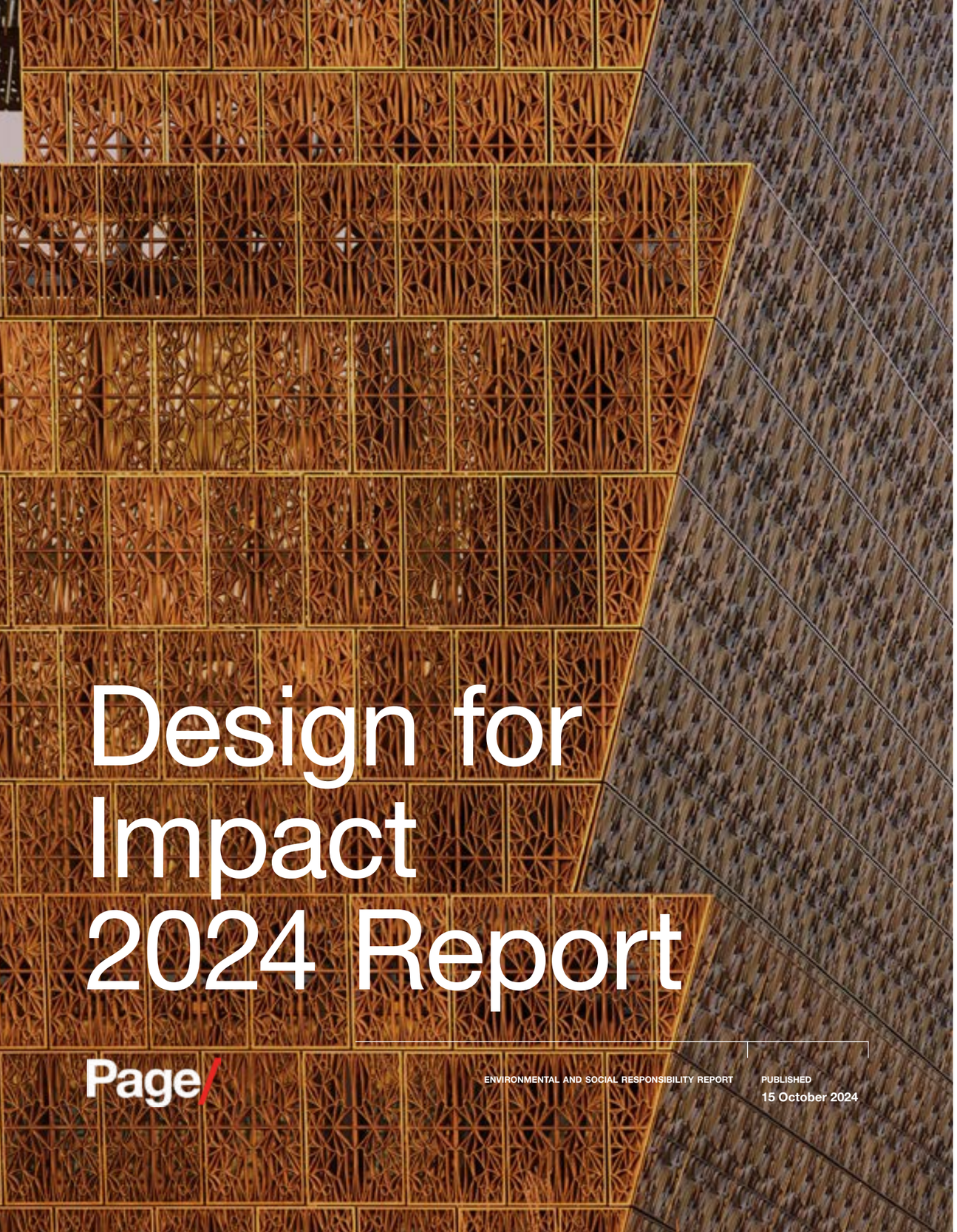
External Presentations

Page is committed to providing external presentations to inspire other industry members to design responsibly and share project examples and resources for getting the job done.
We are committed to engaging with leading professional organizations such as the Carbon Leadership Forum (CLF) and the AIA material Pledge communities. Through these partnerships, we aim to reach a wide audience of fellow advocates, encouraging collective action across the industry and amplifying the conversation around reducing embodied carbon. These opportunities enable us to take an active role in advancing industry-wide change toward more sustainable practices.

Engagement with Material Suppliers

To successfully reduce embodied carbon, Page is actively integrating coordination with local structural material suppliers into our project workflows. We recognize that early engagement with suppliers is crucial in ensuring that the necessary resources and materials required for achieving sustainability goals are readily available. By involving suppliers early in the process, we can better align our material choices with the project's carbon reduction objectives.

This collaboration also promotes innovation within the materials supply chain, encouraging the development of new, low-carbon alternatives that can further reduce the environmental impact of our projects. Page's commitment to these partnerships will contribute to industry-wide progress toward a net-zero carbon future, underscoring the importance of collective efforts in meeting global sustainability goals.



Design for Impact Report 2024

This spread is from our Design for Impact Report 2024. Read more about it here.

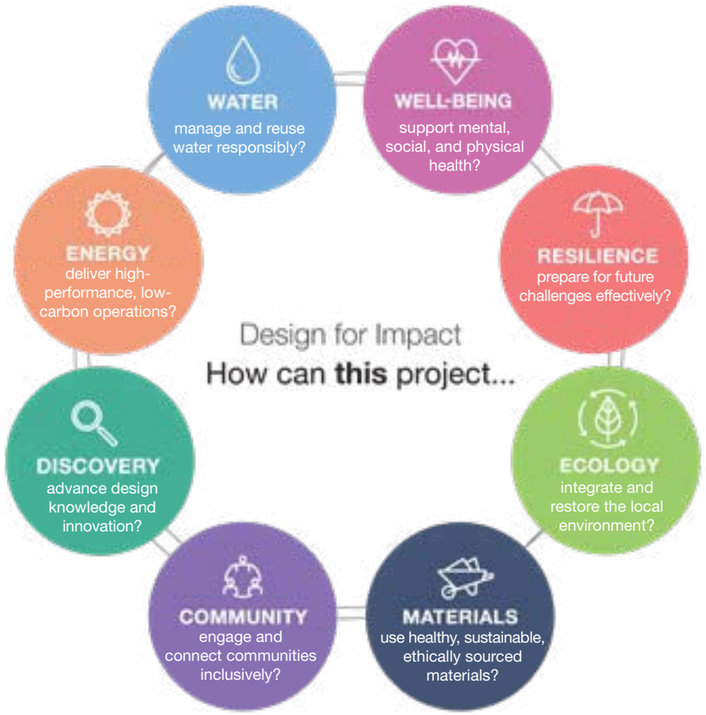
We design for impact by creating high-performing, healthy, and resilient projects for our communities.

Design for Impact

At Page, we understand our work's tremendous impact on the built environment and communities where we work, live, and play. We also recognize that every climate has a different set of challenges, every site has a unique fingerprint, and every project has its own story. Our Design for Impact (DFI) approach to sustainability and impact is grounded in these stories and individual responses to place, not a one-size-fits-all checklist.

We begin with the end in mind and start each project by asking, "What impact story do you want to tell at the end of this project?" Together, we review organizational objectives and client priorities, define clear guiding principles and performance goals that become key drivers in early design concepts, and guide integrative solutions.

Our DFI framework also helps organize our internal efforts. Each impact area has its own coLAB within Page to share knowledge and advance strategies across our markets, practices, and operations.



Design for Impact Process:

1 Align

Conduct a design charrette to define key impact opportunities, set goals, and define success metrics.

Develop the DFI statement and goals with the owner to include in the Owner's Project Requirements.

2 Plan

Develop a DFI action plan with integration strategies, barriers to overcome, and ways of tracking progress and measuring impact.

Identify a DFI project champion.

Summarize the design strategies used to meet goals in the Basis of Design.

3 Integrate

Integrate and coordinate strategies to help advance DFI goals.

Review project strategies regularly as part of the design coordination and include them in design documents.

4 Communicate

Refine the DFI statement at the end of both the design and construction process to reflect the project strategies employed and relevant metrics for achieving goals.

Embodied Carbon

Measuring carbon emissions associated with material selection is critical to reducing our environmental impact.

Buildings, their materials, and the energy they consume account for about 39% of global carbon emissions, with 11% attributed to major construction materials like cement, steel, aluminum, and glass. Reducing embodied carbon in these materials is essential to mitigating climate change.

According to the latest models by the Intergovernmental Panel on Climate Change, the current decade is a crucial time for action. As mechanical systems become more efficient, embodied carbon accounts for an increasingly larger portion of a building's carbon footprint over the typical 60 year lifespan. These are day-one impacts, critical to reduce during this decade of climate action. So, how do we address embodied carbon?

Core Principles for Reducing Our Embodied Carbon

Wherever possible, reuse, renovate, and reposition existing buildings. Extending the life of structures can save 50-95% of embodied carbon emissions compared to new construction, especially if foundations and frames are preserved.

Focus on carbon reduction for structure and envelope materials. Heavier materials like concrete and steel make up about 80% of a building's carbon footprint, offering the greatest potential for savings. Our engineers and Building Sciences team assess structural systems for their embodied carbon impact, and we work with contractors committed to reuse. Architects must also maximize structural efficiencies and specify materials with high recycled content.

Design to minimize waste. Interiors are typically updated every ten years, which generates significant embodied carbon. Selecting products with high recycled content is a good place for interior designers to start making a positive impact. Opting for products with take-back programs can extend material lifespans, support responsible manufacturing, and contribute to a circular economy.

Track the embodied carbon in our building materials. Just as nutrition labels revolutionized how we view food, building material transparency enables more informed decisions.

Architects must:

- Request Environmental Product Declarations from manufacturers, especially for high-carbon materials like concrete, glass, and insulation.
- Use tools like One Click LCA, Tally, EC3, Athena, and Kaleidoscope to conduct design model-based life cycle and material carbon analyses.
- Refer to resources such as the material pyramid and AIA's Large Firm Round Table's Countdown on Carbon guide.
- Engage with Carbon Leadership Forum Regional Hubs to connect with professionals reducing carbon impacts.

To advance our efforts, we commit to:

- Deliver firmwide education on embodied carbon and strategies staff can implement in everyday work.
- Create an embodied carbon toolkit with resources and tutorials to help teams navigate embodied carbon issues on their projects.
- Establish reasonable maximum Global Warming Potential (GWP) constraints for specific high-carbon-impact materials.
- Work with structural engineering partners to identify best practices for reducing embodied carbon in structural elements.
- Continue to conduct Life Cycle Assessment (LCA) analyses for environmental impact on projects seeking green building certification.
- Set LCA goals for the firm, collaborating with market sectors to identify achievable, measurable embodied carbon reduction targets.

These spreads are from our Design for Impact Report 2024. Read more about it here.

Washington, DC

Capital City Public Charter School

The Makerspace project repurposes a 19,000-square-foot, two-story abandoned warehouse in downtown Washington, DC. Approximately 65% of the existing structure will remain, including three of the four exterior walls composed of CMU and brick, the majority of the concrete foundation, and the second-level concrete floor slab. This approach dramatically reduces concrete production and embodied carbon while contributing to the character of the building. The Makerspace will allow students to lean into their creativity through sewing, building, and science projects. What better setting than a building that exemplifies ingenuity and environmental responsibility to create a new and vibrant space out of an underutilized resource?

Austin, Texas

321 West 6th Street

Valuable collaborations with engineering partners can lower embodied carbon impact on any project. Designed in partnership with Handel Architects, 321 West 6th Street is a 55-story mixed-use, new-build tower in downtown Austin. Situated near Republic Square, the city's downtown park and transit hub, 321 boasts seven floors of workspace and 369 rental units, married by an outdoor residential amenity deck and a shared fitness center. The tower's structure, led and championed by our structural partners at Magnusson Klemencic Associates, is the first in the world to be designed and permitted with performance-based wind design (PBWD). The PBWD process optimized its concrete structure based on wind load analysis, reducing reinforcing steel by over 450 tons. This resulted in a 3% reduction in embodied carbon emissions, with no negative impact on user experience.