SE2050
2025 EMBODIED CARBON ACTION PLAN (ECAP)

SMITHGROUP

GLASS CITY METROPARK

WOOD-FRAMED MARKETHALL REDUCED EMBODIED CARBON FOR STRUCTURE BY XX%

ADDRESSING THE CLIMATE EMERGENCY: OUR COMMITMENT

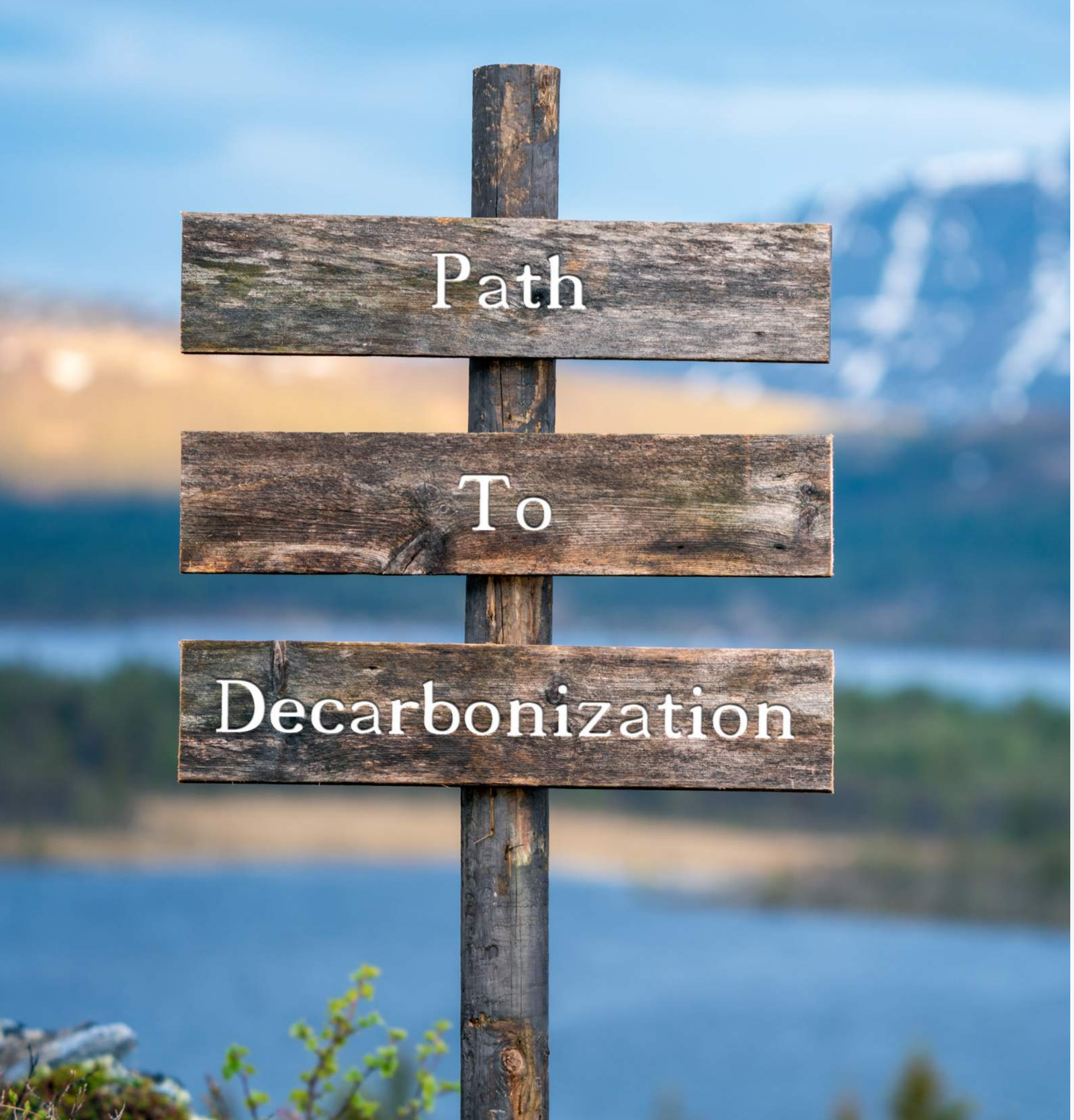
SmithGroup is committed to the creation of a carbon-free future. We hold ourselves accountable to the principle that our design and engineering must embrace conservation, maximize renewable energy, de-carbonize systems, adapt existing buildings and sites, incorporate low-embodied carbon materials and move beyond offsets as much as possible.

SmithGroup has been a leader in sustainable design since the term was first coined. As planners and designers of the built environment, we have a responsibility and an opportunity to mitigate and adapt to the worst impacts of climate change. In 2007, we adopted the 2030 Challenge committing to pursue progressive energy targets across our practice to achieve net-zero energy design by 2030. While we have made strides, we realize that 2030 is imminent and there is a deep need for increased progress and leadership to help us meet this critical timeframe.

We must rethink how we are addressing climate change because we are in the midst of an urgent and growing climate crisis. The adverse effects of an already altered climate continue to intensify—from unprecedented heat waves, droughts and wildfires to increased flooding, coastal erosion and habitat loss.

These shocks are having a growing impact on the communities we work with, economically, environmentally and socially. In addition to reducing carbon emissions, our design work must help our communities become more resilient to climate impacts.

While the climate crisis is enormous, the construction and operation of buildings and the built environment accounts for nearly 40% of global carbon emissions. The impact we can have as a firm and profession is tremendous. Designing a carbon-free and more resilient future will require leadership from every employee within our firm. SmithGroup is committed to rise to this challenge, leveraging our passion for innovation and our multi-disciplinary structure to advance climate mitigation and adaptation in all our work.



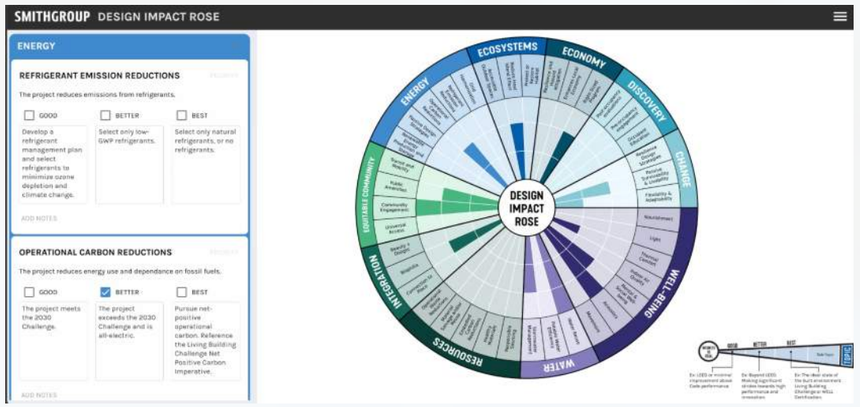
WHO WE ARE

We recognize that time is of the essence in protecting the planet and have formed a team of interdisciplinary experts to accelerate action

As longtime founders and supporters of the AIA 2030 Commitment, SmithGroup recently took the pledge to recognize that planning for 2030 was simply not enough In 2020 we announced our firm's commitment to move towards a zero-carbon future—embracing the MEP2040 and SE2050 challenges—ensuring all of our projects are adapted to the immediate impacts of climate change now and well into the future. A testament to our commitment, SmithGroup's **Integrated Multidisciplinary Performance Analytics & Climate-Impact Team (IMPACT)** is a national group of engineers, architects, economists, and planners who are passionately pursuing design excellence.

Our IMPACT team works as a unit to best address design challenges faced by the communities our clients' projects exist within. Our design impact rose helps us to find alignment with our clients and establish which areas each project should strive to achieve the highest level of performance before we begin the design process - this acts as guidance to our integrated project teams to ensure the most appropriate design concepts are applied.

SmithGroup's IMPACT members have been at the forefront of identifying how climate, equity, and next generation technologies need to come together, collaborating with all of our architectural, engineering, planning, and interior design disciplines.



EMBODIED CARBON

Our interdisciplinary experts come together as through an Embodied Carbon Task Force, coming together to tackle initiatives from discipline Focus Groups

Our **Embodied Carbon Task** Force brings together our Commitment Champions, Impact Team members, discipline representatives, and focus group stakeholders on a frequent bases to update on current efforts, challenges, and opportunities focused around embodied Carbon (EC). The Task Forces sets company-wide goals, identifies internal training needs, and seeks external opportunities to accelerate action.

Discipline Focus Groups form to address discipline-specific needs and foster deeper knowledge and experience as it relates to specific subject matter. These groups are organized into clusters of expertise according to functions, such as Structural, Interior Materials, MEP Whole Life Carbon Pilot, etc.

REFLECTIONS

We need to accelerate action

Our dedication to designing a carbon-free future that encompasses conservation, maximizing renewable energy, decarbonizing systems, adapting existing buildings are sites, incorporating low-carbon construction materials, and minimizing reliance on offsets. However, to address the urgent climate crisis we recognize we need to accelerate our efforts.

With 2030 rapidly approaching, incremental progress is not enough. To meet our commitment to AIA 2030, we are establishing a set of **Minimum Performance Requirements** for all our projects that incorporate targets for all our climate commitments.

To achieve this increasing literacy among all of our staff, enhancing the visibility of our progress towards climate goals, and facilitating action is crucial. We have created a **Sustainable Design Roadmap** to guide all of our projects and fully integrate sustainability and decarbonization into our design process. We have also enhanced our Project Finder tool for tracking project data that engages our entire project teams.

We have gathered numerous lessons learned and feedback regarding our process from conceptual design to performing Life Cycle Assessments (LCA's) - now is the time to develop **better tools and workflows** to share these processes to drive implementation.

Seeing promising results from "greening" our **concrete and steel specifications**, we are working to target all the materials we specify. We will prioritize specifications for the next biggest embodied carbon offenders - aluminum, glass, insulation, plastics, composites, asphalt, etc.

It's no secret that the best way to reduce embodied carbon is to build less new construction and re-use existing building assets. We will be focusing on **circularity**, strategizing with clients on our approach master planning and facility assessments to favor building less, while considering the future adaptability of new buildings and designing for deconstruction.

EDUCATION

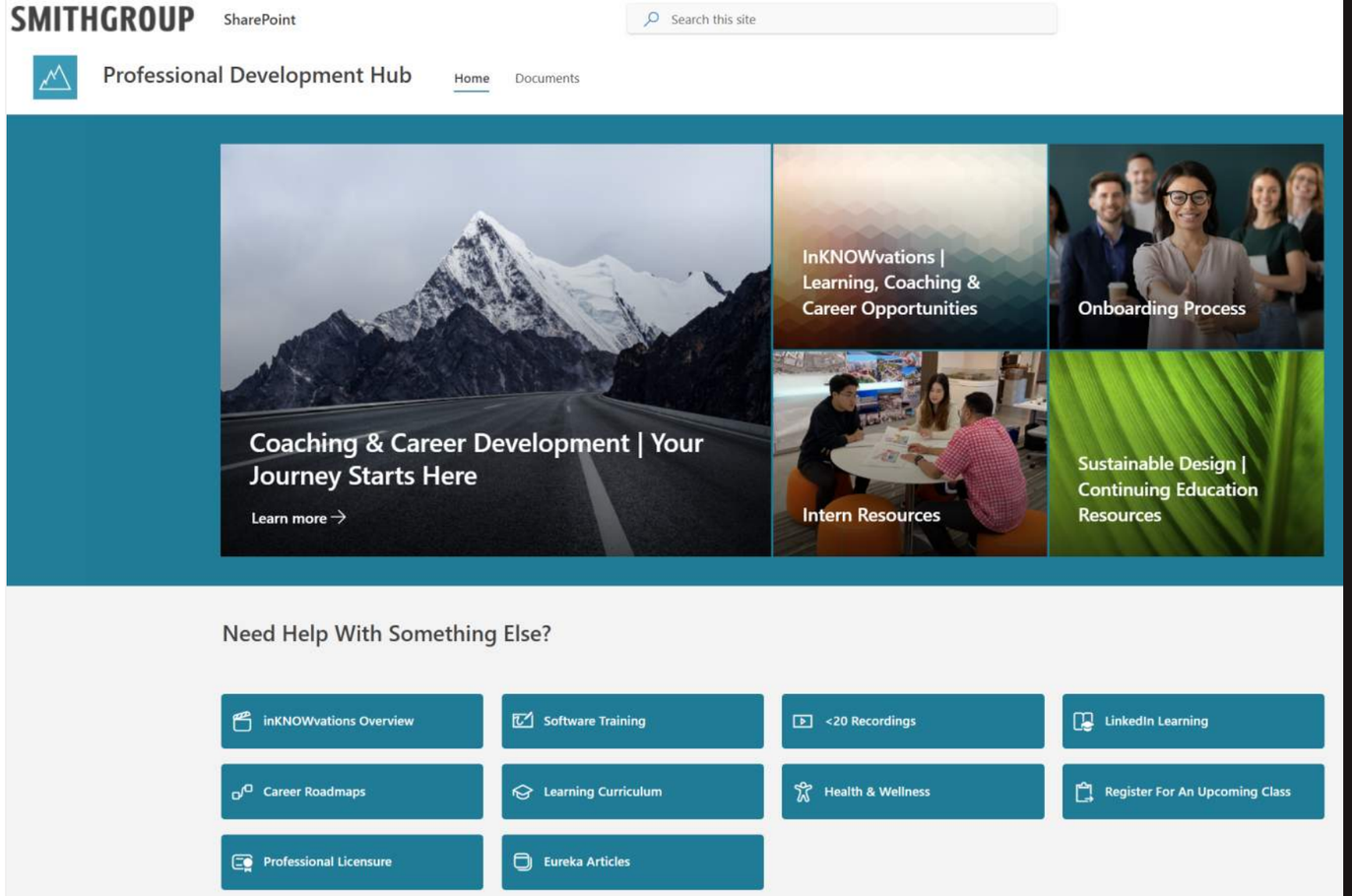
At SmithGroup, we are a learning organization driven by curiosity and rigor.

The SmithGroup core values are passion for design excellence, commitment to sustainability, fostering equity, relentless curiosity, active community leadership, and maintaining integrity in all our endeavors. These core values are deeply integrated into our staff education initiatives.

Our approach enables us to ground our fresh design solutions in evidence-based best practices, which is a key component of our promise to "Design a Better Future". We continuously make improvements to our work through standards, training, and knowledge sharing, ensuring that all teams have access to our latest thinking and expertise.

Educating our staff starts with onboarding by introducing them to our collaborative environment and project expectations. This process includes resource and process orientation, core skills training, and mindset/culture study material. We emphasize the importance of open and transparent communication, respect for people, and continuous improvement.

Sustainability and climate action is emphasized throughout our operations. as part of our commitment to a carbon-free future we educate our staff on the importance of considering embodied carbon when selecting materials and systems, favoring products that embrace the circular economy.



ONBOARDING & PROFESSIONAL DEVELOPMENT

SmithGroup has a thorough professional development on-boarding process that provides a consistent process for all employees that is tailored for all disciplines. Embodied Carbon 101 training is a required course for all structural new hires and orientation includes exposure to Embodied Carbon (EC) resources

INTERNAL EDUCATION

Our internal training resources include InKNOWvations, which provides peer-to-peer training on sustainable design practices, <20's, which are short, focused learning sessions, and . Additionally, we offer access to SE University and LinkedIn Learning and for a wide range of professional development courses.

RESEARCH

We encourage research is through initiatives like our Exploration Grant, which supports employees in self-directed study on various topics such as health equity and urbanism. Additionally, we foster a culture of innovation and thought leadership through informal discussions, internal design competitions, and partnerships with academic institutions.

ENGAGEMENT

We facilitate informal knowledge sharing through various means such as informal discussions, design charrettes, and collaborative spaces that encourage spontaneous interaction and learning. These take many forms (Sustainability Standups, Design@9, Design Slams, Campfire Chats, etc.) throughout and across all of our offices.

2024 EDUCATION ACTIVITIES

- IMPACT team, multi-disciplinary Embodied Carbon Task Force + multi-office Structural Embodied Carbon Focus Group
- Our Embodied Carbon 101 (EC 101) is accessible to all staff and is required for onboarding all new employees, onboarding includes introduction to efforts for designing to reduce Embodied Carbon
- Created additional EC resources available through Teams channels, Climate Central Hub, and SharePoint
- Presented on EC and our commitment to SE 2050 in regular sustainability conversations in several offices, including East region sustainability stand-ups and Midwest region brown bags.
- Two internal Exploration Grants related to building reuse and pathways to utilizing mass timber for inpatient healthcare
- Our <20 series includes dozens of short bursts of sustainability-focused sharing, this past year featured a session with our very own Kyle Ritchie who authored “Circular Economy for Dummies”
- Celebration of Earth Week in April included a week of local and national sustainability-focused events and training in all of our offices
- The theme “Our Design Futures” for SG’s 6th Annual Design Week in October focused on climate change, Sustainability, and resiliency
- SG engages in broader sustainability forums and initiatives including structural-focused efforts with the SEI Sustainability Committee, NCSEA Sustainability Committee, SE2050 Signatory events
- Participated in the SEI Towards Zero Carbon Workshop and Structural Engineering Sustainability Symposium
- SG founded the Structural Engineers Association of Michigan (SEAMi) Sustainability Committee

MORE TO COME IN 2025

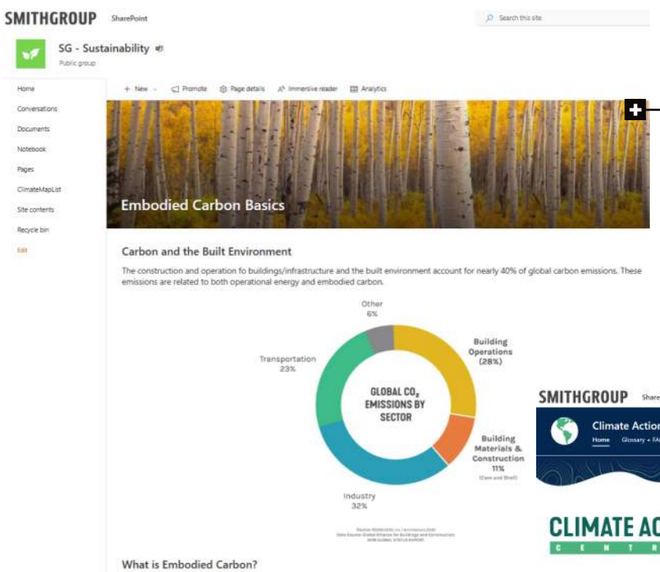
- Refresh of EC 101 and inKNOWvations courses for lowering embodied carbon of our designs
- Further development of additional EC resources
- Earth day to kick off an IMPACT team roadshow in every office to reinforce our climate action plan and commitments
- Earth week camp fire chat “We Started the Fire, How do We Fight it?” to share progress on our climate commitments and strategize immediate steps to reduce embodied carbon
- Update to our Climate Action Plan to include a multi-disciplinary Embodied Carbon Action Plan to engage all AEIP disciplines
- Participating on the SE2050 Signatory Summit Planning Committee and organizing SEAMi events
- Presenting exploration grant research at conferences, AEI Conference confirmed for April
- Publication of quarterly embodied carbon “Perspectives” on companies website and promoted through Social Media, first piece on reducing EC of concrete to be posted in April
- EC Bootcamp for all our structural engineers at May face-to-face meeting

LEADING THE DISCUSSION

SUSTAINABILITY STAND-UPS

Presented by Andrea Reynolds

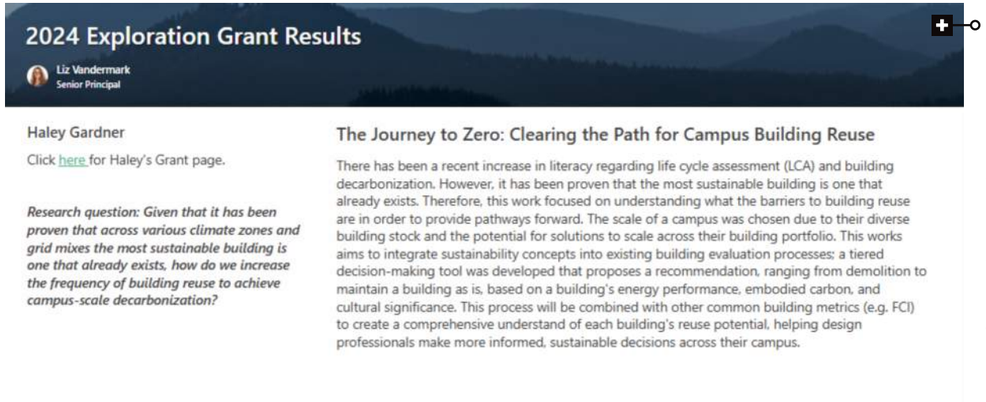
Each of our locations have regular gatherings to host conversations related to climate action, sustainability, and resiliency. A key component has been to share our commitments and stimulate discussions to improve our design process. During Earth Week in April 2026 we will hosting a campfire chat to dive deeper into Embodied Carbon.



INTERNAL RESOURCES

Curated by IMPACT, Embodied Carbon Task Force and Structural EC Focus Group

Educational resources, links, workflows, and how-to's related to Embodied Carbon and sustainability are collected in resource libraries available and on our Climate Action Central, through our SG-Sustainability Team, and on a collection of SharePoint pages.



SMITHGROUP-WIDE EVENTS

Annual celebrations for Earth Week in April as well as Design week provide several opportunities for staff to engage on topics related to the the future of design and climate impact. 2024's Design Week included a progressive exercise that tapped into our collective discourse to explore how the AEC industry and SG might evolve over the next two decades.

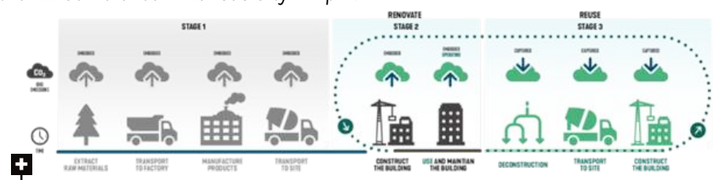
EXPLORATION GRANTS

The Journey to Zero: Clearing the Path for Campus Building Reuse, performed by Haley Gardner; Pathway to Mass Timber Structures for Inpatient Healthcare performed by Lily Rodriguez and John Rushing

SmithGroup's Exploration Grant Program was established in 2017 to open the door to critical inquiry, reflection, and discovery through research. The goal of these microgrants is to cultivate the use of scientific inquiry to advance design knowledge and answer critical questions of design practice to better the built environment. Each grant provides funding and guidance to complete an independent study developed by our staff. The program includes research training, one-on-one coaching and regular opportunities to share progress throughout the grant process.

Two of the 2024 grants explored opportunities to promote embodied carbon reduction through building reuse and the using renewable structural materials. Past years exploration grants researched topics related to embodied carbon, including Low Carbon Concrete, Road to Zero Carbon on Site Projects, and Designing for Mass Timber

Lily and John will be presenting their research at conferences in 2025, including at the AEI Conference in Kansas City in April.

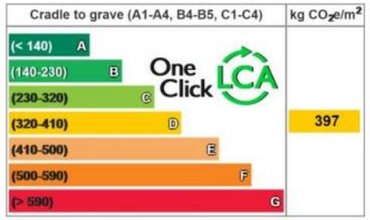


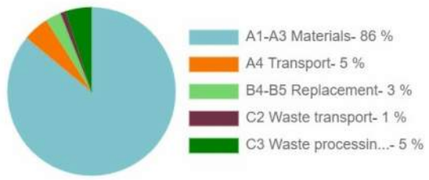
CIRCULAR ECONOMY 101 <20

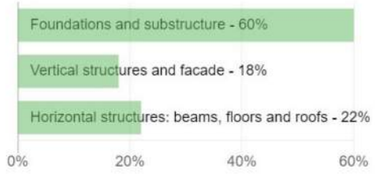
Presented by Kyle Ritchie

This session explored a transformative approach to architecture, engineering, and design utilizing circular economy principles: eliminating waste, extending building use, and regenerative natural systems. Buildings should be viewed as material investments for clients, akin to stock market assets, rather than mere overhead costs. This perspective recognizes that building materials retain their value over time, even if the structure no longer serves its original purpose. Much like stock market assets, these materials can appreciate in value and be reintegrated into the larger construction market through reuse, repurposing, remanufacturing and resale, rather than be destined for the landfill. To support this, it is crucial that the buildings we design today prioritize the use of existing materials available in the market, rather than sourcing new materials from virgin resources. Designers should focus on creating long-term value for clients by utilizing durable materials and designing adaptable spaces that can be deconstructed, rather than demolished.

Kyle will continuing to research design approaches for circular economy, exploring how options for projects, and applying for grants to help fund his research.



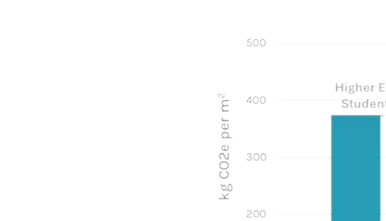




BASE BUILDING

VS.

PROPOSED BUILDING

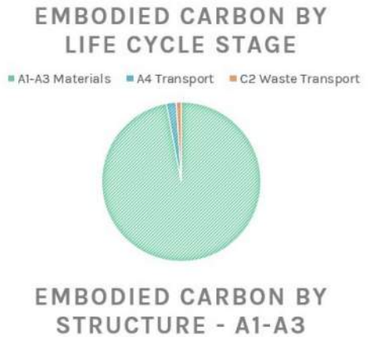


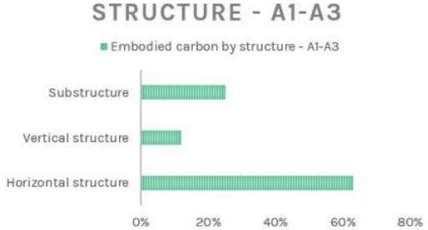
2024 REPORTING ACTIVITIES

- Updates to submitted projects and more projects were submitted to the SE2050 database
- LCA's being performed for projects across all regions, utilizing the same process, software, and reporting tools
- Work sessions during LCA's to share ideas, lessons learned, create workflows, and identify modifications to BIM modeling to streamline LCA's
- Expansion of internal Project Finder database to incorporate project information for all disciplines and commitment reporting requirements
- Performed comparisons of projects with baselines and comparisons of early project designs to completed construction

MORE TO COME IN 2025

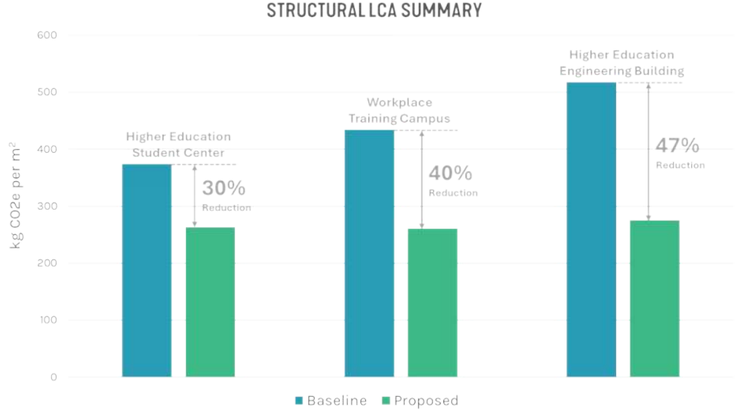
- Intend to perform LCA and submit data for all new projects
- Rollout of Minimum Performance Requirements (MPR) for all projects that will necessitate LCA's for all new build and structural renovation projects
- Streamline LCA modeling, project documentation, and, reporting to minimize duplication of efforts and maximize understanding of carbon impacts on our projects
- Documentation of LCA processes and tools for early design and documentation of completed work to increase literacy across all structural engineers
- Research and identify best practices for shoebox modeling and conceptual design to impact projects early where impact on EC reduction is the greatest





From Baseline to As-built, we have achieved 47% of reduction in embodied carbon!

TARGET MAXIMUM GWP AND CEMENT CONTENT		
NOTES: 1. TARGETS ARE A WEIGHTED AVERAGE BY VOLUME.		
COMPRESSIVE STRENGTH OF CONCRETE, fc (PSI)	TARGET MAX GWP (kg CO2e / CUBIC YARD)	TARGET MAX PORTLAND CEMENT CONTENT (lbs / CU YD)
3000	160	315
4000	188	380
4500	206	420
5000	223	461



REPORTING

Data is essential to making informed decisions, setting important benchmarks for reduction targets, and achieving our collective embodied carbon reduction goals by 2050

To effectively measure and report embodied carbon, we utilize several specialized tools and methodologies. We conduct high-level analysis during material selection to understand the order of magnitude impact various materials have as it relates to embodied carbon. We then minimize embodied carbon in our systems and materials selections by considering multiple environmental attributes from a life-cycle perspective. This includes evaluating the extraction of raw materials, manufacturing, construction, operations, and end-of-life stages to ensure materials are non-toxic, regionally sourced, have low embodied energy, high durability, and are suitable for the project's unique setting.

We use tools like Tally, EC3, and One Click LCA, integrated into our BIM workflow, to compare the life-cycle embodied carbon of different materials and systems. For example, strategies to reduce the embodied carbon of concrete, such as specifying high-strength concrete mixes, incorporating supplementary cementitious materials like fly ash and slag, and using CarbonCure technology, are explored to significantly impact the building's carbon footprint.

Additionally, we require that every project at SmithGroup includes at least 20 products with Environmental Product Declarations (EPDs), Health Product Declarations (HPDs), Declare labels, or Cradle-to-Cradle certifications. We also specify low-emitting VOCs for field-applied paints, coatings, adhesives, and sealants, and select hard surface flooring and carpeting that meet specific environmental certifications 2. This comprehensive approach ensures that we measure and reduce the embodied carbon of our projects effectively.

REDUCTION

Our approach to reducing embodied is through careful selection of structural systems and materials, considering multiple environmental attributes and using a life-cycle perspective

Our design process focuses on reducing embodied carbon starting from the programming phase. Our integrated teams right-size buildings and envisioning multi-functional spaces to maximize space utilization and efficiency while providing future flexibility. Material and system selection considers multiple environmental attributes such as low-embodied energy, high durability, and regional procurement. Our sustainability workflows and integrated design sprints prioritize carbon reductions throughout the design process.

We aim to achieve a 25% reduction below CLF benchmarks for the structural systems we design. In projects we have measured, we have exceeded this target, measuring an average of more than 40% below benchmarks. Our new minimum performance requirements mandate LCA's on all projects, providing data to set new even more ambitious reduction targets. To achieve these targets, we have updated our master specifications to lower the carbon footprint of our concrete by 20%-40%, require higher recycled content for steel, and incorporate sustainably harvested biogenic materials.

2024 REDUCTION ACTIVITIES

- Performed a comparitive analysis to determine GWP for projects are +40% below the 2017 CLF Benchmark Median Values
- Developed an Overall Sustainability Roadmap that incorporates Embodied Carbon into our design process
- Implemented strategies to consider EC when selecting structural materials and determining framing configurations
- Collaborated with concrete contractors on multiple projects to educate and clarify intent, while confirming specification updates are clear and achievable
- Finalized Concrete Master Specifications updates and updated the most commonly used civil and landscape concrete specifications
- Established new documentation procedures for concrete mixes to more clearly convey GWP targets
- Incorporated requirements for EPD's on projects and set targets for recycled content for steel

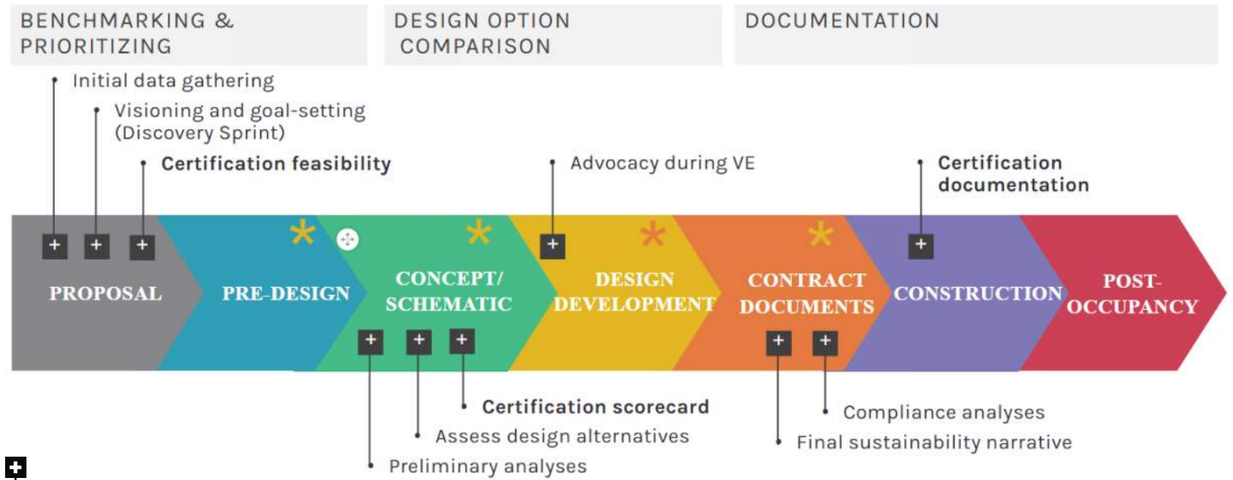
MORE TO COME IN 2025

- Refine EC reduction targets for projects based on LCA data and a company-wide, multi-disciplinary ECAP and EC reduction targets
- Share tools and guidance for considering EC during conceptual design to all structural engineers at May face-to-face meeting
- EC Task force to establish a multi-disciplinary specification focus group to incorporate updates in sections across all disciplines, prioritizing materials with the greatest impact
- Perform shoebox analysis and/or preliminary LCA's in early design phases and compare to LCA's for final designs to confirm achievement of EC targets
- Explore opportunities to utilize circular economy principals - considering re-use and designing for future deconstruction, particularly in performing facility condition assessments and masterplanning

UNIVERSITY OF LOUISVILLE, SCHOOL OF ENGINEERING

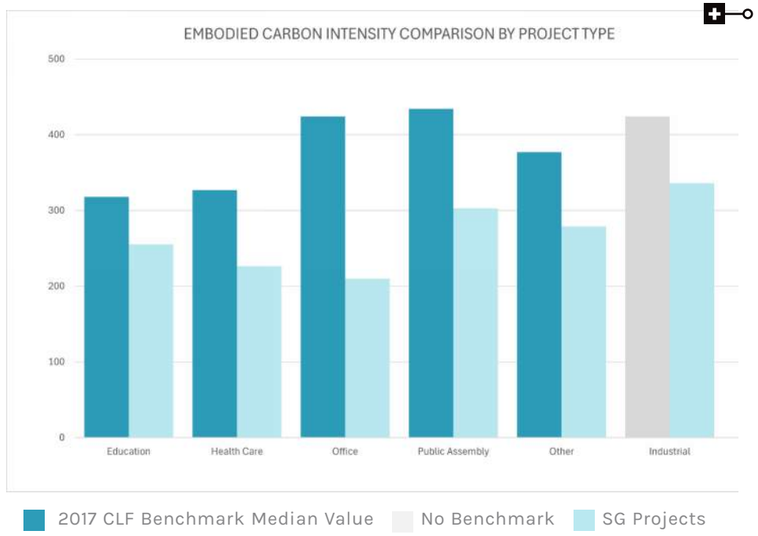
NEW GREEN CONCRETE SPECIFICATION RESULTED IN A +45% REDUCTION IN GWP FOR THE STRUCTURAL SYSTEMS

GETTING TO ZERO



SUSTAINABLE DESIGN ROADMAP FOR ALL PROJECTS

Our **Sustainable Design Roadmap** is a comprehensive workflow that leads to an integrated, cost-effective, sustainable design that meets our clients' and SmithGroup's goals. While every project is unique, often with aggressive schedules and challenges, this roadmap provides a starting point that considers embodied carbon throughout - from **shoebox models** to select materials in conceptual design to LCA's on the final design & lessons learned to apply to future projects.

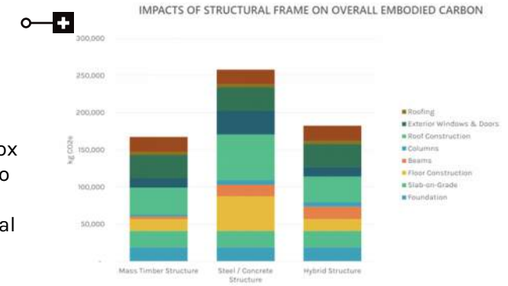


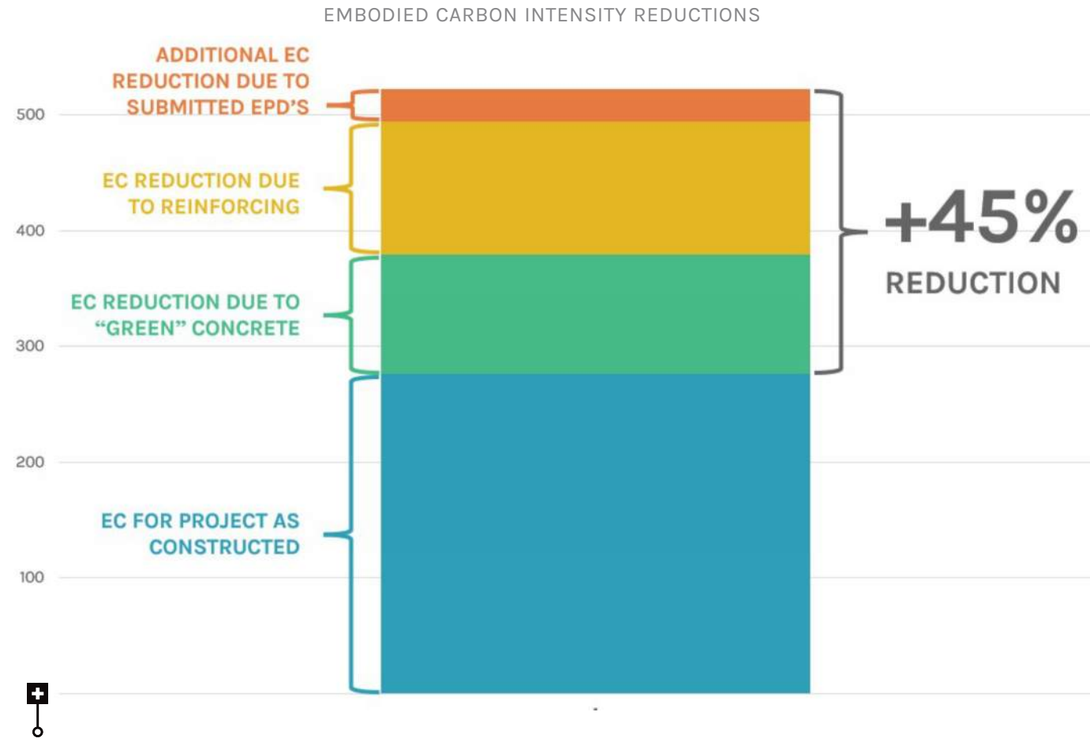
EMBODIED CARBON INTENSITY COMPARISON

SmithGroup is actively working to establish Embodied Carbon (EC) reduction targets for structural systems. Our initial goal to design systems that a achieve a 15% reduction below the 2017 CLF Benchmark Median Value. An analysis of the projects reported to SE2050 indicates all reported projects are below this target, with an average reduction of more than 40% from the CLF Benchmark. Projects that considered EC from the outset have seen the largest reductions. Our goal is to measure the carbon intensity on all projects in effort to establish more ambitious targets.

SHOEBOX MODELING

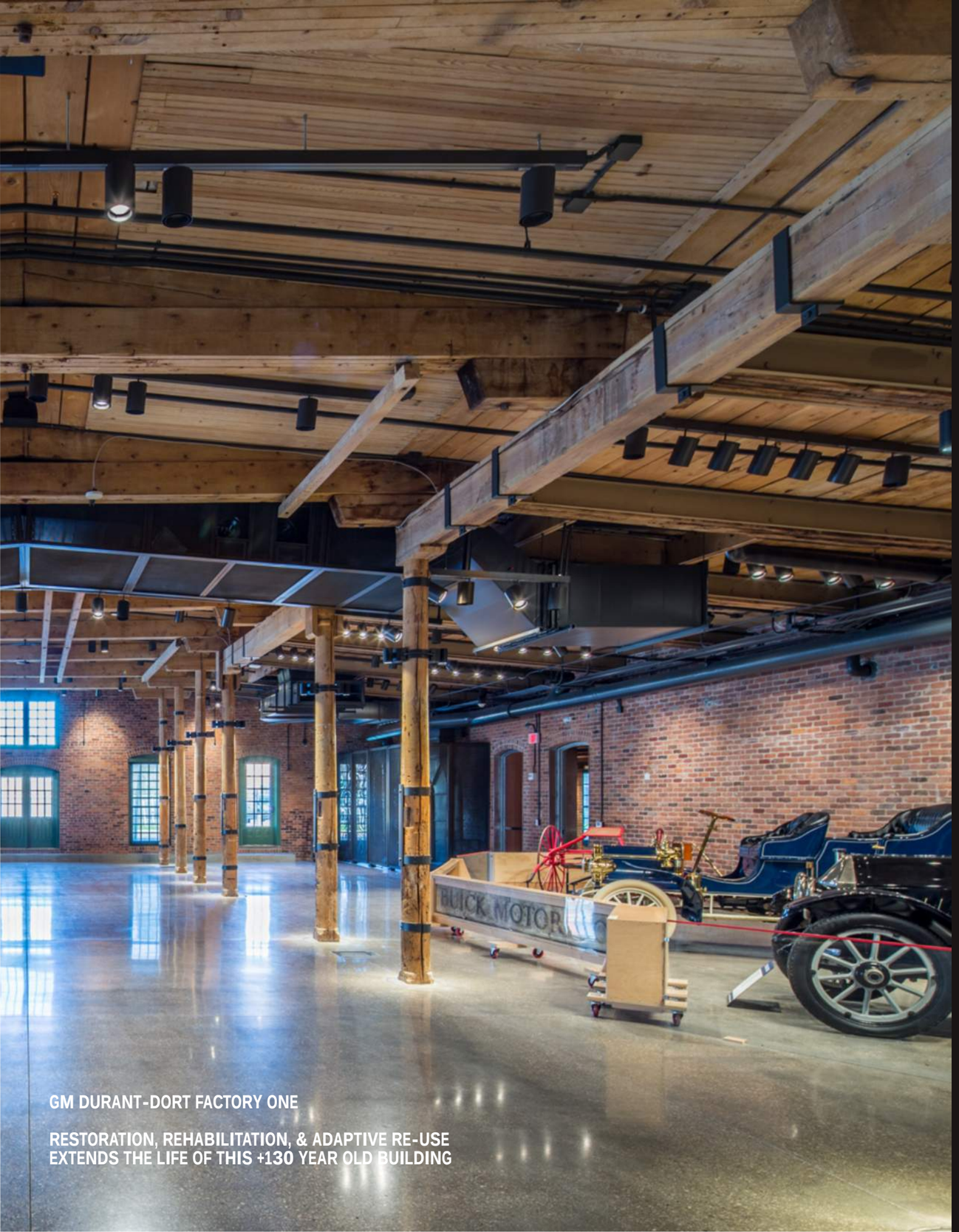
Our design process includes Discovery Sprints which are multi-step, integrated design charrettes with the aim of creating sustainable and resilient solutions based on the ten principals of the AIA Framework for Design Excellence. Shoebox models are integrated into our collaborative design process to set targets during programming and early design and then leveraged to inform subsequent design decisions and material selections to understand impacts.





CONCRETE SPECIFICATION UPDATES

2024 saw the completion of a major effort to refine updates to our most frequently used master concrete specifications: 033000 Cast-in-Place Concrete (civil), 321313 Concrete Paving (civil), and 321316 Concrete Paving (landscape). We were also able to measure the impact of these specification changes on projects being constructed. This graph represents a series of LCA's that were performed on a concrete building to compare the effects of the changes to requiring +90% recycled content and setting targets for reducing the EC of the concrete mix designs. A final LCA was done based on EPD's provided by the contractor that demonstrated even further EC reductions. To further assist our teams understand the specifications changes we have created SharePoint resources and InKNOWvations courses.



GM DURANT-DORT FACTORY ONE

RESTORATION, REHABILITATION, & ADAPTIVE RE-USE
EXTENDS THE LIFE OF THIS +130 YEAR OLD BUILDING

2024 ADVOCACY ACTIVITIES

- Our commitment to Climate Initiatives is posted on our external website, as well as various Perspectives related to Climate Action
- SG engages in broader sustainability forums and initiatives including structural-focused efforts with the SEI Sustainability Committee, NCSEA Sustainability Committee, SE2050 Signatory events
- Participated in the SEI Towards Zero Carbon Workshop and Structural Engineering Sustainability Symposium
- SG presented EC 101 to the membership of the Structural Engineers Association of Michigan (SEAMi) and founded a new Sustainability Committee
- SG provided input to increase EC and biogenic material programming at the 2024 SEAMi Annual Conference to increase literacy in Michigan, including a tour of a adaptive re-use of a building with an addition that utilizes low embodied carbon materials
- Developed a series of A3 for the utilization of biogenic, mass timber systems as an informed sustainable decision for health care and institutional projects, including an A3 to assist in client conversations
- Developed concrete specification guidance that our architectural teams can utilize with civil and structural consultants to advocate for greener concrete on all SG projects

MORE TO COME IN 2025

- Refresh of our Climate Action Statement to be posted on our external website
- Participating with the planning for the SE2050 Signatory Summit at SEI's upcoming *Towards Zero Carbon 2025: Summit & Symposium*
- SmithGroup structural engineers continue to chair the SEAMi Sustainability committee and organizing SEAMi events, including pushing for presentation on ACI's new 323-24 publication on Low-Carbon Concrete at the 2025 Annual Statewide Annual Conference
- Presenting exploration grant research at conferences, AEI Conference confirmed for April, awaiting abstract approval at the Health Care Design Conference + Expo in October
- Publication of quarterly embodied carbon "Perspectives" on companies website and promoted through Social Media, first piece on reducing EC of concrete to be posted in April
- Awaiting response for grants to explore alternative concrete materials that we have partnered with learning institutions and clients
- Pursuing additional external grants to continue our research into utilizing biogenic materials in our more complicated health care and science & technology projects
- Advocate the commitments and Minimum Performance Requirements on all of our projects

ADVOCACY

At SmithGroup, we understand that true change requires industry-wide and cross-industry wide adoption.

We advocate for carbon reductions with our clients by leveraging advanced computational design solutions and developing decision-making tools that integrate carbon into broader planning processes Additionally, we engage in collaborative efforts with stakeholders to integrate sustainability into operations, curriculum, and culture, and partner with local resources to support community resiliency and optimize performance through innovative solutions and iterative design.

We advocate for sustainability and embodied carbon reductions externally through active participation in major industry programs and professional associations. We are committed to and involved in initiatives such as the AIA 2030 Challenge, SE 2050, MEP 2040, ASLA CAP, and the Interior Design Pledge for Positive Impact, among others, to advance climate mitigation and adaptation. We are also members and sponsors of organizations like the US Green Building Council, the International Living Future Institute, the Healthy Building Network, and the Health Product Declaration Collaborative. By embedding sustainable design leadership in each of our disciplines and practices, we ensure that sustainability is a core focus across all our projects and interactions.

Our structural engineers are engaged with SEI and NCSEA Sustainability Committees and the Great Lakes Mass Timber Collaborative and Michigan Mass Timber Community of Practice. In 2024 we founded a Sustainability Committee with the Structural Engineering Association of Michigan (SEAMi) to raise awareness.

COMMUNITY & RESILIENCE

Recognizing our critical position at the intersection of design, policy, economics, ecology, and society, we understand the importance of merging overarching strategies with the tactics needed to bring them to life.

Climate action and resiliency planning is no longer a side conversation, but a major driver for our quality of life. Across the world, cities and institutions are reevaluating their design and policy decisions to ensure that what is done today sufficiently protects their constituency and has a positive impact for years to come. By evaluating our impact and planning for our future, we can better position ourselves for success. Through place-based interventions, our team thinks across scales and works with the community to identify solutions rooted not just in infrastructure but in institutional and cultural practices.

Design a Better Future

SMITHGROUP

www.smithgroup.com