



SOM



Embodied Carbon Action Plan

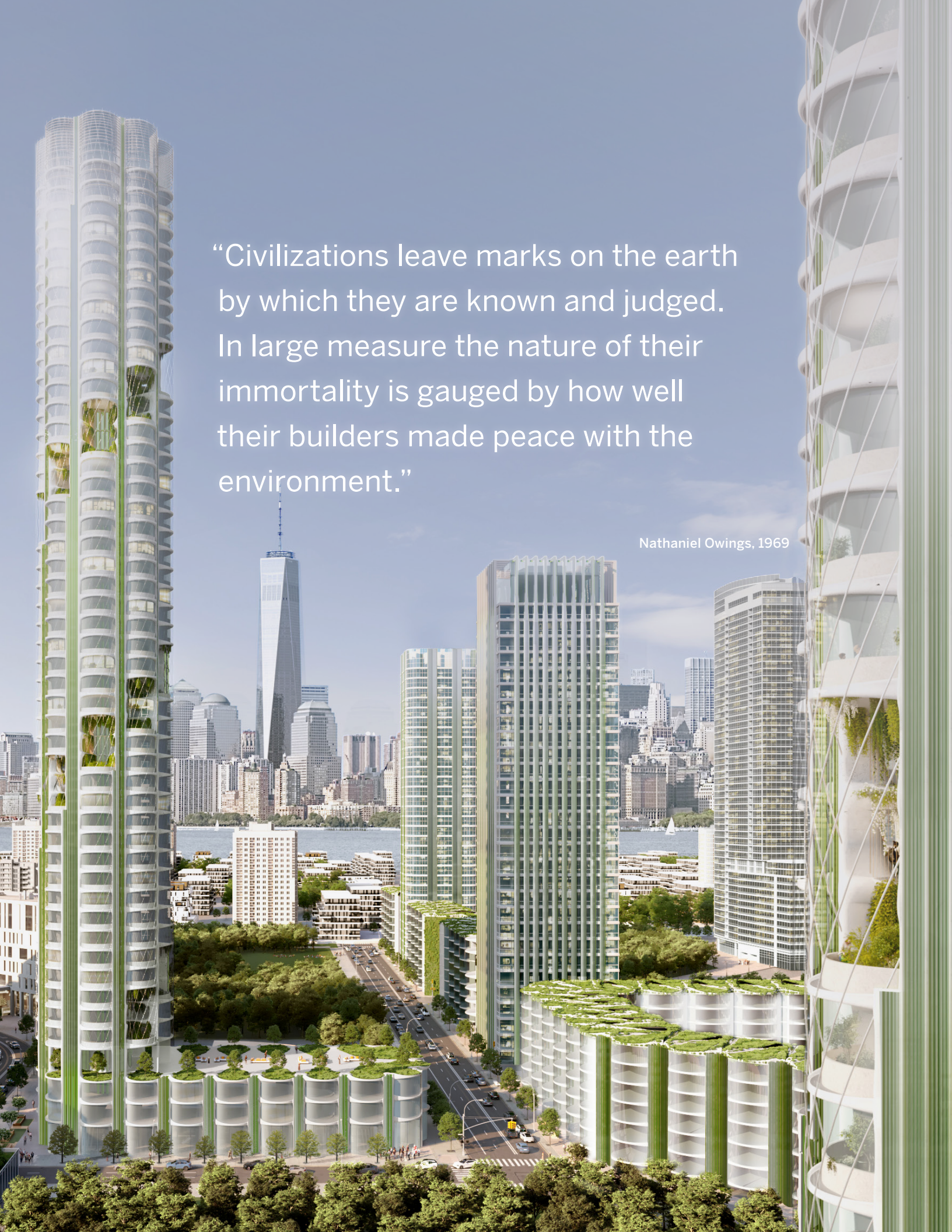
March 27, 2025

We're Rising to the Challenge

Our commitment to sustainability

Structural engineers have an important role to play in mitigating climate change by reducing the impact the built environment has on our planet. SOM is proud to have joined leading engineers as a member of the SE 2050 Commitment since 2020, leveraging our deep breadth of expertise in research and design to bring more sustainable building systems, materials, and technologies to the forefront. Working collaboratively, we're playing our part to drive the transition to a net zero carbon built environment.



An architectural rendering of a futuristic, sustainable city. The scene is dominated by tall, modern skyscrapers with unique designs, including one with a curved, ribbed facade and another with a grid-like pattern. These buildings are integrated with lush greenery, featuring vertical gardens and green roofs. In the foreground, a street with cars and pedestrians is visible, flanked by trees and smaller green structures. The background shows a dense urban skyline with various skyscrapers, including the Freedom Tower, under a clear blue sky.

“Civilizations leave marks on the earth
by which they are known and judged.
In large measure the nature of their
immortality is gauged by how well
their builders made peace with the
environment.”

Nathaniel Owings, 1969

Our Commitment

5/26/2021
PRESS RELEASE

SOM Joins SE2050 Commitment to Carbon Neutral Structural Systems



**STRUCTURAL
ENGINEERING
INSTITUTE**

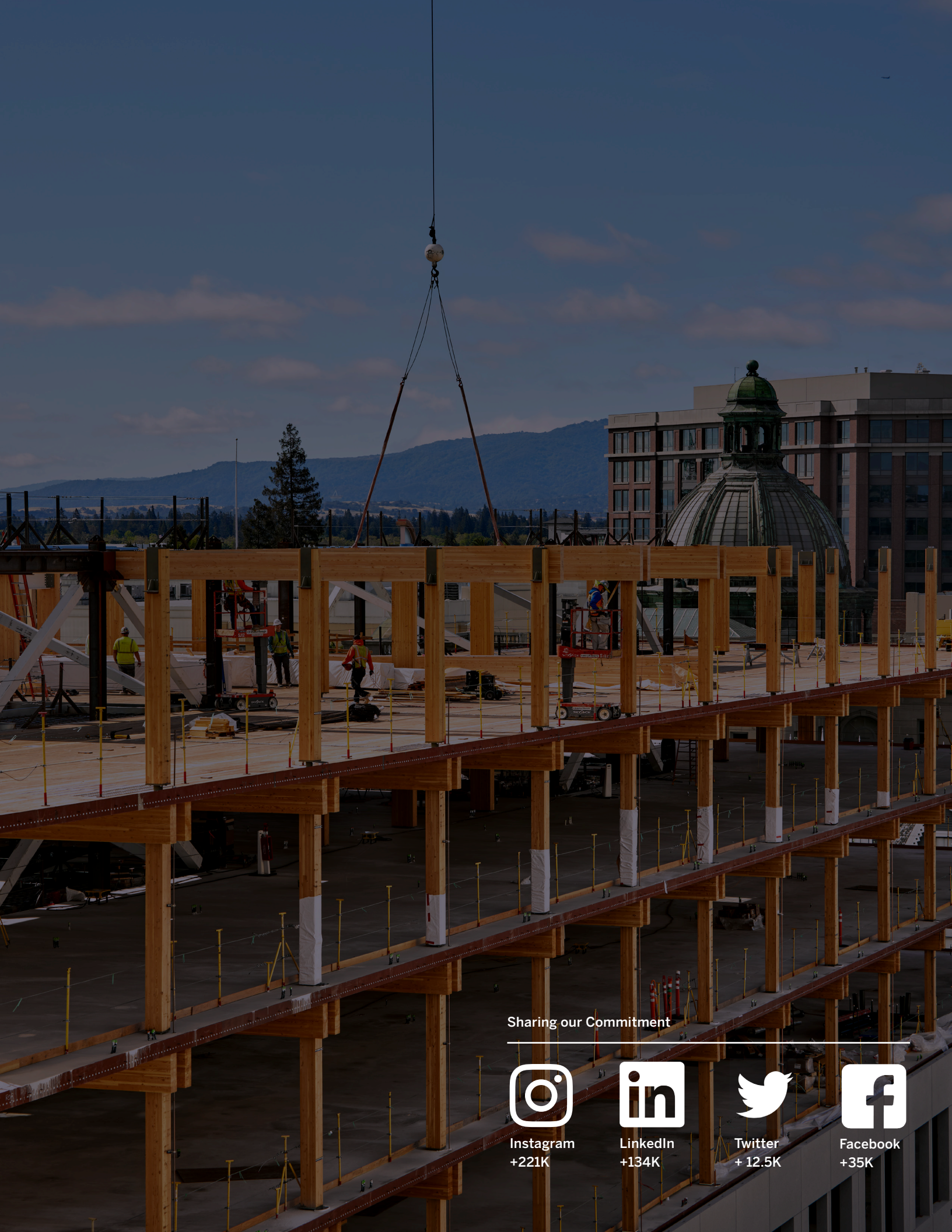


SOM has joined leading structural engineering firms in signing the Structural Engineering Institute's (SEI) Structural Engineers 2050 (SE2050) Commitment. The initiative sets measurable goals to eliminate embodied carbon in structural systems by 2050. SOM is among the first architecture and engineering firms to commit to achieving substantive embodied carbon reductions within structural systems.

Making the SE2050 commitment further advances SOM's response to the most urgent challenge of our time: protecting the Earth's resources and leading the transition to a zero-carbon economy.

Strategies to reach net-zero embodied carbon include reducing and eliminating emissions from extracting, manufacturing, and transporting construction materials, all of which contribute immensely to global warming. The SE2050 program provides engineers with a platform to play an integral role in carbon reduction. The SE2050 committee will be sharing professional resources and educational opportunities to benchmark embodied carbon metrics, set targets, and track progress for firms that pledge to the program.

SE2050 adds to the list of climate action commitments that SOM has already made, including the AIA 2030 Commitment, the Architecture 2030 China Accord, and World Green Building Council Bringing Embodied Carbon Upfront.



Sharing our Commitment



Instagram
+221K



LinkedIn
+134K



Twitter
+ 12.5K



Facebook
+35K

SOM SE2050

March 27, 2025

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Introduction

Quick Project Facts

85% Less Embodied Carbon

4% Cost Savings

Measured in the Life Cycle Analysis

- Optimized timber material volume
- Reduced piece count
- Reduced steel connections
- Reduced construction time
- Reduced floor-to-floor height



San Mateo County Office Building 3

The COB3 building will redefine the San Mateo County Government Center with an iconic, forward looking design that reflects the values of the community. With a mass timber/CLT structural system, ultra-low carbon footprint, and net zero energy goal - the design will set a new standard for a sustainable, generational, civic building beyond the Bay Area.

Skidmore, Owings & Merrill

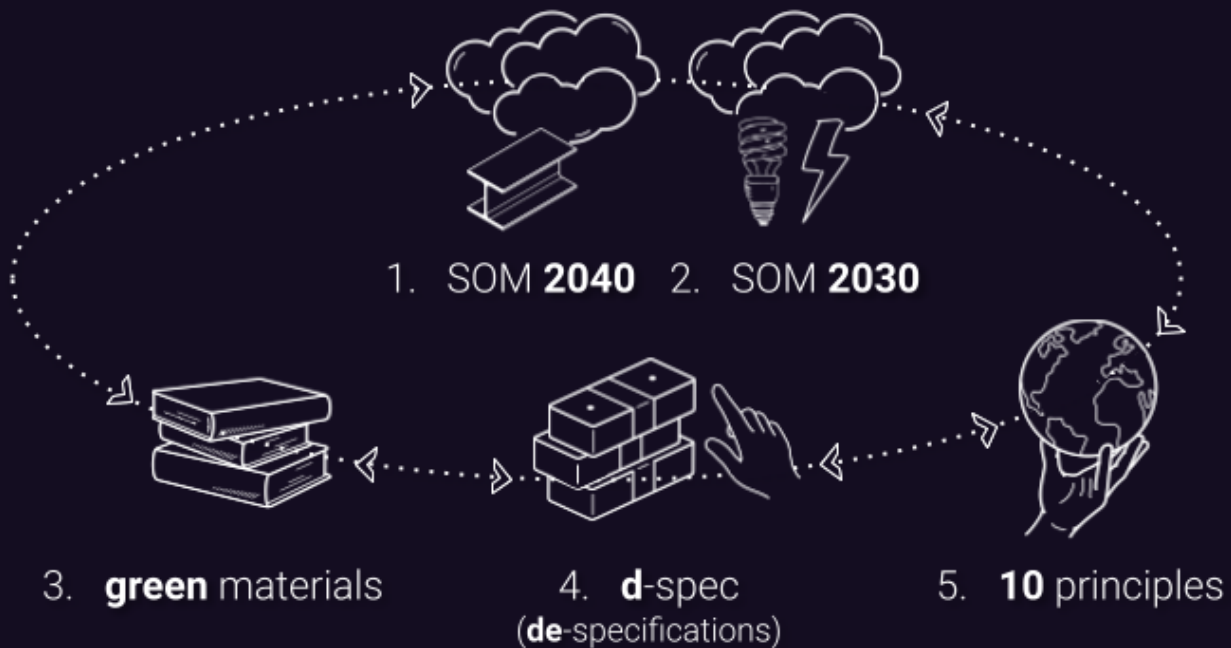
We are driven to answer the most urgent challenge of our time—to protect the Earth’s resources and support the transition to a zero-carbon economy. We must take responsibility, individually and collectively, for the future of our planet. As architects, engineers, and planners, we are positioned to lead the charge by shaping buildings and cities to advance sustainable development.



SOM Climate Action Group

A collective of architects, designers, engineers and planners shaping a better future for our planet, by combating climate change and accelerating our actions for a sustainable low carbon future.

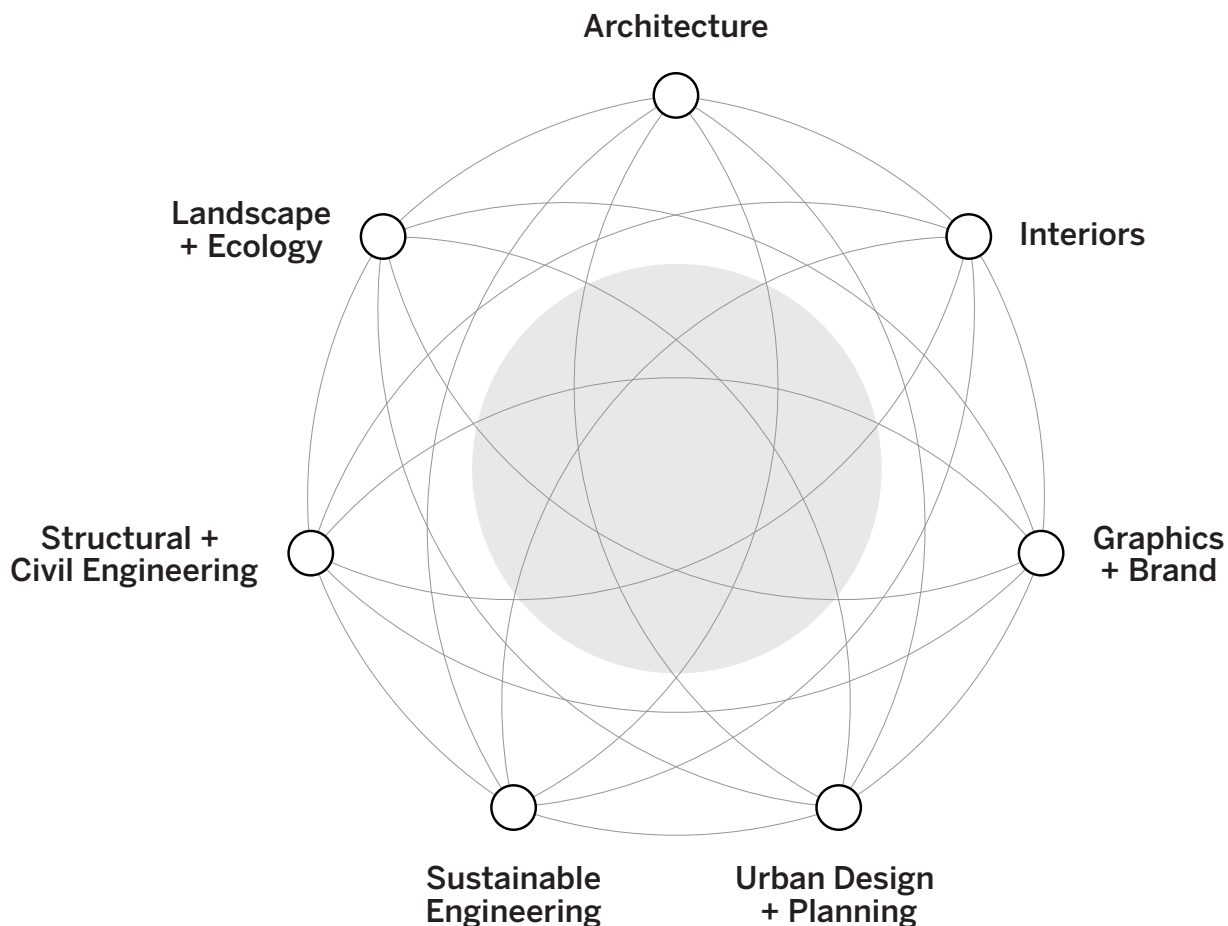
through
5 interconnected
initiatives



- 1. SOM 2040:** Commitment to net zero embodied carbon in the designs of our wider portfolio by the year 2040
- 2. SOM 2030:** Commitment to net zero operational carbon in our designs by the year 2030
- 3. Green Materials:** Commitment to investing time and resources to the pursuit of new sustainable building materials
- 4. D-Spec:** Commitment on improving our sustainable performance from a materials and construction standpoint
- 5. 10 Principles:** Underpinned by the UN Sustainable Development Goals for 2030, our design principles for sustainability and wellbeing (see page 14 for more details)

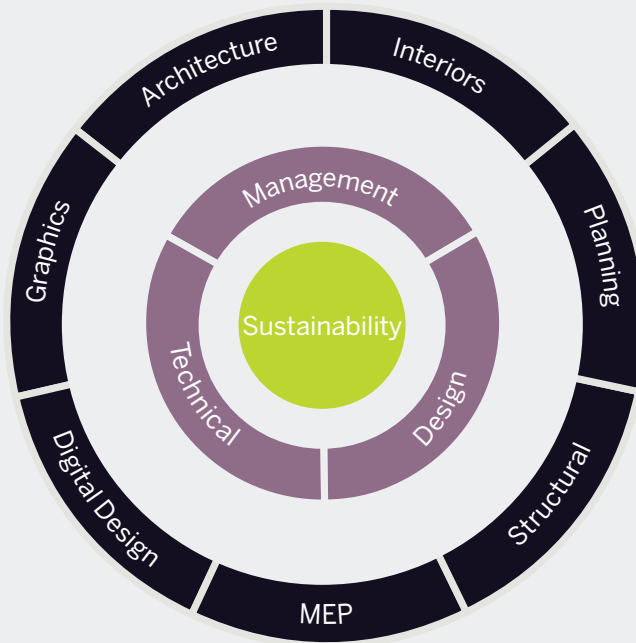
A Holistic Approach

As an integrated design practice, SOM is committed to evaluating and improving on embodied carbon performance not only across the firm's structural design group, but within the architectural, interior, urban planning and MEP design studios. Through this integrated approach we leverage our embodied carbon calculation methodology and reduction strategies across all disciplines and work collaboratively to further a common goal of net embodied carbon reduction in the built environment.



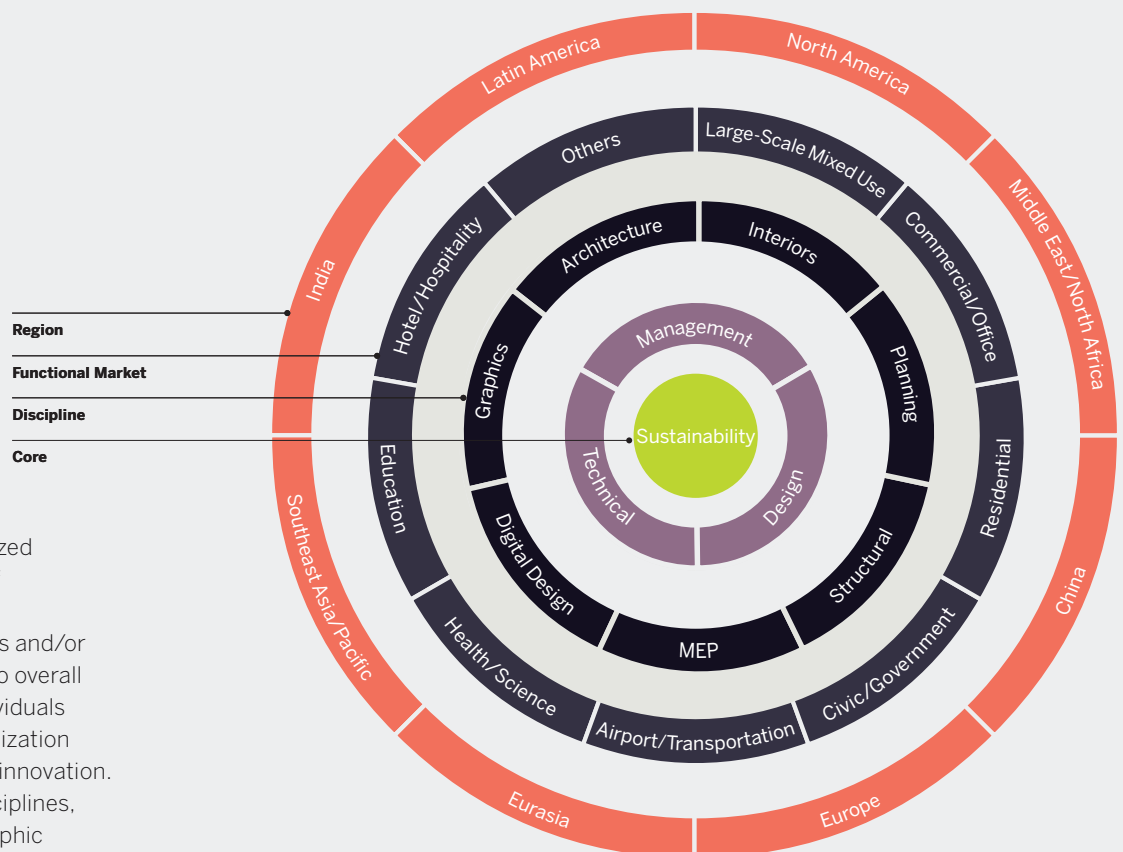
21st Century Staff Structure

Disciplines and Talent Accessible Firmwide



SOM's current structure is based upon the assembly of the best available firmwide international talent with specific functional expertise applied to highly program-driven projects. Enabled by advances in computational systems, digital communications and a "one-firm" partnership culture, this structure provides depth in specialist expertise; and breadth in intellectual cross-fertilization across diverse project typologies and geographies. The firm's core values in design, technical and management are applied to each discipline, firmwide, to promote consistent quality. The visual manifestation of the firm's overall design ethos, as established by the partners, is an important measure of the level of a project's success.

21st Century Project Organization

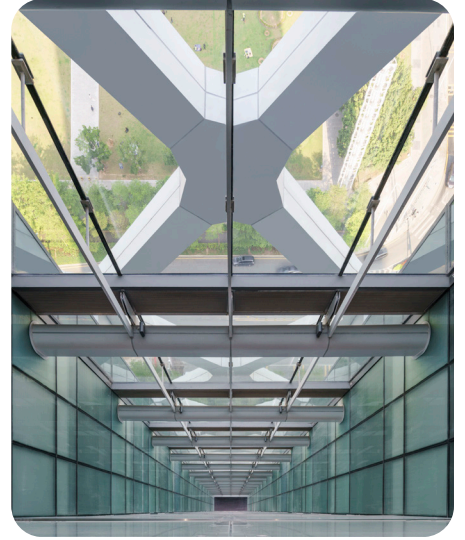


Each project is organized around a core team of Design, Technical and Management directors and/or partners. In addition to overall leadership, these individuals encourage cross-fertilization and inter-disciplinary innovation. They work across disciplines, functional and geographic markets.

Our 10 Design Principles

SOM is committed to developing sustainable built environments, and it recognizes the limitations of our planet's collective resources. Grounded in building and planning science, SOM's integrated environmental design approach is embedded in projects through rational and informed design decisions. Through research, analysis and innovation, we aim to create built environments that prioritize the wellbeing of our planet and people.





10 Design Principles for Sustainability and Wellbeing



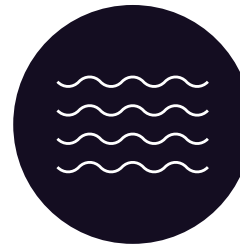
ECOLOGY
Leverage and Protect
Nature



ECONOMY + EQUITY
Provide Low Carbon
Urbanism for All



ENERGY + CARBON
Design and Deliver
Net Zero Carbon Built
Environments



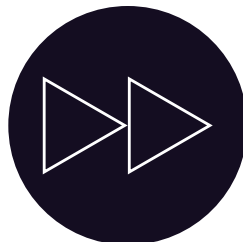
WATER
Value Every Drop



RESILIENCY
Adapt for Climate
Change



LIVABILITY + WELLBEING
Design Places where
People Thrive



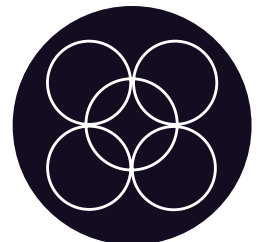
MOBILITY
Promote Sustainable
Connectivity



MATERIALS + RESOURCES
Specify Responsibly and
Prioritize Efficiency



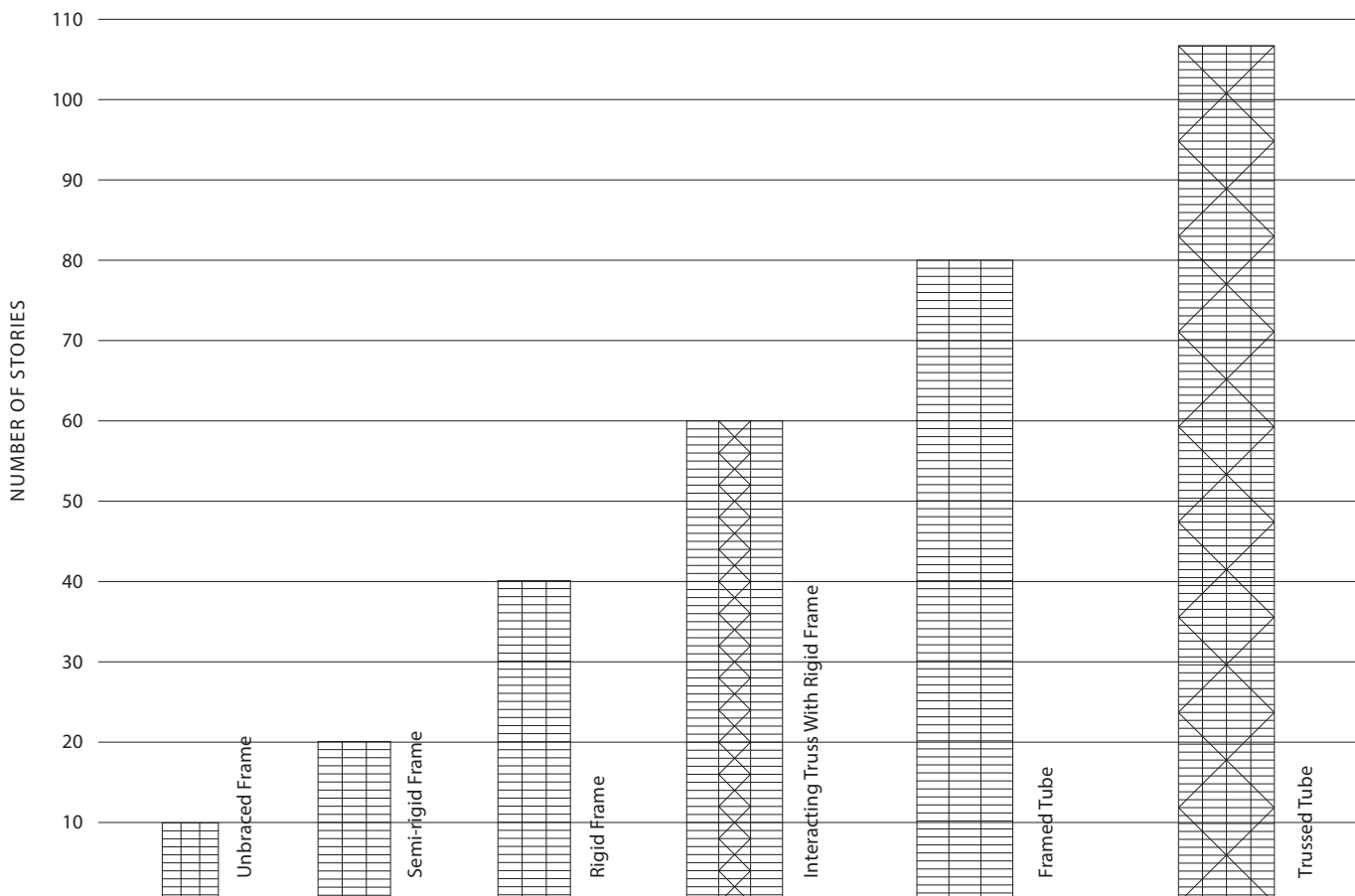
WASTE
Do more with Less



HERITAGE + IDENTITY
Cultivate Authentic
Connections

Legacy of Structural Sustainability

Structural optimization has been a core means by which SOM has achieved sustainable buildings. This is seen in the pioneering work of Fazlur Khan in the 1960s and 1970s. The braced tube system of 875 North Michigan Avenue (formerly John Hancock Center) and the bundled tube system of the Willis Tower (formerly Sears Tower) allowed incredible heights to be reached with remarkable material efficiency.





A historic collaboration between architects and structural engineers, the 100-story 875 North Michigan Avenue (formerly John Hancock Center) represents the first use of the exterior diagonalized tube structural system.

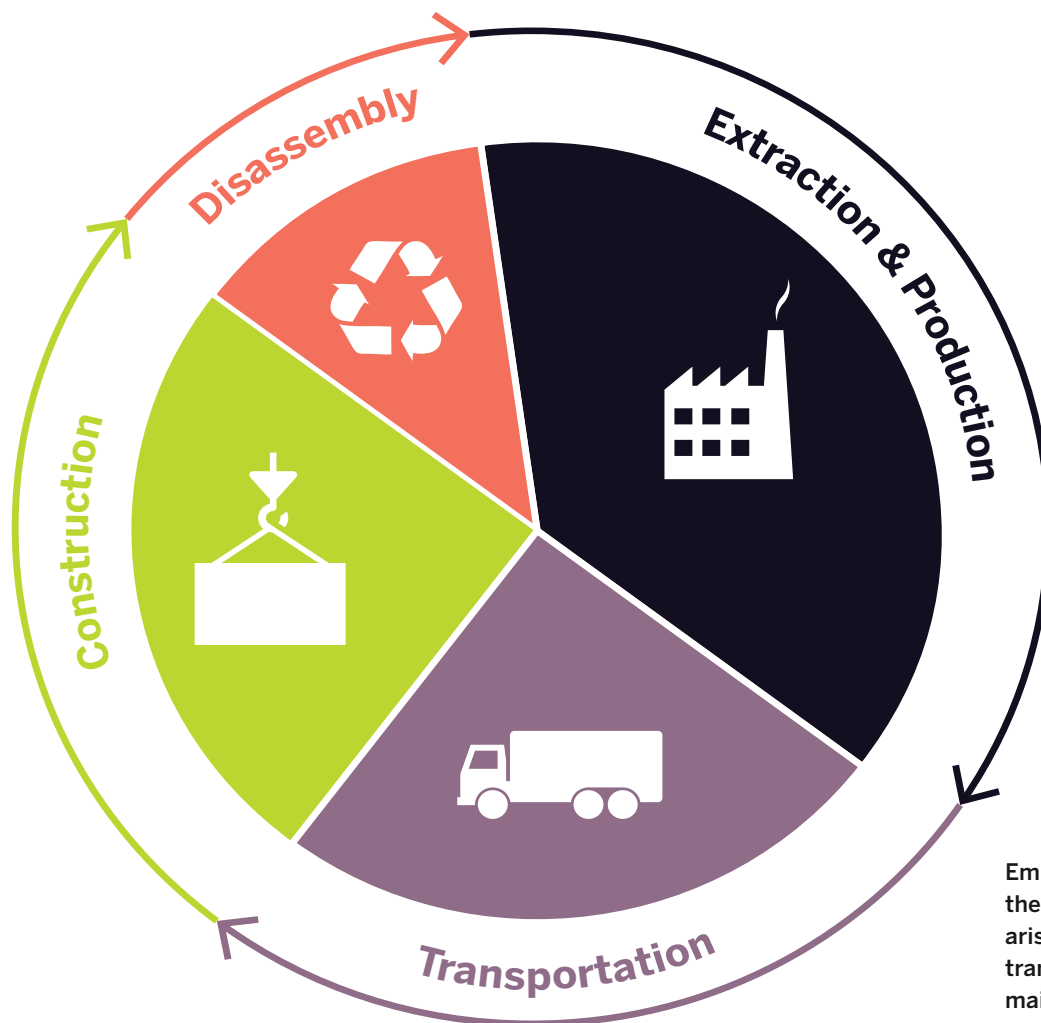
In 1969, one of SOM's founders, Nathaniel Owings, said *"Civilizations leave marks on the Earth by which they are known and judged. In large measure, the nature of their immortality is gauged by how well their builders made peace with the environment."* As an environmental activist as well as a business leader, he spoke of the responsibility that our firm has to protect our planet's limited resources. Our work has been guided by this conviction for decades.

We believe that great buildings come through a dialogue between engineers and architects, working as a design collective with the shared aspiration of achieving simplicity, structural clarity, and sustainability. The incorporation and commitment to sustainable building ideas has been an integral part of SOM's design approach. Today, we are staffed with 295 LEED® accredited professionals who have extensive knowledge of the industry's progressive efficiency design solutions and strategies.

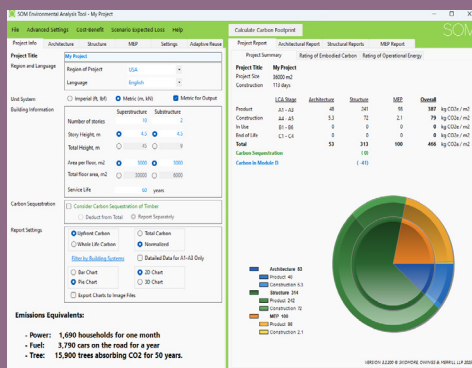
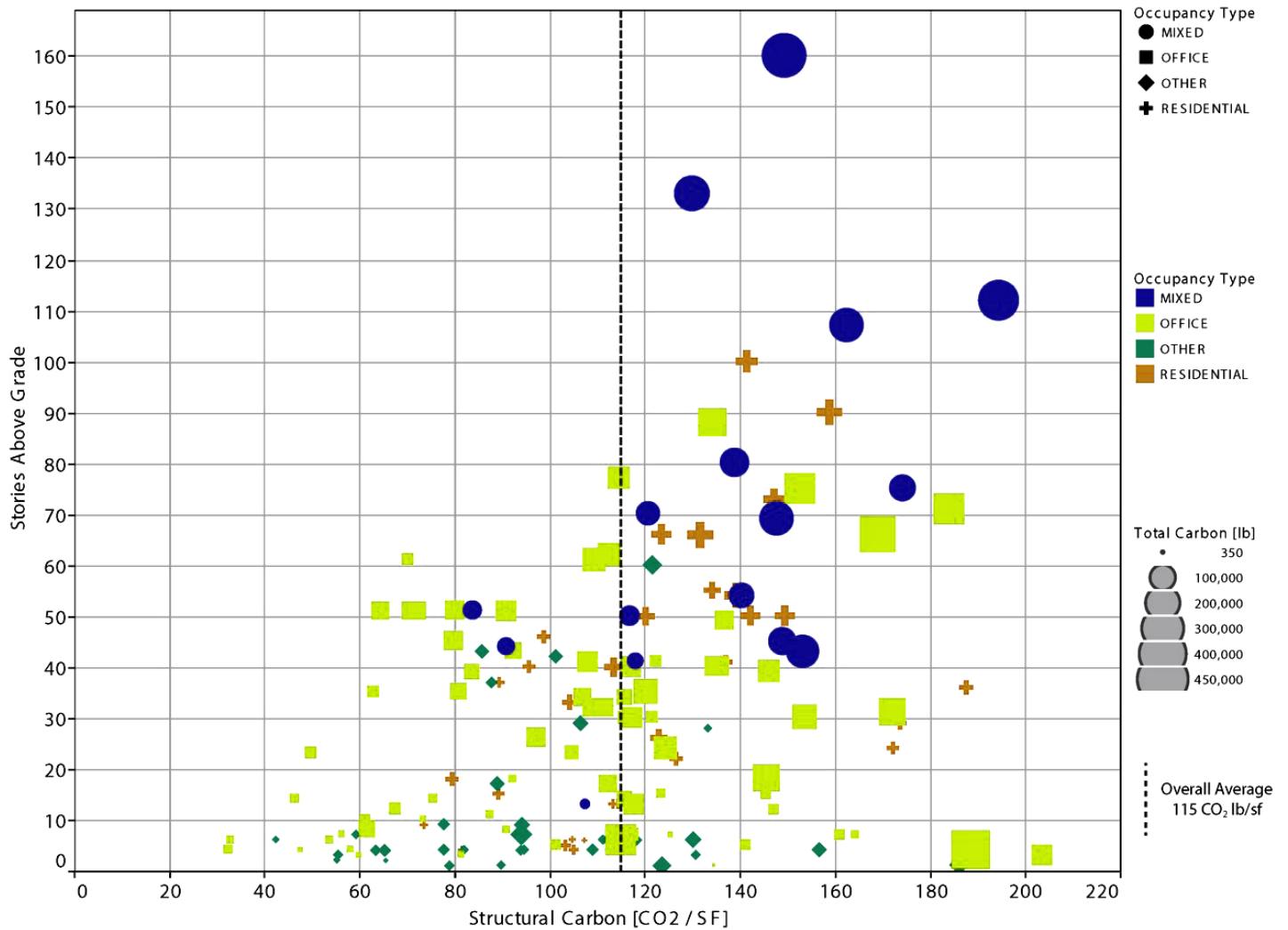
Efficiency & Optimization Tools

Embodied carbon is a significant percentage of global emissions.

As engineers and designers it is urgent for us to take action. In our contemporary work we use a range of optimization tools and techniques that capitalize on modern computing to conceive new forms and efficient material placement.



Embodied carbon refers to the greenhouse gas emissions arising from the manufacturing, transportation, installation, maintenance, and disposal of building materials.



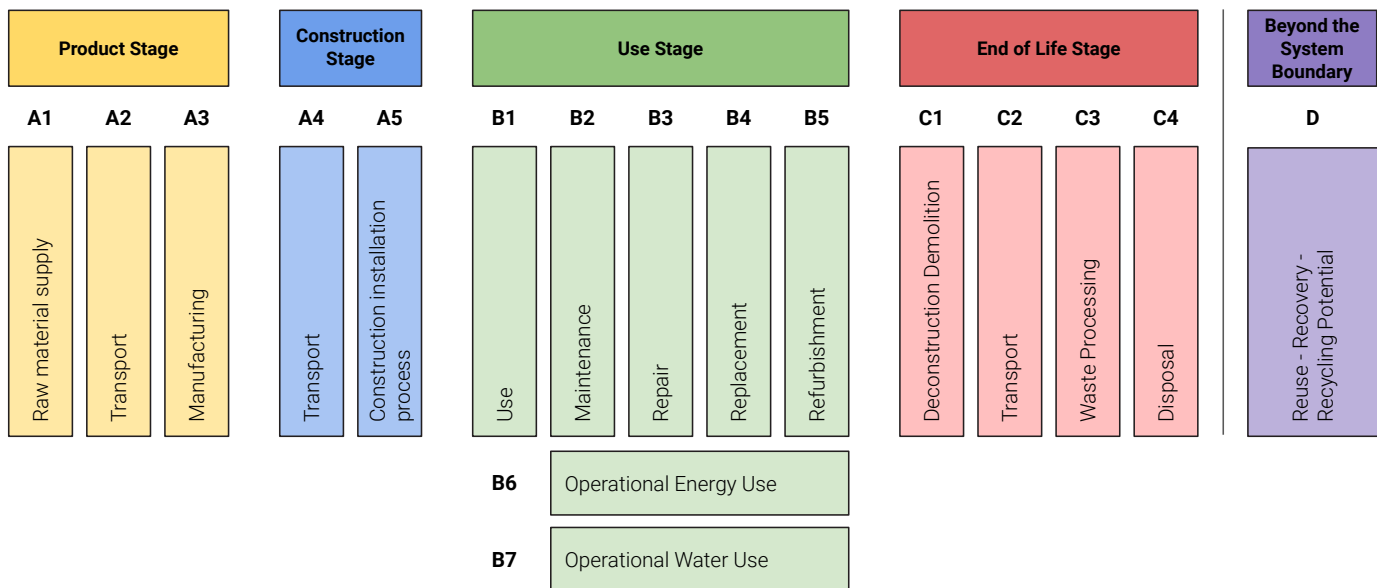
SOM has kept detailed records of the structural material quantities of our projects for many years. This provides useful benchmarks for efficiency based on project types, structural systems, and location. As the theories of embodied carbon and project life cycles have become better understood, we have developed tools that help us track and evaluate these in our projects. The EA Tool is a simple yet robust software program, created by structural engineers at SOM, that has been available as a free resource for the industry for over a decade. The program allows designers to estimate embodied carbon starting with a very minimal amount of information about a building.

Structural Life Cycle Group

Leading the sustainability efforts for our firmwide structural engineering teams is the Structural Life Cycle Group. The group aims to advance our sustainable design principles over the entire lifespan of a structure. The Group's mission is to advance environmental performance of structural systems, advocating for more integrated design solutions, the implementation of innovative materials and construction practices.

Whole Building Life Cycle Assessment

System Boundary



Adapted from BS EN 15978 & IStructE

SOM

STRUCTURAL LIFE CYCLE

EMBODIED CARBON + HIGH PERFORMANCE DESIGN

SOM SE2050 Champions

Effective results starts with a realistic and detailed work plan that is proactively managed throughout the process. We have assembled a team of experts that bring extensive experience with sustainability, material efficiency, and environmentally responsible structural systems.





David Shook, PE, LEED AP
Structural Engineering Associate
Principal



Karl Micallef
Structural Engineering Associate
Principal



Nicole Wang, PE
Structural Engineering Associate



Matthew Streeter, PE
Structural Engineering Associate



Eunice Leung, PE
Structural Engineering Associate



Christopher Parau
BIM Associate



Lauren Moore
Structural Engineering Professional

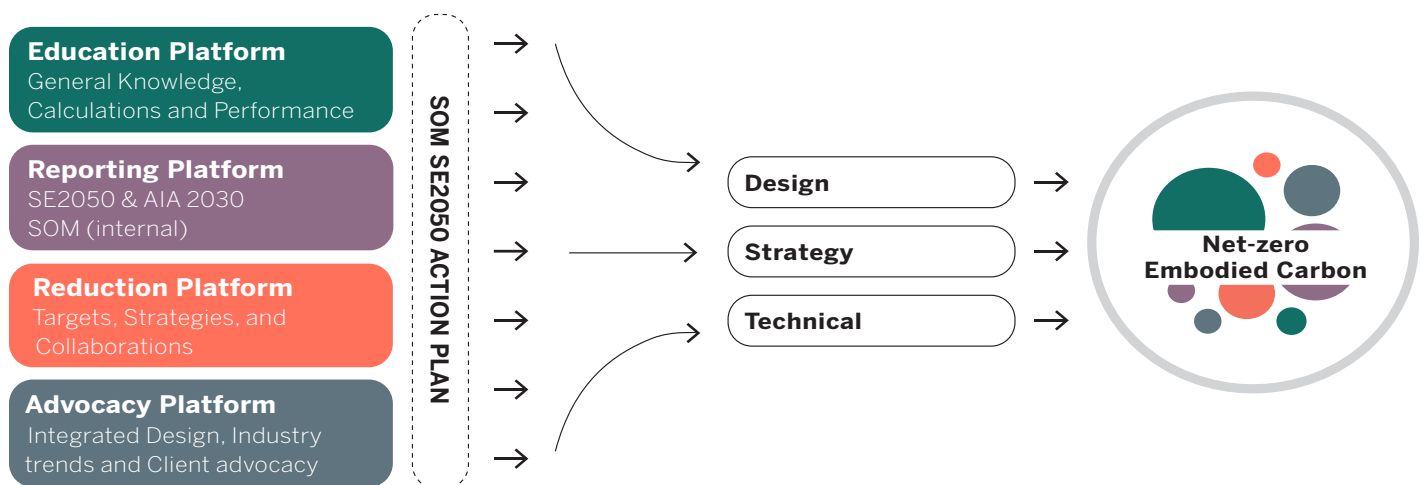


Ben Luce
Structural Engineering Professional

SOM SE2050 Action Plan

Our commitment for the coming years is to formalize SOM's embodied carbon reduction strategies within the structural engineering practice in several ways. Here we present the general layout of each platform that will help inform and guide our action plan and commitment.

This Action Plan documents ongoing as well as new efforts within our firm to reduce the carbon footprint of our work. Additionally, this Action Plan will be used as a firmwide aid to guide our design practice towards more sustainable design solutions to achieve our goal of net zero embodied carbon by 2050.





Education Platform



Education about embodied and operational carbon has been a priority and is central to SOM. Our Climate Action Group leads this effort through ongoing internal webinars and design guidelines.



Low Embodied Carbon Materials

The LEED® Platinum certified Billie Jean King Main Library in Long Beach, California utilizes timber construction and features rooftop photovoltaic cells, daylighting strategies, controlled air ventilation systems, and extensive glazing with architectural overhangs for solar protection.

Education Platform

Our commitment for the coming years is to formalize our Action Plan within the structural engineering practice.

These three pillars make up the basis of the education platform for our embodied carbon action plan.

General Knowledge

Objectives:

We focus on general knowledge required to understand what contributes to embodied carbon within a structural system. Our goal is to provide clear definitions of parameters used to calculate embodied carbon throughout the lifecycle of a structure.

Internal Deliverables:

We will create and present our own embodied carbon webinar on a an annual basis to all designers within the firm. The purpose of this webinar is to provide an outline for performing the LCA process as well as to highlight any developments that have been made in the materials science/design/construction industry which may have an impact on our sustainable design practices.

Calculations

Objectives:

The goal is to provide detailed guidance on calculating embodied carbon on a given project at all stages throughout the design process. This includes guidelines on regional carbon factors for various materials as well as best practices for estimating quantities. These calculation processes are in line with industry accepted standard practices for calculating embodied carbon for a given LCA module.

Tool Evaluation & Internal Deliverables:

SOM is periodically monitoring and evaluating commercially available LCA calculation tools to ensure accuracy and efficiency in our EC calculation processes. Additionally, SOM has been and will continue to develop internal tools for calculating embodied carbon to be used to make informed design decisions. As part of this development, we are providing annual educational presentations and user guides to inform SOM designers on how to implement both internal and commercially available tools for LCA calculations.

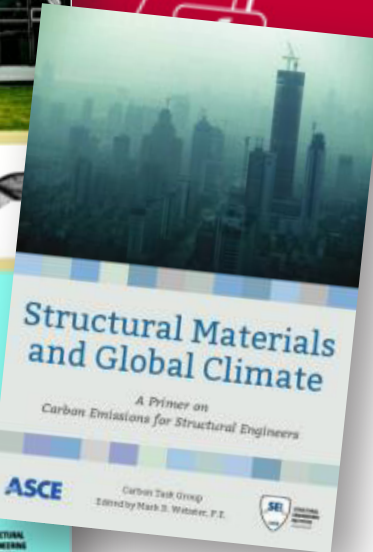
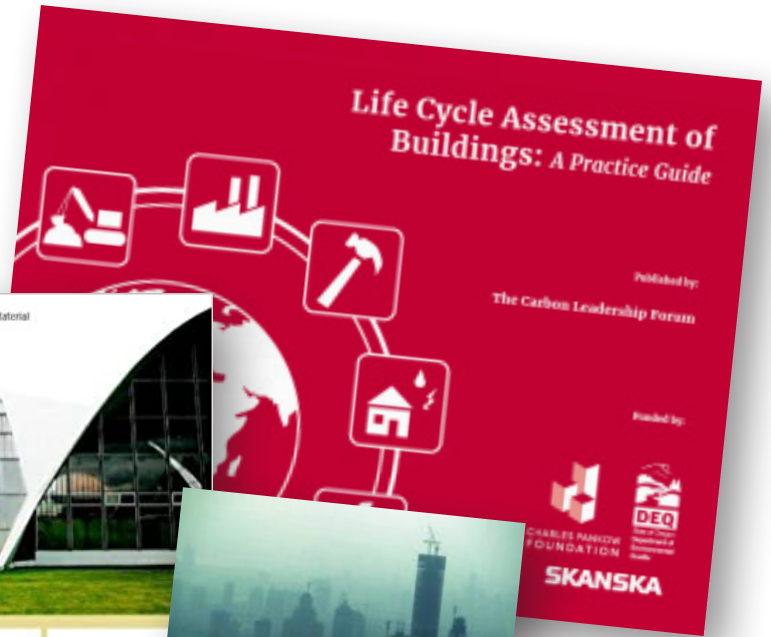
Performance and Reduction

Objectives:

The goal is to inform designers on the leading reduction strategies being implemented on various projects across the firm. This pillar is also being utilized to educate teams on lessons learned from past projects, whether it be to highlight structural systems which were successful in reducing embodied carbon compared to traditional systems, or to identify projects which fall short of there EC goals and what aspects of the design led to this shortcoming.

Internal Deliverables:

Webinars relating to reduction strategies and EC performance as it relates to internal and industry wide EC benchmarks are incorporated in the quarterly embodied carbon webinar described in the General Knowledge pillar.





PLUMBING

FP



Reporting Platform

Tracking and reporting of embodied carbon is critical for both internal design optimization and for the industry as a whole, to understand how we can make the most effective reductions that impact the built environment.

Reporting Platform

We have created internal spreadsheet tools for calculating Embodied Carbon (EC). These tools are used by the structural engineering teams on each project both for comparing embodied carbon schematic options as well as for documenting embodied carbon at major milestones. SOM has also developed the Environmental Analysis Tool (EA Tool) & EC 101 tools that informs design decisions not only for structural systems, but for other design considerations, to achieve a holistic approach to embodied carbon reduction.

SE 2050

Scope:

SOM reported ten projects in total from our North America offices in the first year of reporting for SE2050. We aim to not only continue exceeding the target of minimum of two projects reported from each office, but also report a greater percentage of projects than the preceding year, but may be limited based on available EPD data, project location or project phase. Our initial reporting will focus on project locations for which reliable EPD values are available. Our aim is to build our understanding of EPD values across all global regions and monitor how these values are improved as new materials and manufacturing processes become available. SOM will also limit reporting to projects which have progressed up to, or beyond the schematic design phase.

Strategy:

As part of our SE2050 reporting strategy, SOM has established structural system component categories which are consistent with SE2050 reporting guidelines. Establishing a consistent component categorization strategy, allows for easier data interpretation and comparison across the industry. After the initial rounds of reporting, SOM hopes to receive feedback from SEI regarding reporting categories which can be refined moving forward to improve data aggregation processes. Prior to reporting, SOM will plot all results against select building metrics to identify any potential outliers and understand the cause of this deviation.

Tools:

SOM will utilize commercially available tools which are LEED verified to perform embodied carbon calculations for SE2050 reporting. SOM will also use internally developed EC calculation tools, however internal tools must be verified using commercially available software accepted by industry peers.

AIA 2030

Scope:

As part of SOM's commitment to AIA2030, embodied carbon information on various projects shall be provided during the AIA2030 reporting process. SOM structures contributed for the first time to the reporting process during the year 2020 reporting cycle, during which we calculated embodied carbon for 45 projects across four different offices. During the previous years (2023) reporting cycle, 53 additional embodied calculations were completed and reported. Structural system components categories for AIA2030 reporting will not be broken down into as much detail as will be done for SE2050 reporting. AIA2030 reporting currently focuses on identifying the scope of the project included in the calculation. SOM will continue on this path until more detailed reporting is required/requested.

Strategy:

Similar to EC Reporting Pillar, AIA2030 reporting will also include a back check prior to issuance to ensure outliers are identified. Quantities for AIA2030 will be subdivided into three main categories (Foundation, Substructure & Superstructure).

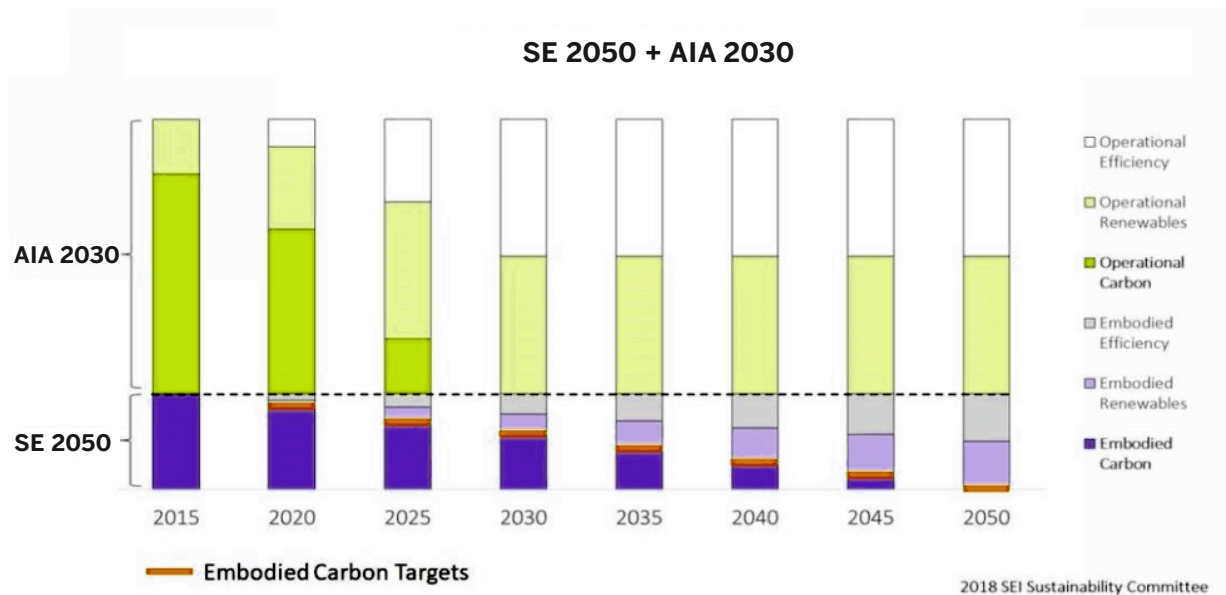
SOM - Internal Evaluations

Scope:

To ensure SOM is making progress towards our embodied carbon targets we will engage in periodic embodied carbon tracking at the internal level. Our goal is to have design teams calculate embodied carbon at the end of each phase for all active projects within the structures group. By doing so, we can evaluate a given project's embodied carbon progression from the concept phase to the construction document deliverable to ensure reduction strategies are being implemented and overall reductions are being achieved. This internal tracking program also allows us to compare a given project's EC performance at a certain stage with past projects as well as measure it against objective EC targets. Further, we have been, and will continue to use these internal tracking mechanisms to identify which aspects of various structural systems are successful at reducing EC in our design, and to inform our reduction strategies moving forward.

Strategy:

SOM will continue to utilize internally developed tools to track embodied carbon over the duration of a project. These tools will feed into a larger database of all projects that will allow for rapid visualization EC performance across all offices/projects. This parent database will also serve as an educational tool to highlight embodied carbon success stories as well as give designers a clear reference of reasonable embodied carbon targets for a given project typology.



The background of the image shows a museum or gallery setting. Several people are visible, looking at informational panels. One panel on the left features a large image of sailboats on a body of water with a city skyline in the background. Another panel in the center has the text 'The first net-zero-energy school in New City'. A third panel on the right shows a modern building with a grid-like facade. The overall lighting is warm and slightly dim, typical of an indoor exhibition space.

Reduction Platform

In the first year of SOM's commitment to SE2050, we undertook a comprehensive study of the embodied carbon in a great majority of our projects. We evaluated these based on various characteristics, including height, occupancy type, and structural material. This information has been used to set benchmarks and achievable targets for the following years. Entering the second year of our commitment to SE2050, we will continue studying new projects to introduce more efficient materials and systems.



A building that
disappears into
the landscape

Health & wellbeing

United Nations
Sustainable
Development
Plan in Germany

Reduction Platform

Benchmarking & Targets

Objectives:

The goal of establishing embodied carbon benchmarks and targets is to establish a reduction roadmap and timeline that allows for EC reductions which are consistent with the reality and constraints that exist within the industry. As a firm we have a history of innovative design resulting in new and increasingly efficient structural systems. We will continue on this path of innovation, however EC reduction targets must be viewed through an objective lense. Therefore, we will establish targets which are consistent with industry wide targets as well as the ultimate goal of net zero structural embodied carbon by 2050.

Internal Deliverables:

Our aim is to internally publish these structural embodied carbon targets on an annual basis. As part of this publication, we will evaluate our previous years performance against the targets for that same time period to evaluate our success at achieving these goals.

As described in the previous sections, one of SOM's strengths as a design firm is the integrated nature of our practice. Through collaboration across our various design disciplines, we aim to leverage integrated systems as much as possible in future designs to reduce construction waste and raw material usage. Our targets and strategies for embodied carbon reduction will continue to develop in collaboration with the other design disciplines to ensure wholistice embodied carbon reduction is being achieved over the entire scope of a project.

Internal Deliverables:

Internally, SOM has developed our own Climate Action Group which meets regularly to review carbon performance and potential reductions strategies for both embodied and operational carbon. SOM structures will continue to be involved with and lead discussion within this internal committee as they relate to embodied carbon performance and reduction strategies.

Reduction Strategies

Objectives:

As a group, we are working to define realistic reductions strategies that are consistent with the embodied carbon targets described in the previous section. These strategies will include but are not limited to: new materials research, structural systems optimization, more sustainable material specifications, innovative construction techniques and systems integration. It is our hope that through the combination of these strategies, we can start to achieve our embodied carbon reduction targets.

Internal Deliverables:

As part of our annual embodied carbon webinar, we will outline the leading embodied carbon reduction strategies for various structural systems and project typologies to ensure all potential reduction practices are available to our project engineers.

Collaborations

Objectives:



The Additive Manufacturing Integrated Energy (AMIE 1.0) Demonstration Project



Robotic Construction - The Glass Vault Digital Fabrication, Demonstration Project



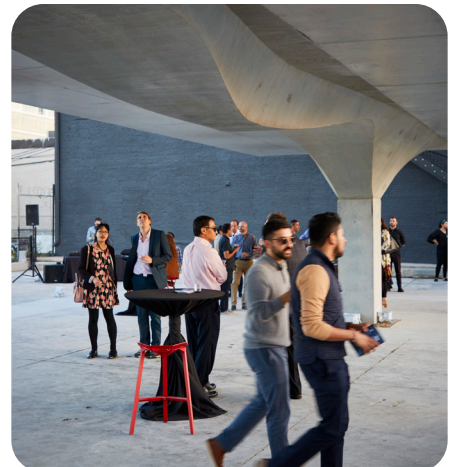
3D-Printed Concrete Barracks U.S. Army Corps of Engineers



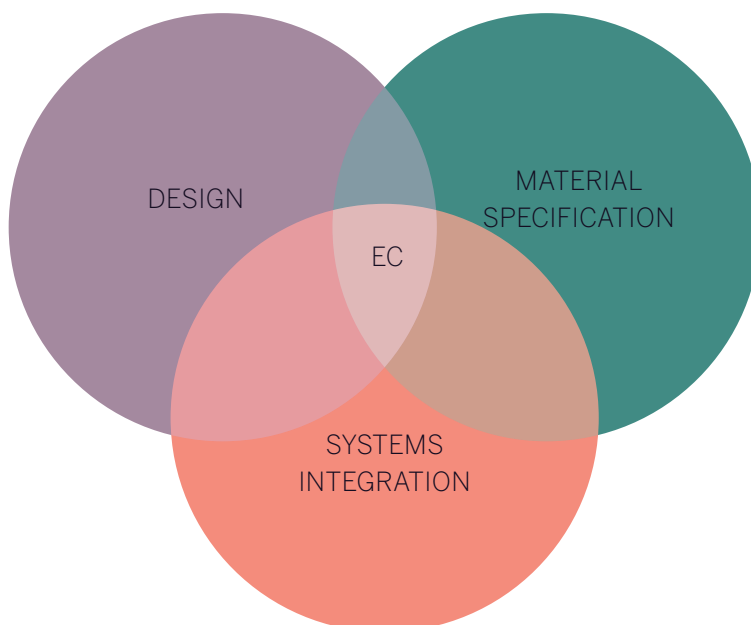
Timber Tower - Research to Minimize the Embodied Carbon Footprint of Buildings



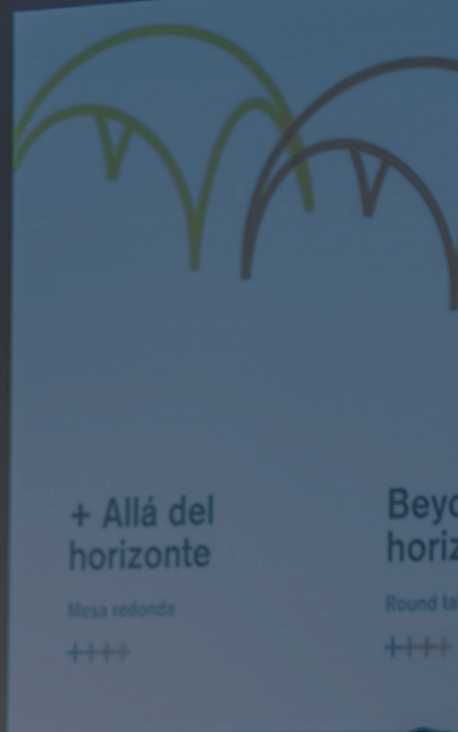
SPLAM - A Full-Scale Structural Framing System Prototype that Reduces Material Use



Stereoform Slab - Optimized Structure That Reduces Embodied Concrete



As designers our primary influence on the sustainable performance of a building system results from decisions made during the design, materials specification and systems integration processes. It is at the intersections of these design processes that we have the potential to affect significant embodied carbon reduction in the built environment.



Advocacy Platform

SOM is committed to change within our own firm and promoting our goals. Our internal communications reach all of our staff and encourage thoughtful actions. Our commitment to net zero and environmental stewardship are conspicuously shown throughout our external communications, routinely promoting sustainable solutions to our clients. Our goal is to influence and lead the global industry.

Advocacy Platform

Integrated Design Advocacy

Objectives:

Within our firm we constantly engage in conversations with our colleagues in other disciplines to champion and explore the benefits of interdisciplinary design. With each new project, we challenge the traditional processes and design flows, looking for opportunities to improve sustainability.

It is our goal as an integrated design practice to evaluate the potential for integrated design techniques on all new and ongoing projects. As we have seen from past experience, significant embodied carbon savings can be achieved through the integration of building systems, and the potential for savings increases by considering integrated design strategies early in the design process. Through this platform we will also evaluate past integrated design approaches implemented by SOM or other industry leaders to identify which integration strategies result in optimal carbon savings.

Internal Deliverables:

Success stories are presented in office and firm-wide meetings to reinforce this key aspect of our design ethos. Our structural group is highly involved with the firmwide initiatives related to sustainability, and are developing discipline-specific actions that parallel the global ideas (i.e. the Ten Principles).

Client Advocacy

Objectives:

Highlight and strive for economic benefits through sustainable design practices. Our marketing and external communications make it clear to our clients the high value that SOM places on sustainability and embodied carbon reduction. We seek opportunities to work with like-minded clients, allowing us to leverage our knowledge and experience in this realm as a resource to assist clients and projects.

Through this pillar we aim to develop consistent sustainable design drivers which are presented to our clients from the earliest stages of the design process to ensure our commitments as a firm are reflected in our client relationships.

Internal Deliverables:

Provide teams with sustainable design narrative for project specific design criteria and locations that are based on past experience. This will include compiling regional specific information about local construction practices and material availability to ensure our sustainable design drivers are implemented within a context derived from the project location.

Industry Advocacy

Objectives:

As an industry leader, it is critical that SOM is plugged into the latest sustainable practices from both the design industry as well as the construction industry. By engaging with other design industry leaders, we hope to establish knowledge sharing pipelines to ensure that successful design approaches are being implemented across the broader design community. As part of this effort, structural engineers from SOM have committed to leadership positions on committees in SE2050 and continue to engage in other sustainable design communities such as Carbon Leadership Forum.

Similarly, it is important that our group engage with general contractors and builders to not only identify new sustainable materials and construction practices, but also to understand the feasibility of implementing sustainable design solutions in practice.

Internal Deliverables:

To achieve the above industry advocacy goals, SOM will continue engaging with the sustainable design communities with the hopes of hosting and/or participating in inter-practice sustainable design workshops to allow knowledge sharing across firms. SOM will also continue to engage local universities in sustainability workshops and lectures to bring embodied carbon to the forefront of prospective engineers and architects early in their studies.



Annual Update





Holistic Design Approach

Pearl River Tower in Guangzhou, China was the first supertall building certified LEED® Platinum by the U.S. Green Building Council. The building redefines what is possible in sustainable design by incorporating the latest green technology, architecture, and engineering advancements. A feature of the project are the wind turbines located at openings up the height of the structure that reduce wind lateral loads and generate clean power.

Path to Net Zero

As a firm, we continue to push our understanding of sustainable design solutions within several different categories that range from new materials research to improving on standard design specifications and practices as well our accounting for carbon on individual projects and a broader database of projects. Below is a summary overview of some of the components our firm has been focusing on in each of these categories.

Research

- Continued research into new materials:
 - More sustainable cementitious replacement, such as ground glass pozzolan
 - Biogenic material applications
 - Resilient steel materials
- Continued research of active and passive carbon sequestration technologies
- Continued research of modular and prefabricated design options which improve material efficiencies
- Legacy and newly developed tools automatically incorporate structural quantities with architectural embodied carbon for a complete, interdisciplinary EC targets, reflective of SOM's interdisciplinary design ethos.
- Continued development of integrable tools for real-time embodied carbon calculation

Database

- Developed embodied carbon benchmarks using past project information and targets based on global environmental carbon reduction requirements

- Utilized a database that leverages past projects to identify successful systems and advocate for these systems on new projects
- Collected and cataloged EPDs from suppliers and manufacturers of commonly used structural materials

Specifications

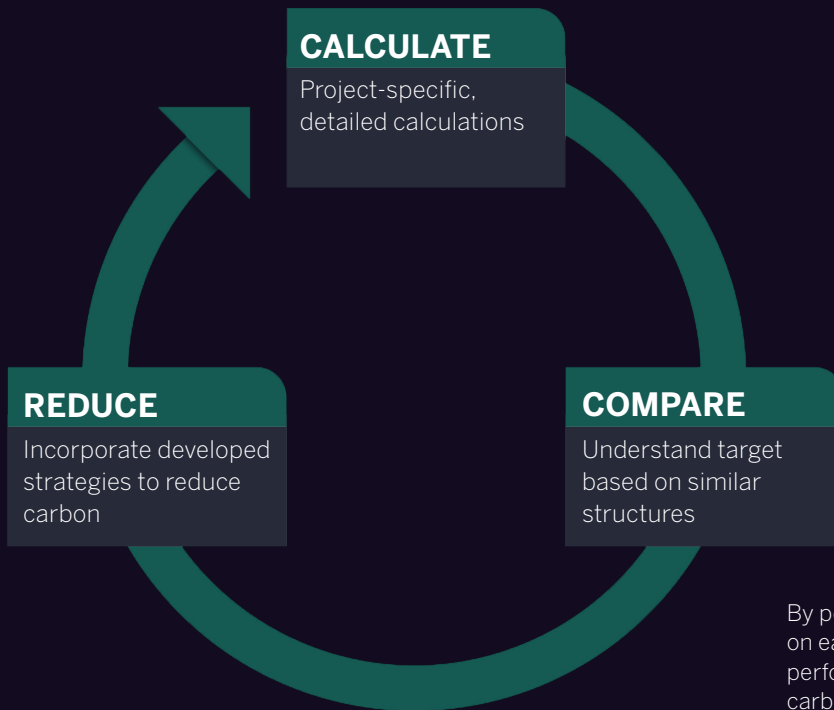
- Updated specifications to include a carbon budget for each material division
- A specified minimum amount of recycled content for structural steel and rebar on each project
- Allowed for more sustainable cementitious replacement on projects using performance-based specifications
- Specified timber on more projects to reduce the amount of Portland cement.

Early phase evaluation

- Researched local material options early on during a project to ensure the right materials are being selected based on site and regional constraints
- Discussed with local builders and work with client groups to establish carbon goals

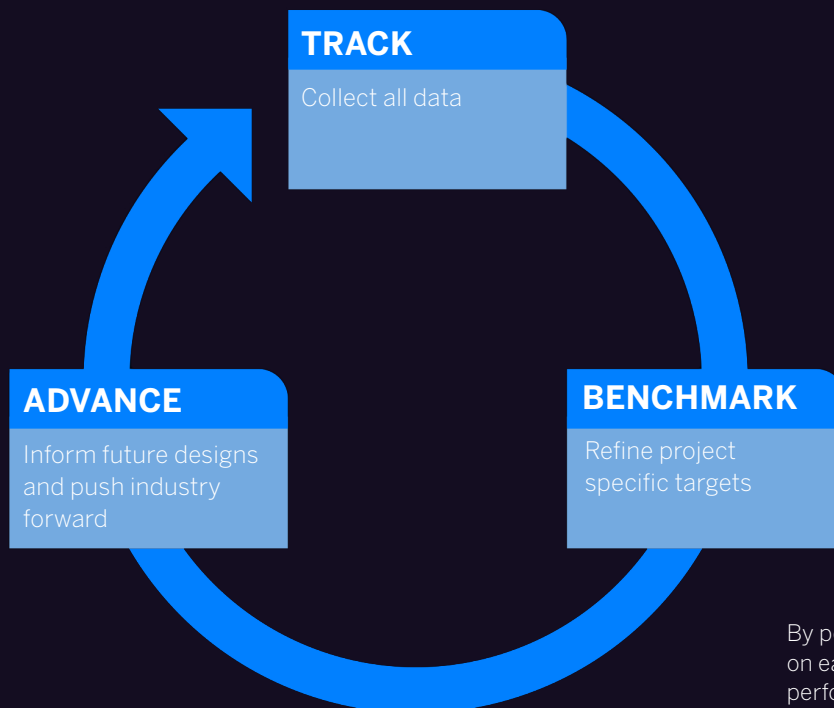
Biogenic material applications

- Continued incorporation of composite timber systems to reduce the amount of concrete



Project Process

By performing this consistent calculation process on each project, mechanisms for tracking carbon performance can be implemented, allowing embodied carbon benchmarks and targets to be defined and provided to design teams, as well as ensuring future projects are informed of carbon performance on past projects.



Firmwide Process

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Education

Over the past year, we have aimed to provide educational opportunities to our design teams to ensure all team members have a clear understanding of how to calculate embodied carbon as well as which LCA modules are currently our focus for these calculations. These have taken the form of in-person sessions and firmwide webinars to present potential workflows and standard assumptions in order to ensure a consistent approach is being used. The below lists identify some of the lessons we've learned, accomplishments we've achieved, and new goals for the upcoming year as they relate to the educational platform of our ECAP.

Lessons Learned

- Designers are becoming more comfortable with embodied carbon targets, but more rules of thumb benchmarks are needed to make sure targets become second nature.
- As Carbon Budgets are being implemented into specifications, we need to work with contractors to educate them on what these budgets entail, how to document the performance of their proposed material selection, and what techniques can be implemented to reduce embodied carbon and still achieve material performance targets.

Accomplishments

- Provided a simple diagram of which components belong to the foundation, substructure and superstructure systems for use by the design teams. Additionally, we have provided our design teams with industry average carbon factors for standard structural materials to give designers a basis for understanding carbon performance of different materials.
- Over the past year, we have given six presentations to our structural engineering group and the larger firm focused on sustainability and embodied carbon reduction.

January, 2024: External presenter on OPC technologies with low to carbon-negative emissions and silica byproducts for use in concrete mixes

February, 2024: External presenter on engineered wood products including MPP

March/June, 2024: External presenter on low-carbon concrete strategies and implementation on projects

September, 2024: Leadership in Low Carbon Webinar series on ACI 323

September, 2024: External presenter from Nucor, North America's largest steel manufacturer and recycler discussing sustainable manufacturing practices and responsible material sourcing

September, 2024: Internal presentation and participation in HESTIA Program which aims to eliminate embodied emissions and transform the built environment into a network of net carbon storage structures through the use of atmospheric carbon dioxide in the production process

Start, 2025: EA Tool SOM internal training of AIA 2030 reporting and Embodied Carbon calculation tool tutorial

- At least one representative from SOM has been attending quarterly external education programs provided by SE 2050, Carbon Leadership Forum (CLF), or other embodied carbon resources

Previous Year Goals

- Compile reports of research as educational documents for our design teams. STATUS: IN-PROGRESS
- Establish a mandatory internal carbon performance review at each office to ensure targets are being met and reduction strategies are implemented. STATUS: COMPLETE
- An Embodied Carbon lecture taught annually by SOM engineers in the curriculum at a top academic institution. STATUS: COMPLETE
- Create cheat sheets for designers which summarize carbon factors, benchmark formulas and target reduction strategies. STATUS: IN-PROGRESS
- Set up an educational series during which design teams can share their experience with contractor in implementing carbon budgets on projects. STATUS: IN-PROGRESS

New Year Goals

- Provide educational seminar on how to discuss EPD's with contractors for the first time
- Educate all design teams on tools for estimating early phase quantity targets for various building typologies.



SE2050 **action** plan



people:
**training +
tools**



projects:
**targets +
specifications**



practice:
**performance +
tracking**

Reporting

A crucial part of our ability to reduce embodied carbon is contributing carbon data to industry wide databases such as SE2050 and AIA2030 to ensure our designs are being captured along with the broader design community. Over this past year we have worked to leverage both internal and commercially available tools to produce consistent and accurate life-cycle assessment of our projects, and submit them to these reporting platforms. As part of this process we have tried to internally track our progress at calculating embodied carbon on active projects as well as which members of the team are actively performing these calculations.

Lessons Learned

- Structured data is crucial to our ability to perform QA/QC on larger sets of data. It also allows for a more detailed analysis of the data and potentially allow for integration with AI work flows.
- A detailed QA/QC process should be performed following embodied carbon calculation to verify results.

Accomplishments

- Our group has successfully reported five projects to SE2050 and provided embodied carbon data for AIA2030
- We have helped our architectural teams with a tool and workflow for calculating embodied carbon for architectural system components.
- We have calculated structural embodied carbon on

all active projects.

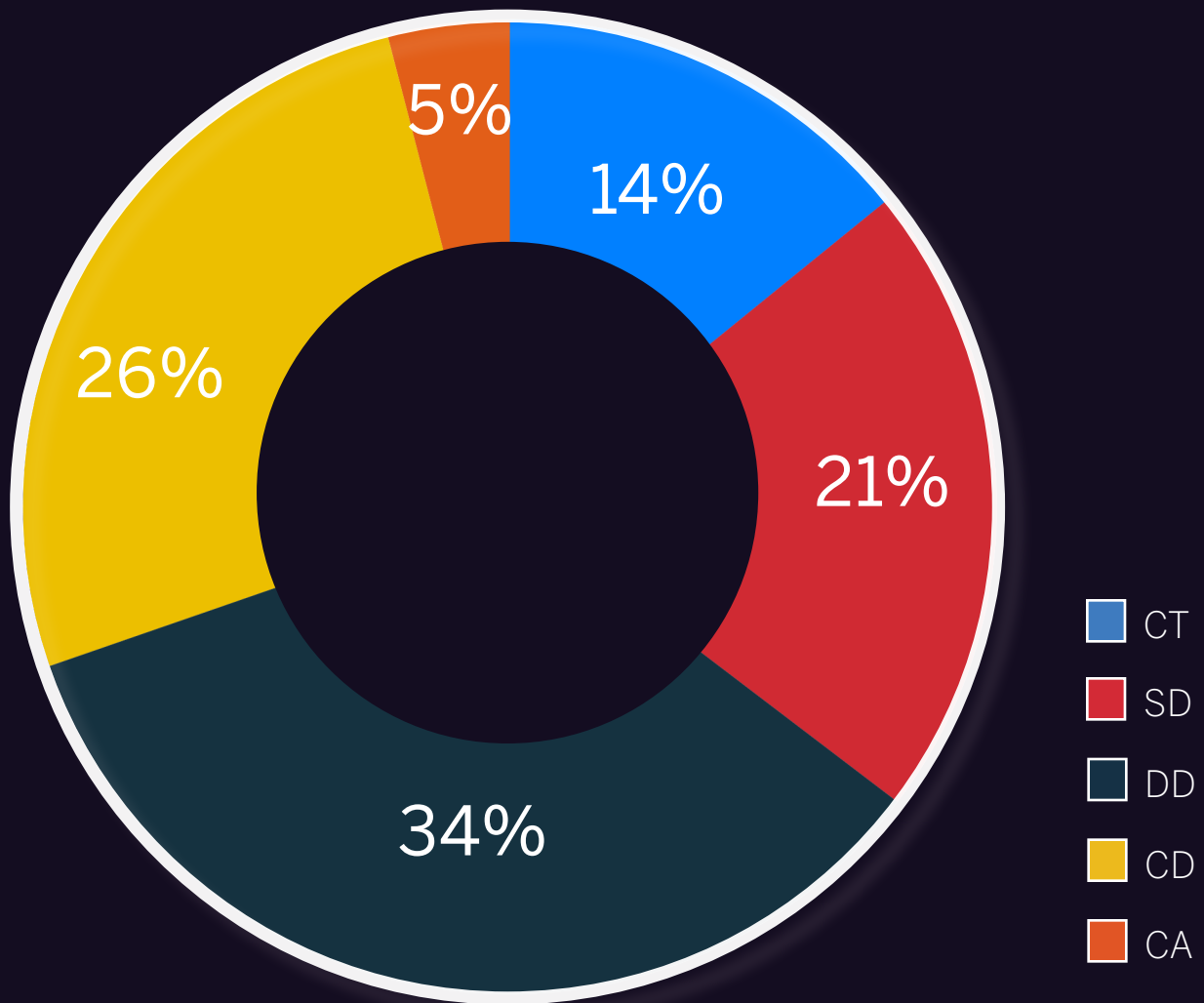
- We have created a beta version of an internal embodied carbon database for a percentage of SOM's current and projects.
- We have started establishing more rigorous QA/QC processes for reviewing embodied carbon data.

Previous Year Goals

- Continue coordinating with the other design disciplines to determine a wbLCA. STATUS: ONGOING
- Continue advancing standard revit modeling practices to allow for more accurate and efficient calculation of material quantities and embodied carbon of a project. STATUS: ONGOING
- Create a more automated link between analysis models and embodied carbon calculations to allow EC to play a bigger role in design decisions. STATUS: ONGOING
- Begin reporting embodied carbon to clients and contractors as part of our documentation set. STATUS: ONGOING

New Year Goals

- Incorporate all past/legacy projects into SOM's internal carbon database
- Further develop project explorer tool which allows engineers to search an internal database for similar projects and compare carbon performance
- Validate all embodied carbon data that has been flagged through an internal QA/QC process.
- Perform more detailed data analytics on cleaned carbon data



Embodied Carbon Calculation Distribution by Design Phase

[↑] The distribution of design phases of roughly 108 SOM projects for which their embodied carbon has been calculated.

Our goal is to have every project's embodied carbon calculated -- for all applicable phases in order to track a project's carbon performance as the design evolves.

Reduction

This past year has been focused on developing a platform to display past and ongoing project information in a way that can be easily accessed and navigated. This platform will allow us to establish clear benchmarks and targets for each project type. Additionally, we have focused on incorporating the embodied carbon into our specifications while developing ways to coordinate these with client goals and contractor limitations.

Lessons Learned

- Our first attempts at incorporating an embodied carbon budget into our specifications should not be too aggressive. Contractors are still getting used to providing EPD's and integrating this new performance requirement into their procurement process.
- We should be targeting the highest grade of column steel available if it does not represent a significant carbon or cost premium on a per ton basis.

Accomplishments

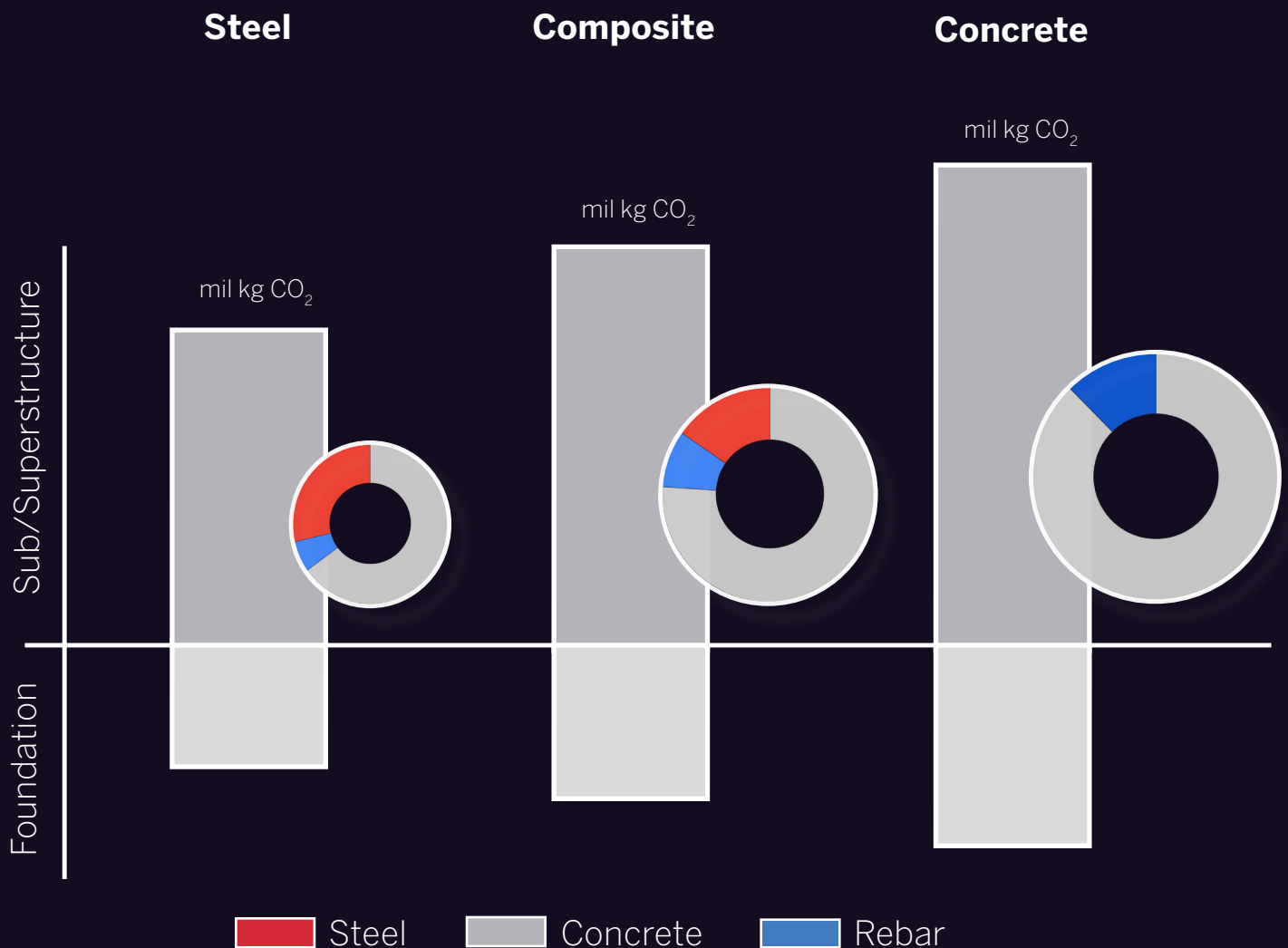
- Over the past year we successfully incorporated Biogenic materials on at least 4 projects, all of which are in later phases of the design process.
- We furthered our collaboration with a bio-based concrete substitute product by realizing test installations and finding a path towards code approval.
- Implemented new CALGreen Mandatory Measures for Embodied Carbon Reduction on a multi-building university dormitory project in Southern California
- Used a carbon negative material made from biosolids, otherwise marked for landfills, as a fine aggregate replacement in site concrete at an education facility in North Carolina

Previous Year Goals

- Develop an internal database for monitoring carbon performance, trends and developing benchmarks. STATUS: IN-PROGRESS
- Distribute embodied carbon benchmarks and targets to the design teams. STATUS: IN-PROGRESS
- Develop embodied carbon trend lines using internal database STATUS: IN-PROGRESS

New Year Goals

- **Short Term Goals (6 - 12 months)**
 - Set up internal review process for project EC performance
 - Roll out carbon budget on 15% of projects.
 - Incorporate biogenic cementitious replacement on at least one project in the upcoming year
- **Medium Term Goals (1 - 5 years)**
 - Update all structural specifications to include a carbon budget for all projects
 - Incorporate ground glass pozzolans as cementitious replacement on more projects
 - Demonstrate embodied carbon reductions on 50% of projects relative to benchmark
 - Incorporate additional building life cycle stages into embodied carbon calculations, targets, and reporting
 - Incorporate more post-tensioned floor system and voided mat foundations on East coast projects to reduce concrete quantities
- **Long Term Action Items (5 - 10 years)**
 - Demonstrate embodied carbon reductions on 75% of projects relative to benchmark
 - Assist in development of design standards and code requirements for new carbon sequestering and biogenic materials
 - Incorporate new carbon sequestering structural materials in active projects
 - Reduce year-over-year firmwide EC average by 5%



Embodied Carbon Calculation Distribution by Material Use

[↑] A key to understanding the path toward embodied carbon reductions is to perform apples-to-apples comparisons of potential systems on each project to ensure the most carbon-efficient system is chosen for a given project. Similarly, it is just as critical to advocate these carbon benefits to clients, contractors, and the construction team to ensure all involved stakeholders embrace the most efficient system.

Advocacy

In addition to the other platforms, over the past year we have been working to define clear strategies for communicating our carbon goals to clients and contractors while identifying sustainable design strategies that are appropriate based on the project budget and logistical constraints as well as the region of the world it will be constructed. This has included presenting design options through the lens of carbon performance while engaging with contractors to establish cost premiums and savings for each potential design solution. In many ways, our success in achieving our goals is directly linked in our ability to get buy-in and approval from contractors and owners alike.

Lessons Learned

- By showing how sustainable design solutions result in a reduction in operational carbon and thus operational costs can be an effective strategy for convincing client groups.
- Contractors apply added cost to sustainable design options from the start. As designers we must understand which of these costs are real, and which are a result of discomfort with new construction materials and practices.

Accomplishments

- We have advocated for more biogenic materials or less carbon intensive alternatives on multiple projects.
- We have worked with other design disciplines to compare the integration of structure and facade systems. This process was normalized around the globe and includes quantification of both embodied and operational carbon.
- We have presented embodied carbon performance for various structural system options to clients when informing structural design on real projects.

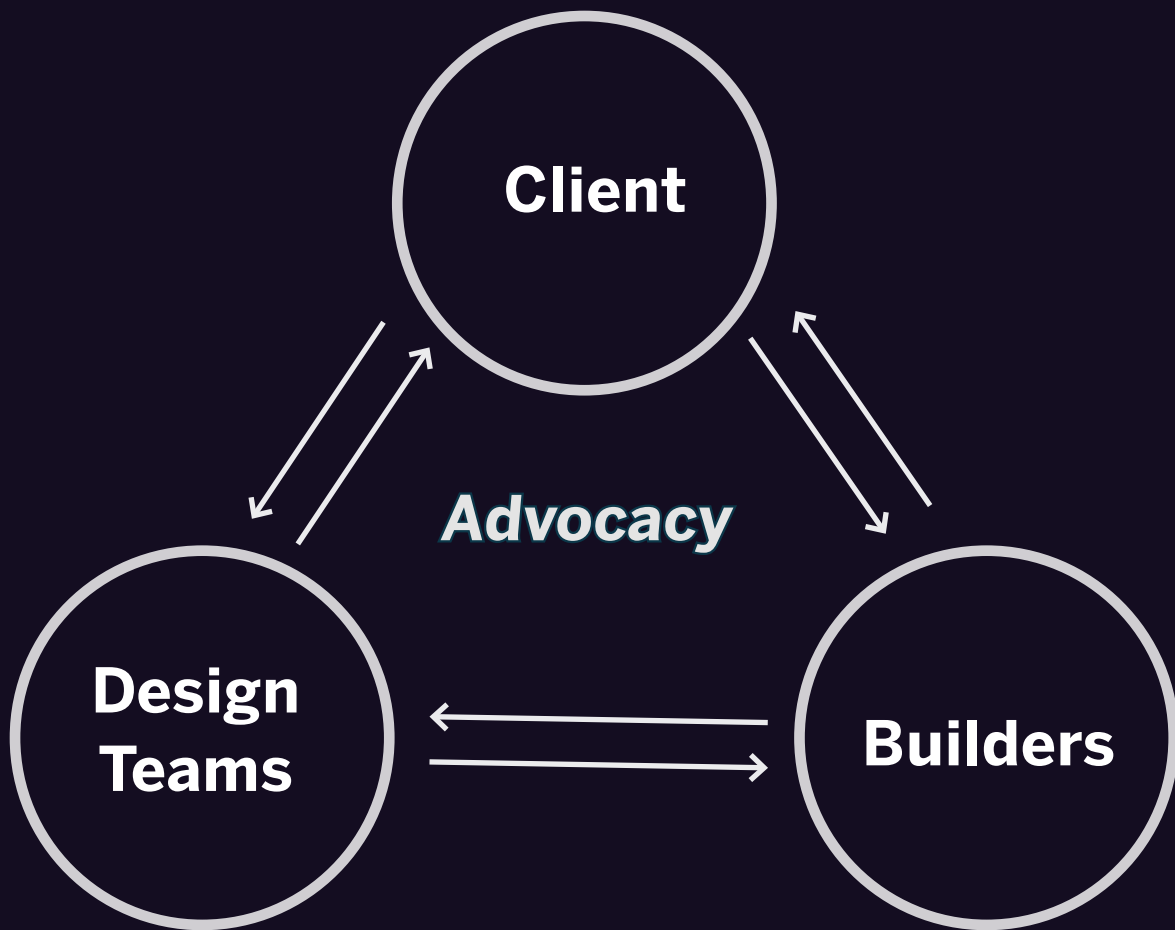
- We engaged with material suppliers to understand what sustainable options are available for both steel and concrete.
- We are sharing education opportunities with clients.
- We continue to engage local universities in sustainability workshops and lectures to bring embodied carbon to the forefront of prospective engineers and architects early in their studies.

Previous Goals

- We will present embodied carbon performance to clients for all projects and express the benefits of different design options. STATUS: ONGOING
- We will update all structural specifications to include a carbon budget for all projects. STATUS: IN-PROGRESS
- We will advocate for more efficient column grids on projects. STATUS: ONGOING
- We will require more projects to include structural materials with facility-specific or product-specific EPDs. STATUS: ONGOING
- We will encourage industry and policy change to incentivise availability of low-carbon and carbon sequestering materials. STATUS: ONGOING
- We aim to start incorporating EC calculations in our drawing sets/deliverables to raise awareness around the carbon cost of each project. STATUS: IN-PROGRESS
- Continue advancing carbon budget with contractors and requiring the submission of EPD documents during the construction process. STATUS: IN-PROGRESS

New Goals

- We aim to start incorporating embodied carbon calculations in our drawing sets and deliverables to raise awareness around the carbon cost of each project
- Continue advancing carbon budget with contractors and requiring the submission of EPD documents during the construction process



[↑] To truly advocate for sustainable design solutions, we must be willing to have two way discussions with both clients and builders to do our best to align our goals and identify the most appropriate sustainable design solutions for a given project.

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