HGA

EMBODIED CARBON ACTION PLAN (ECAP)

FEBRUARY 2022


SEI
ASCE
STRUCTURAL
ENGINEERING
INSTITUTE
SE2050
COMMITTING TO NET ZERO

CONTENTS

WITH SPECIAL THANKS TO...

TIM CARL Chief Executive Officer,
SCOTT LINDVALL Chief Operating Officer,
PAUL ASP Structural Engineering Department Lead,
and **ALAYNA LOTTO** Sustainability Intern

OUR FUTURE

There has never been a more important time to take responsibility for our actions. The world is experiencing unprecedented rates of change in climate, energy supply, technology, and business—all of which impact the human experience. As designers of the built environment, we have a unique and inspiring opportunity to shape a positive future. We are committed to designing for change.

To us, good design and sustainability are intertwined and inextricably linked. Our projects become beloved parts of their communities, support the health and wellbeing of their inhabitants, and reach the highest levels of building performance.

As a signatory of the SE 2050 initiative, we are committed to meeting our clients' goals as well as challenging our industry. This means developing the expertise and research to push beyond net zero energy to net positive energy; from a neutral effect on health, safety, and resources, to a positive one. As the need and desire for sustainable environments grow, so does the focus on high-performance buildings with sound data that we can share back with clients and our design teams.

The climate crisis is urgent. Architecture 2030 reports that just three materials used frequently in structural and architectural systems—concrete, steel and

EDUCATE

All employees will have a baseline understanding of why reducing embodied carbon is a priority at HGA. Through education and training, structural engineers, architects, specification writers, interior designers, and sustainability specialists will know strategies and tools they can leverage to specify lower carbon materials

REPORT

We will track carbon on five projects in our first year as signatory. Within three years, we will develop a tracking database and workflow to implement consistently on projects. Within five years, HGA will track carbon on all new construction projects

REDUCE

A specialized, expert team will conduct LCAs on our projects. A designated Sustainability Lead will work with design teams to identify opportunities and implement targeted strategies to lower embodied carbon.

ADVOCATE

The Sustainability Lead will convey the importance of carbon reduction to clients and recommend reduction strategies. Our teams will advocate for and share knowledge about embodied carbon via committee involvement, published articles, and public presentations.

aluminum—account for 23% of annual global carbon emissions. We have a responsibility to seek lower carbon alternatives to these materials and work to lower the embodied carbon impact of our projects.

We pledge to continue reducing our operational carbon while also focusing on eliminating embodied carbon from structural materials common to our practice. Implementing design strategies like lengthening building life-span, designing for circularity, and optimizing material quantities on projects, will be crucial in our efforts to help mitigate the negative impacts of global warming.

Our structural engineers are committed to adapting and improving current practices according to the requirements of the SE 2050 Commitment. We believe that these requirements and the positive impact they generate for the planet are achievable through the strategies outlined here in our plan. At HGA, assessing what works and identifying opportunities for improvement has always been an integral part of our design process. We understand the gravity of our individual responsibility as designers yet recognize that the task of reducing embodied carbon must be a collective effort across several industries. In committing to the SE 2050 Challenge, we hope to lead by example—encouraging these other industries to follow suit—by generating demand for materials and construction practices that serve this greater goal, creating a better future for all.

Our decades of sustainable design experience serve our clients on new construction and renovation projects; with LEED, Living Building Challenge, and WELL certification; resilient design planning and implementation; infrastructure optimization; and sustainable partnerships. Our approach is inspired by the unique aspirations of each client, infused with our collective insight, and implemented as part of a holistic vision for a project's impact.

OUR LEADERSHIP

ETHAN FOGLE PE

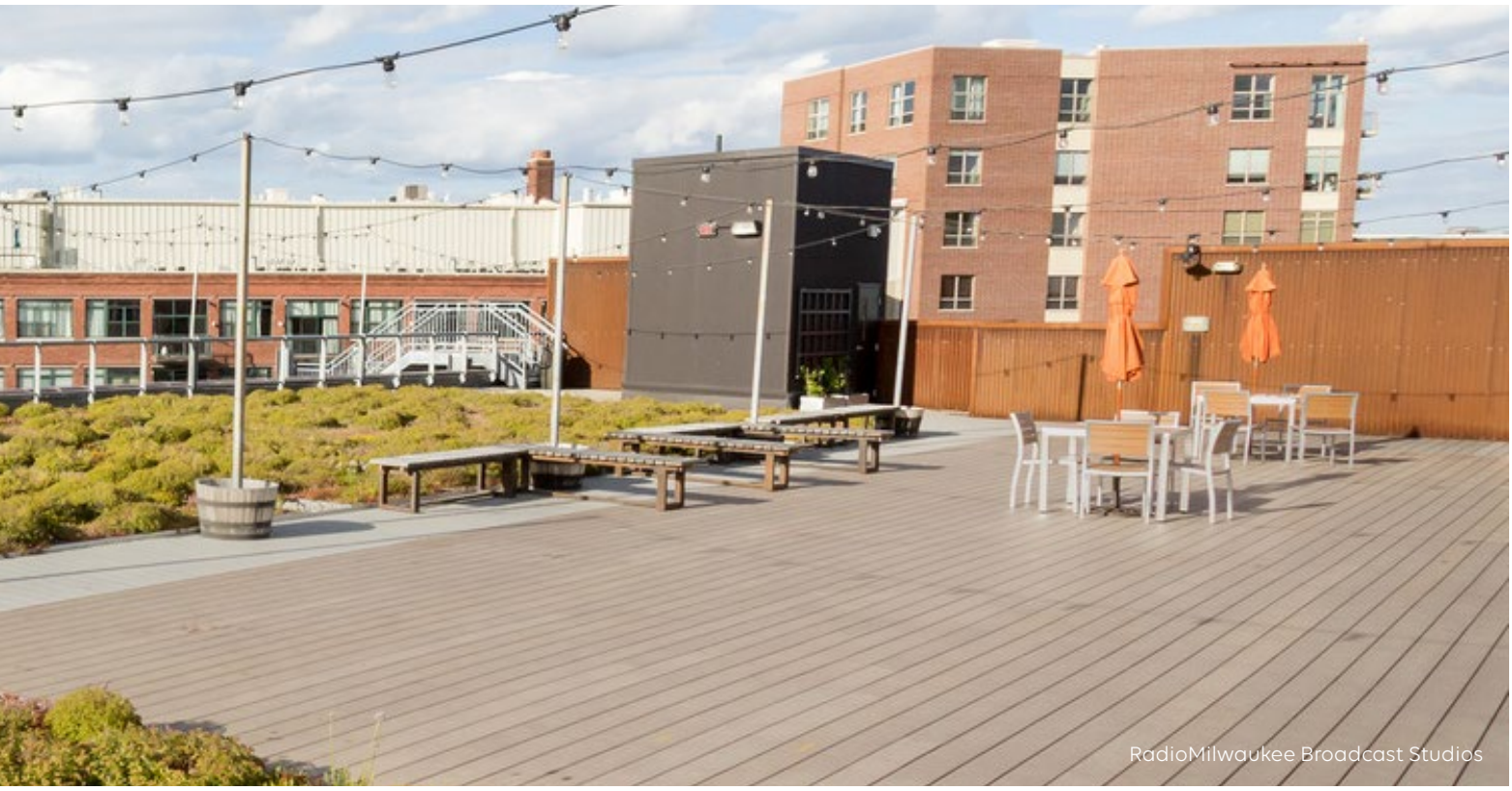
EMBODIED CARBON REDUCTION CHAMPION

Ethan is a structural engineer with five years of experience on a wide range of project types. He is passionate about the opportunity structural engineers have to change the trajectory of our industry and reduce our impact on the planet. Ethan combines broad technical expertise with a personal mission to help deepen our connection to the natural world. A strong advocate for sustainable design at HGA, Ethan is a member of HGA's Sustainability Steering Committee, and also a member of the ASCE-SEI Sustainability Committee. He graduated in 2016 from The Pennsylvania State University with Bachelor and Master of Architectural Engineering degrees.

Contact: efogle@hga.com | 703.317.6078

Supporting Ethan on this initiative are:

- **ARIANE LAXO**, CID, IIDA, LEED AP ID+C, EDAC | Sustainability Director
- **ALISSA KINGSLEY**, AIA, LEED AP Sustainability Operations Leader
- **ELIZABETH LERICHE** LEED GA Sustainability Specialist
- **PATRICK DOSS-SMITH**, LEED AP Structural Designer
- **LAUREN PIEPHO**, PE Structural Engineer
- **SARAH JORCZAK** PE, LEED AP BD+C Structural Engineering Discipline leader

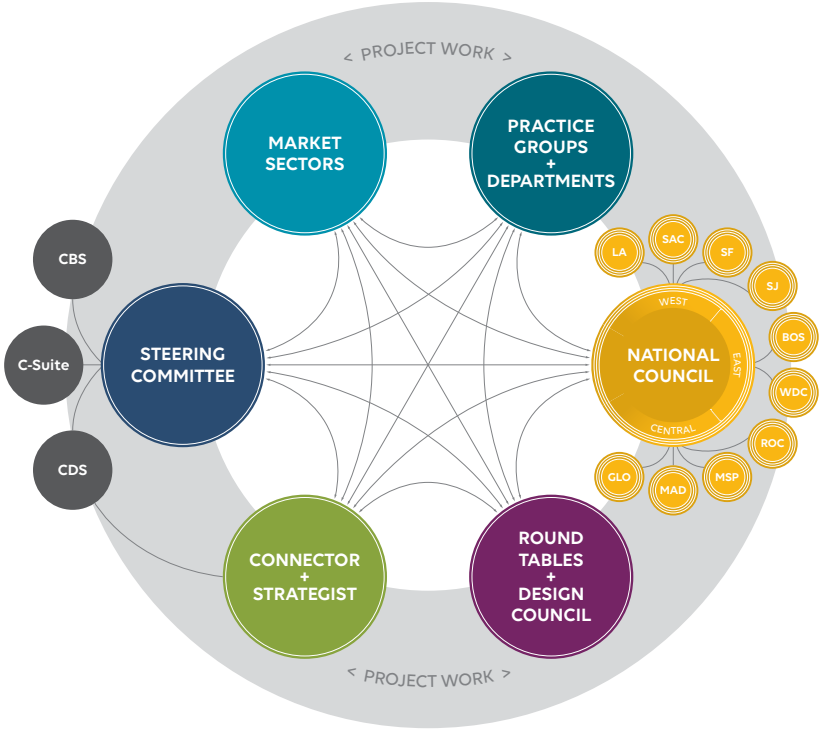


RadioMilwaukee Broadcast Studios

HGA SUSTAINABILITY NETWORK

At HGA, sustainability expertise is connected across all offices, market sectors, practice groups, departments, disciplines, and roles – **EVERYONE HAS THE KNOWLEDGE AND TOOLS TO DO THIS WORK.**

- **STEERING COMMITTEE**
  Set firm-wide strategy
- **CONNECTOR + STRATEGIST**
  Sustainability Director: Ariane Laxo
  Sustainability Operations Leader: Alissa Kingsley
- **NATIONAL COUNCIL**
  Create tools | Refine process | Identify education + expertise needs
- **LOCAL COUNCILS**
  Set local priorities | Education opportunities | Apply to project work
- **LOCAL OFFICES**
  Office Directors | Office Services | Project work



A DEDICATED TEAM

In 2020 we formed a collaborative of architects and engineers to guide the evolution of sustainable practice at HGA, led by our Director of Sustainability, Ariane Laxo. Through our work, we have embraced a vision and strategy for sustainability that relies on a distributed model of knowledge and resources, leveraging best-in-class engineering and expertise in high-performance design—no team member is more than two degrees of separation from the expertise and resources they need. It is through this collective approach that we will continue to elevate the level of sustainable design on every project we touch.

The Trailhead at Theodore Wirth Park

1 EDUCATION

We believe all staff—from business developers to design team members, principals to engineers—should understand why reducing embodied carbon is a priority at HGA. Our education and training strategy will elevate the baseline of knowledge so all have the vocabulary they need to influence carbon reduction on their projects, and raise awareness of the design strategies, available tools, and subject matter experts that can be leveraged to support this work.

FIRMWIDE EDUCATION APPROACH

Background knowledge of embodied carbon is critical for all designers at HGA, whether running LCAs themselves or understanding the basic principles behind specifying materials with lower embodied carbon. Our education strategy is tailored to the audience: those using LCA software will receive hands-on experience with guidance from our subject matter experts, while other design team members will learn terms and concepts so they can ask the right questions during design.

As we work to embed embodied carbon expertise into our process and designs, education efforts will leverage existing channels within HGA. These include our cross-office structural knowledge sharing meetings and larger firmwide meetings and events. Our structural-specific meetings will focus on helping structural engineers understand their agency as it relates to embodied carbon and how to initiate impactful conversations with project teams and clients. Firmwide meetings will help to elevate the base level of embodied carbon knowledge throughout the firm.

To date, HGA has already held an introductory firmwide presentation ("SE 2050 Commitment: Net Zero Embodied Carbon" presented in May 2021) which aimed to define embodied carbon and introduce the SE 2050 Commitment. This was followed by another presentation outlining the recommended workflow for capturing embodied carbon metrics in our projects developed by HGA's LCA team ("SE 2050 Commitment: LCA Workflow Development" presented in August 2021). Next, we plan to issue design guides on the basics of embodied carbon and embodied carbon reductions

EMBODIED CARBON INTEREST GROUP

HGA's LCA Team is committed to embodied carbon reduction and has taken leadership over the education efforts on LCA workflow development and implementation. They collectively sift through research and collect data, helping inform designers of available embodied carbon reduction strategies and offering instruction and guidance on their implementation. The LCA team continually synthesizes research to formulate resources and workflows for designers, with the goal of making embodied carbon reduction efforts more widely a part of everyday practice at HGA.

SE 2050 REQUIREMENTS: EDUCATION

	REQUIREMENTS / ELECTIVES	IMPLEMENTATION
✓	Distribute firm-wide announcement of your firm's pledge to join the SE 2050 Commitment. After the first year, make an announcement sharing your ECAP from the previous year.	HGA issued an internal announcement in February of 2021, informing our employees through multiple channels (internal intranet page, sustainability council meetings, and structural department meetings).
✓	Provide a brief narrative describing how your firm is promoting a firm-wide education program for embodied carbon reduction and the firm's commitment to SE 2050.	See page 6.
✓	Nominate an Embodied Carbon Reduction Champion for your firm. Include a brief profile in your ECAP.	See page 4.
✓	Set a date within the first year to present an "Embodied Carbon 101" Webinar to your firm. Include this resource in your orientation/on-boarding programs.	See page 6.
✓	Minimum (1) additional elective to educate your firm about embodied carbon and a narrative of its significance. The following completed electives reflect our efforts to educate our firm about the urgency of addressing embodied carbon, equipping our employees with the design strategies available to reduce embodied carbon, and elevating the baseline of sustainable design across all disciplines within the firm.	
	• Share the SE 2050 library of resources with technical staff.	The SE 2050 library was presented to the structural engineering department and included in shared team files. It was also posted and made readily available on HGA's internal website.
	• Share embodied carbon reduction strategies with your firm as outlined in the "Top 10 Carbon Reducing Actions for Structural Engineers" document process produced by SE 2050.	The embodied carbon reduction strategies were distributed to all technical staff. They were also shared firmwide in multiple presentations and are posted on HGA's internal website for reference.
	• Present the document "How to Calculate Embodied Carbon" to all technical staff.	The document was shared in multiple firmwide presentations and was also uploaded to HGA's internal website for use as a reference document.
	• Initiate an embodied carbon interest group within your firm and provide a narrative of their goals.	See page 6.

2 REPORTING

Reporting is key to progress. We are dedicated to developing project data collection and reporting tools and an appropriate workflow so capturing baselines, targets, and modeled data becomes integral to our work. In 2021, our first year as a SE 2050 signatory, we pledged to track embodied carbon on five projects. By 2023 we will have developed a tracking process, implemented with consistent tools, on projects. By 2025 HGA will track embodied carbon on all new construction projects.

MEASURING, TRACKING & REPORTING

HGA will use One Click LCA® for measuring and tracking embodied carbon throughout a project. HGA will leverage One Click LCA's Carbon Designer feature for early phase analysis and the Revit-integration tool for detailed material extraction. To aid in early design decisions, our engineers will provide project teams with itemized life cycle assessments (LCAs) of standard structural details to highlight differences in embodied carbon. HGA will track projects with One Click LCA and an internal database that mimics the SE 2050 reporting tool. This will streamline the reporting process.

HGA will work to engage structural engineers early in the design process. Extrapolating early single-bay life cycle assessments over the building footprint can help quickly evaluate structural system options through an embodied carbon lens alongside other typical evaluation metrics. The Carbon Designer tool in One Click LCA can also generate a baseline building for comparison. In later design phases, teams will extract material quantities and track impact categories by using Revit-model integration from One Click LCA. Since EPDs only consistently report life cycle stages A1-A3, these will be HGA's primary focus, but the scope will include A1-C4.

HGA has also compiled a specification resource chart from EPDs in One Click LCA of common structural materials that represent industry standards for the regions of our projects. This resource will allow for comparable baselines to be developed between projects and project types. Project teams can then compare selected materials against the baseline, industry standard selections.

INTERNAL TRAINING STRATEGY

In addition to the embodied carbon educational seminars described in the previous section staff will have access to internal training on One Click LCA's Revit-integration abilities. Structural engineers will be required to attend a seminar walking through the life cycle assessment workflow, outlining the tools and experts who can to help them make informed decisions on embodied carbon. These include LCAs on Revit models, carbon designer baselines, and standardized menu details.

HGA has developed a workflow document and seminar that teaches design teams how to use One Click LCA to discover opportunities for embodied carbon reduction. This resource also informs the LCA capabilities in every design phase. Teams will have access to and awareness of the process for reporting LCA information that guides design decisions on projects.

SE 2050 REQUIREMENTS: REPORTING

	REQUIREMENTS / ELECTIVES	IMPLEMENTATION
✓	Provide a narrative on how your firm plans to measure, track, and report embodied carbon data.	See page 8.
✓	Describe the internal training for embodied carbon measurement you provided or will provide.	See page 8.
✓	Submit an annual minimum of two projects per US structural office but need not exceed five total projects for the firm to the SE 2050 Database.	HGA will submit 5 projects to the SE 2050 database this year including Bowdoin College, which features mass timber construction, and CSU San Bernardino. Both clients are pursuing LEED certification.
✓	Other actions you feel appropriate and a narrative for why.	*LCA Workflow.* HGA developed workflow guidance. This will allow for consistent modeling across projects and project types.. *EPD Recommendations.* HGA developed recommended baseline materials guidance. This will allow for consistent modeling across projects and project types. *Internal Database.* HGA has created an internal database to track embodied carbon across all design phases.

CSU San Bernardino Performing Arts Addition

3 EMBODIED CARBON REDUCTION STRATEGIES

In order to achieve the goals of SE 2050, our LCA subject matter experts will develop embodied carbon education materials for use as resources. By raising the baseline of knowledge among structural Engineers, more staff will be equipped to execute LCA services and identify opportunities to lower embodied carbon as an integral part of their work.

FIRST YEAR REDUCTION GOAL & STRATEGY

HGA's Embodied Carbon Reduction Strategy (ECR) includes pursuing lower-carbon concrete specifications, specifying sustainably sourced wood, optimizing structural design for further material efficiency, salvaging reusable materials, and designing for building reuse or deconstruction. Our goal for year one is to demonstrate each of these five techniques on at least one of our submitted projects to the SE 2050 database.

To track our progress we are in the process of conducting LCAs on past projects within each of HGA's common project sectors: healthcare, public/corporate, science and technology, and ACE (arts, community, and education). Analyzing past projects will allow us to formulate standard internal baselines and set reasonable goals for reducing embodied carbon based on project type.

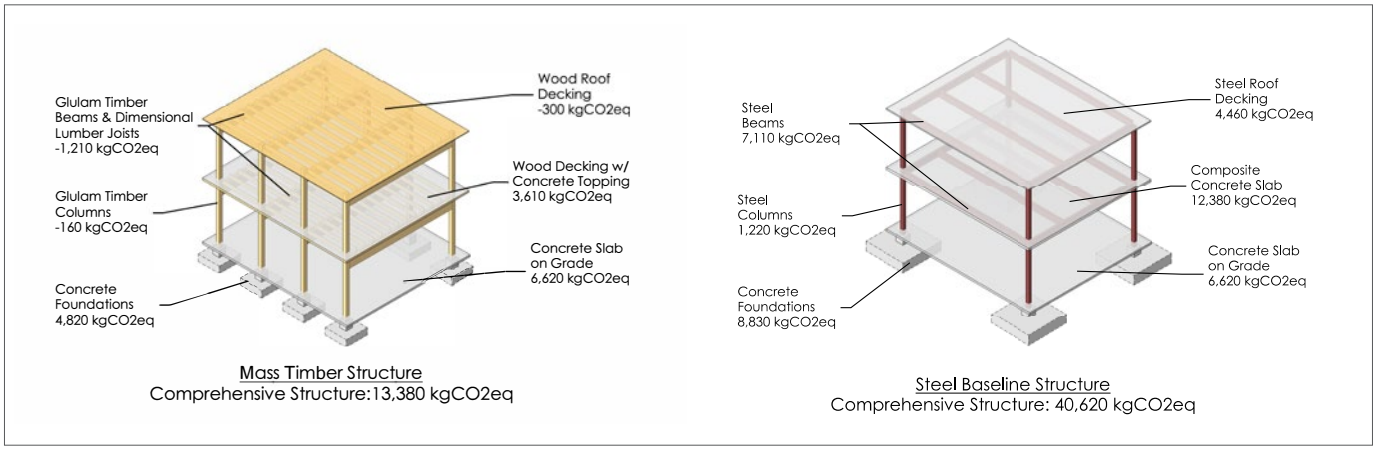
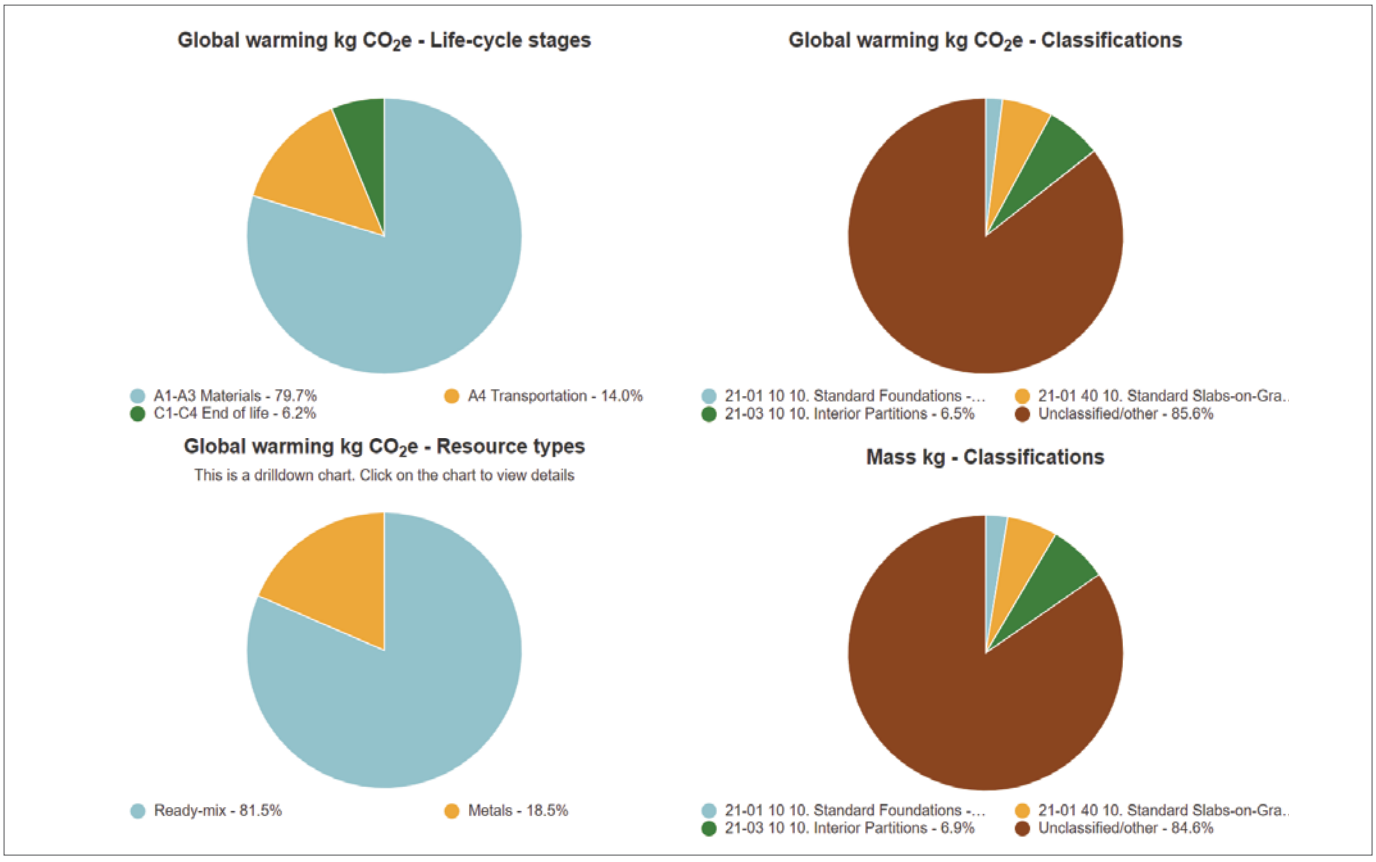


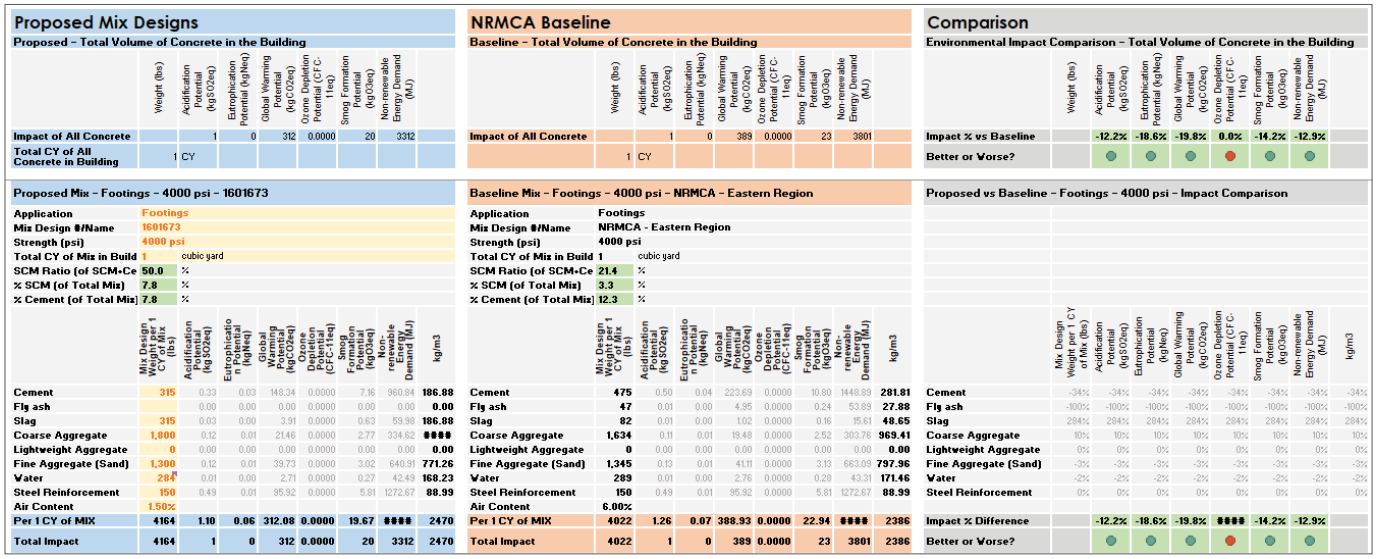
Figure 1. The diagram above shows an embodied carbon comparison study based on LCA data. HGA uses visuals like these during the project concept phase to explore design considerations with clients



Most contributing materials (Global warming) — Compare data

No.	Resource	Cradle to gate impacts (A1-A3)	Of cradle to gate (A1-A3)	Sustainable alternatives	
1.	Ready-mix concrete	611 tons CO_2e	45.3 %	Show sustainable alternatives	Add to compare
2.	Steel roof and floor deck	611 tons CO_2e	45.3 %	Show sustainable alternatives	Add to compare
3.	Structural steel profiles, generic	67 tons CO_2e	5.0 %	Show sustainable alternatives	Add to compare

Figures 2 & 3. These diagrams illustrate how our team uses data to make informed decisions and communicate design options to our clients. Figure 2 (top) shows the graphics generated by One Click LCA. These charts help calculate and visualize results of baseline structural systems and Revit models once created. Figure 3 (bottom) One Click LCA highlights material selection hotspots with the most contribution to global warming potential, as seen in the above table. This data helps inform HGA design teams where the biggest areas for carbon impact reductions can be made..



Proposed Mix Designs

Proposed – Total Volume of Concrete in the Building

	Weight (lbs)	Acidification Potential (kgSO2eq)	Eutrophication Potential (kgNeq)	Global Warming Potential (kgCO2eq)	Ozone Depletion Potential (CFC-11eq)	Smog Formation Potential (kgO3eq)	Non-renewable Energy Demand (MJ)	
Impact of All Concrete		1	0	312	0.0000	20	3312	
Total CY of All Concrete in Building	1	CY						

Proposed Mix – Footings – 4000 psi – 1601673

Application	Footings	
Mix Design #/Name	1601673	
Strength (psi)	4000 psi	
Total CY of Mix in Build	1	cubic yard
SCM Ratio (of SCM+Ce	50.0	%
% SCM (of Total Mix)	7.8	%
% Cement (of Total Mix)	7.8	%

	Mix Design Weight per 1 CY of Mix (lbs)	Acidification Potential (kgSO2eq)	Eutrophication Potential (kgNeq)	Global Warming Potential (kgCO2eq)	Ozone Depletion Potential (CFC-11eq)	Smog Formation Potential (kgO3eq)	Non-renewable Energy Demand (MJ)	kg/m3
Cement	315	0.33	0.03	148.34	0.0000	7.16	960.84	186.88
Fly ash		0.00	0.00	0.00	0.0000	0.00	0.00	0.00
Slag	315	0.03	0.00	3.91	0.0000	0.63	59.98	186.88
Coarse Aggregate	1,800	0.12	0.01	21.46	0.0000	2.77	334.62	####
Lightweight Aggregate	0	0.00	0.00	0.00	0.0000	0.00	0.00	0.00
Fine Aggregate (Sand)	1,300	0.12	0.01	39.73	0.0000	3.02	640.91	771.26
Water	284	0.01	0.00	2.71	0.0000	0.27	42.49	168.23
Steel Reinforcement	150	0.49	0.01	95.92	0.0000	5.81	1272.67	88.99
Air Content	1.50%							
Per 1 CY of MIX	4164	1.10	0.06	312.08	0.0000	19.67	####	2470
Total Impact	4164	1	0	312	0.0000	20	3312	2470

NRMCA Baseline

Baseline – Total Volume of Concrete in the Building

	Weight (lbs)	Acidification Potential (kgSO2eq)	Eutrophication Potential (kgNeq)	Global Warming Potential (kgCO2eq)	Ozone Depletion Potential (CFC-11eq)	Smog Formation Potential (kgO3eq)	Non-renewable Energy Demand (MJ)	
Impact of All Concrete		1	0	389	0.0000	23	3801	
	1	CY						

Baseline Mix – Footings – 4000 psi – NRMCA – Eastern Region

Application	Footings	
Mix Design #/Name	NRMCA - Eastern Region	
Strength (psi)	4000 psi	
Total CY of Mix in Build	1	cubic yard
SCM Ratio (of SCM+Ce	21.4	%
% SCM (of Total Mix)	3.3	%
% Cement (of Total Mix)	12.3	%

	Mix Design Weight per 1 CY of Mix (lbs)	Acidification Potential (kgSO2eq)	Eutrophication Potential (kgNeq)	Global Warming Potential (kgCO2eq)	Ozone Depletion Potential (CFC-11eq)	Smog Formation Potential (kgO3eq)	Non-renewable Energy Demand (MJ)	kg/m3
Cement	475	0.50	0.04	223.69	0.0000	10.80	1448.88	281.81
Fly ash	47	0.01	0.00	4.95	0.0000	0.24	53.88	27.88
Slag	82	0.01	0.00	1.02	0.0000	0.16	15.61	48.65
Coarse Aggregate	1,634	0.11	0.01	19.48	0.0000	2.52	303.76	969.41
Lightweight Aggregate	0	0.00	0.00	0.00	0.0000	0.00	0.00	0.00
Fine Aggregate (Sand)	1,345	0.13	0.01	41.11	0.0000	3.13	663.03	797.96
Water	289	0.01	0.00	2.76	0.0000	0.28	43.31	171.46
Steel Reinforcement	150	0.49	0.01	95.92	0.0000	5.81	1272.67	88.99
Air Content	6.00%							
Per 1 CY of MIX	4022	1.26	0.07	388.93	0.0000	22.94	####	2386
Total Impact	4022	1	0	389	0.0000	23	3801	2386

Comparison

Environmental Impact Comparison – Total Volume of Concrete in the Building

	Weight (lbs)	Acidification Potential (kgSO2eq)	Eutrophication Potential (kgNeq)	Global Warming Potential (kgCO2eq)	Ozone Depletion Potential (CFC-11eq)	Smog Formation Potential (kgO3eq)	Non-renewable Energy Demand (MJ)	
Impact % vs Baseline		-12.2%	-18.6%	-19.8%	0.0%	-14.2%	-12.9%	
Better or Worse?								

Proposed vs Baseline – Footings – 4000 psi – Impact Comparison

	Mix Design Weight per 1 CY of Mix (lbs)	Acidification Potential (kgSO2eq)	Eutrophication Potential (kgNeq)	Global Warming Potential (kgCO2eq)	Ozone Depletion Potential (CFC-11eq)	Smog Formation Potential (kgO3eq)	Non-renewable Energy Demand (MJ)	kg/m3
Cement	-34%	-34%	-34%	-34%	-34%	-34%	-34%	-34%
Fly ash	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
Slag	284%	284%	284%	284%	284%	284%	284%	284%
Coarse Aggregate	10%	10%	10%	10%	10%	10%	10%	10%
Lightweight Aggregate	0%	0%	0%	0%	0%	0%	0%	0%
Fine Aggregate (Sand)	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%
Water	-2%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
Steel Reinforcement	0%	0%	0%	0%	0%	0%	0%	0%
Impact % Difference		-12.2%	-18.6%	-19.8%	####	-14.2%	-12.9%	
Better or Worse?								

Figure 4. HGA uses public tools like the concrete LCA calculator above to assess concrete mix designs on projects.

CASE STUDY
BOWDOIN COLLEGE

ARCTIC MUSEUM &
CLASSROOM BUILDING

BRUNSWICK, MAINE

A CATALYST FOR RESEARCH & DIALOGUE

This pair of new buildings will provide a new home for Bowdoin's storied Peary-MacMillan Arctic Museum, a new event space, and state-of-the-art educational facilities.

The museum includes two new galleries: a permanent 'Orientation Gallery' serves as an introduction of the collection to visitors and scholars, while a larger 'Changing Gallery' allows space for temporary exhibitions, events, traveling artifacts, and student installations. The lobby and Orientation Gallery prioritize flexibility, while at the same time take advantage of light, views, and spatial volume to produce memorable architectural experiences.

The museum is an all electric, low net-carbon building designed with a simple material palette of masonry, exposed timber, and white walls. This will be the first commercially scaled mass timber project in the state of Maine, reducing the building's amount of embodied carbon by 75%. The project has just completed documentation and is awaiting construction.

PROJECT DATA

Size: 45,900 GSF New Construction

Completion: November 2022 (estimated)

HGA Services: architectural design, structural engineering, MEP engineering, interior design

SUSTAINABILITY CHALLENGE

Minimizing the Center's carbon footprint was an important driver in the building's design and program's messaging. HGA's integrated, interdisciplinary design team leveraged multiple building systems, including the use of mass timber structural framing and careful mechanical system design, to achieve the College's desire to have the museum contribute to a "fossil-fuel free" narrative while meeting museum-level temperature and humidity requirements.

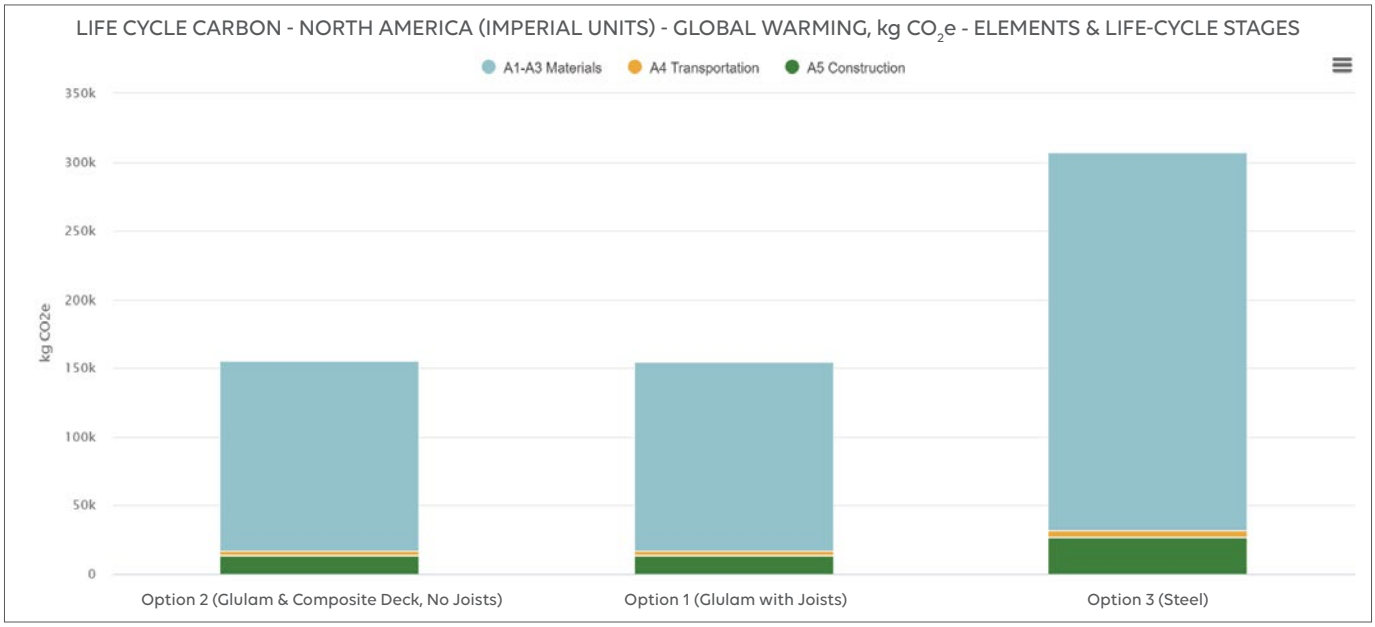


Fig. 5 The Life Cycle Carbon Elements & Life-Cycle Stages data above shows how three different structural design options compare and their respective carbon dioxide emissions. Blue represents the A1-A3 scope, from which the most significant embodied carbon emissions emanate. From this data, it is evident that Option 3 has the greatest global warming potential.

LIFE-CYCLE ASSESSMENT

To help decide on the building structural system, HGA used life-cycle assessment (LCA) data. The process of generating bay designs to compare via LCA helped refine the One Click LCA workflow. HGA leveraged the software to evaluate material specifications and identify opportunities earlier in the design process to allow greater cost and carbon savings.

This project has helped HGA determine a helpful timeline of applicable actions in each design stage; expanding upon CLF's "Road Map to Reducing Building Life Cycle Impacts". HGA foresees using the Carbon Designer tool in One Click LCA to gather an estimated baseline of carbon emissions in the Pre-Design stage. This, supplemented by the use of the Revit-integration One Click LCA tool, allows for earlier embodied carbon evaluation on structural bay options to maximize impact for carbon reductions.

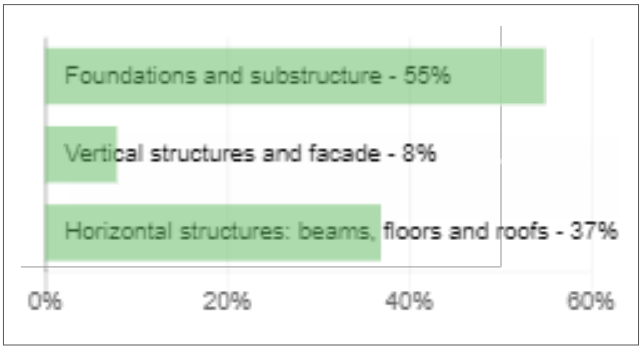


Fig. 6 Consistently across the mass timber and steel options the majority of carbon reduction potential lies in the horizontal structural system.

Structural bay options inform both the client and the design team where carbon and cost saving potentials are, allowing for educated choices and advocacy for lower embodied carbon options.

SE 2050 REQUIREMENTS: EMBODIED CARBON REDUCTION STRATEGIES

	REQUIREMENTS / ELECTIVES	IMPLEMENTATION
✓	Set an EC reduction goal for the coming year and an implementation narrative. Qualitative goals focused on education are appropriate for the first year.	HGA will first focus on accurately and consistently quantifying embodied carbon. Our goal is to implement all five of the strategies below on at least one project reported to SE 2050. 5 strategies: lower-carbon concrete specifications; sustainably-sourced wood; structural system optimization; salvaging reusable materials; designing for reuse or deconstruction
✓	For second year's ECAP and beyond, provide a narrative about what you have learned about embodied carbon reduction in the past year. Describe successes and misses to help the program improve.	This will be updated for our 2022 (second year) ECAP.
✓	Minimum one additional elective you undertook to reduce embodied carbon in your designs, why you chose the elective and its significance.	See below.
	• Incorporate data visualization into your ECAP. How are you looking at data to make informed design decisions and communicate design options to your clients?	Figures 2–4 on page 11 display One Click LCA's graphics which analyze embodied carbon by life cycle stage and material type. HGA leverages data on embodied carbon hotspots for specifying materials with less global warming potential to maximize the most impactful reductions.
	• Provide a project case study in your ECAP sharing embodied carbon lessons learned.	See pages 12–14.
	• Complete an embodied carbon comparison study during the project concept phase.	Figure 1 on page 10 shows a comparison between steel and mass timber structures for a client.
	• Update your specifications and incorporate embodied carbon performance. Include embodied carbon in your submittal review requirements.	HGA will use industry guidance to modify our concrete specification for less embodied carbon in our mix designs.

4 ADVOCACY

HGA's approach to advocacy will focus on building connections with other industry experts and organizations. Our commitment to SE 2050 serves this purpose by joining forces with other industry professionals to share data, resources, and strategies.

KNOWLEDGE & DATA SHARING TO ACCELERATE REDUCTION

Reporting data from our own internal database will not only educate HGA employees, but also push our industry to do better as more metrics are gathered around embodied carbon.

HGA also has representation in the Carbon Leadership Forum (CLF) Minnesota Local Hub. This is a group of Minneapolis-based firms sharing embodied carbon knowledge and resources, and working with industry experts to reduce embodied carbon.

By considering embodied carbon early in projects and specifying materials with lower global warming potential, we are is making a statement to the manufacturing and extraction industry to also fulfill their role in helping achieve the goal of net-zero embodied carbon by 2050. With more demand for lower embodied carbon products, manufacturers will be incentivized to develop and invest in methodologies that generate fewer emissions. HGA's development of a performance-based concrete specification is an example of this. The specification allows for lower embodied carbon mix designs. By engaging concrete suppliers with this request, we are encouraging the market to trend towards sourcing lower embodied carbon concrete.

ADDED CLIENT VALUE

As a firm committed to SE 2050, HGA brings an advanced, holistic lens for evaluating building impacts and guiding project decisions. Our considerations include the six impact categories associated with LCA, as well as product-specific replacement needs, evaluating end of life scenarios, healthy materials, and impacts of material industries on community development. When we optimize our designs, embodied carbon will be a parameter for evaluation.

Lower embodied carbon often translates to less material and less cost. While many owners might think solely in terms of dollars, it is our responsibility to communicate the additional value of embodied carbon reduction strategies beyond the financial realm. An example of this is in the Building Life parameter of an LCA. Assuming a longer life span in the LCA might make the numbers look good, but we understand that there is a deeper conversation to be had with our clients about the life of their building. We will strive to add value beyond dollars saved by taking the time and effort to design buildings that will last a lifetime.

INCENTIVIZING INDUSTRY-WIDE CHANGE

With the help of industry experts, we have developed a performance-based concrete specification. This will allow for lower embodied carbon concrete mix designs and give suppliers more control over how to achieve embodied carbon targets. Our implementation of this specification, together with other firms in the industry, will incentivize low carbon solutions as demand for such products increases.

Similarly, HGA promotes sustainably sourced mass-timber which encourages transparency and certification of reduced environmental impacts from this industry. These efforts are instrumental in creating sustainability stories that align with client goals. When our design team can connect the dots between lowering embodied carbon and important client goals (such as lower project costs when fewer, longer-lasting materials are used) we will become better engineers and help our clients make informed decisions regarding their own journey to a net-zero carbon future.

SE 2050 REQUIREMENTS: ADVOCACY

	REQUIREMENTS / ELECTIVES	IMPLEMENTATION
✓	Provide a narrative about how you plan to share knowledge and data to accelerate adoption of embodied carbon reduction.	See page 16.
✓	Describe the value of SE 2050 to clients. How can we collaborate to drive adoption? At your option, attach any associated marketing materials.	See page 16.
✓	Declare your firm as a member of the SE 2050 commitment on boilerplate proposal language.	Our boilerplate proposal language declares HGA as a member of SE 2050.
✓	Share your commitment to SE 2050 on your company website.	HGA announced its public commitment to SE 2050 on February 11th, 2021. Click here to view the official announcement on our website. The news was also shared in our latest client newsletter, Happening Now: Sustainability.
✓	Discuss with the owner/client the option of requiring that some of the structural materials come with facility-specific or product-specific EPDs.	HGA presents this as an option to clients during sourcing discussions and also use this, if necessary, as an educational opportunity for the owner/client on the importance of sourcing these specifications.
✓	Provide a narrative of how you have encouraged industry and policy change incentivizing availability of low-carbon and carbon sequestration materials.	See page 16.
	Share your best case studies in your ECAP.	See pages 12–14.

ABOUT OUR FIRM

At HGA we have the unique opportunity to leave a positive impact on the world; not only with beautiful, functional buildings, but also with responsible, sustainable development. We believe that enduring, impactful design can only hold that distinction if it fulfills its responsibility to our clients and to the environment.

AN INTEGRATED, HOLISTIC APPROACH

With over 65 years of experience working as an interdisciplinary design firm, we have developed an integrated, holistic approach to our work. Collaboration happens early and often, resulting in innovation throughout the design process. Our architects, engineers, interior designers, planners, and researchers have built a network of expertise and a culture of knowledge-sharing to address the increasing complexities faced by our clients.

We start every project by listening carefully to our clients, building a vision for sustainability that

ARCHITECTURE | COMMISSIONING | DIGITAL PRACTICE | ENGINEERING | INTERIOR DESIGN

Cottage Grove Ravine Regional Park Trailhead

embodies our clients' values. That vision is realized through ideas that reflect our desire to understand and optimize all aspects of a project's performance: human experience, technical rigor, cultural significance, and systems efficiency.

AN INSPIRED FUTURE

Our growing portfolio of sustainable projects encompasses citywide master plans to complex new construction to small renovations. We have added resources in early design modeling and simulation, environmental analysis, and energy and compliance modeling, and increased our support for teams deepening their knowledge and capabilities in certification programs like LEED, WELL, and the Living Building Challenge. Our clients, colleagues, and resources—fueled by our curiosity and commitments—are inspiring our future.

Human experience is at the core of any successful design solution. Our aim is to create spaces that are embraced by the owners, users, operators, and community members they impact. A beloved building—one so treasured it lasts for generations—is beautiful and truly sustainable.

LANDSCAPE ARCHITECTURE

LIGHTING DESIGN

PLANNING

SUSTAINABLE DESIGN

TECHNOLOGY

HGA