

# EMBODIED CARBON ACTION PLAN

## 2024



**McNAMARA · SALVIA**  
STRUCTURAL ENGINEERS

[mcsal.com](http://mcsal.com)

# COMMITMENT

## OUR COMMITMENT

McNamara ▪ Salvia, Structural Engineers is a 170-person firm located in Boston, New York, Miami, Orlando, West Palm Beach, Denver, and Pune. We are fully committed to reducing the carbon impact of our structures and understand that we have a significant role to play in creating a sustainable future. Embodied carbon reduction will be achieved through new technologies, design optimization methods, construction methods, and innovative materials. We recognize sustainability is a holistic goal and are dedicated to working with our clients to make measurable improvements on all of our projects. McSal signed the SE 2050 Commitment Program in order to advance this goal not only throughout our firm but, across the industry.

The SE 2050 Commitment is multifaceted with focus areas in education, reporting, reduction, and advocacy. It challenges engineers across the industry to reduce embodied carbon in our structures in order to be carbon neutral by the year 2050. This Embodied Carbon Action Plan (ECAP) lays out our steps for the upcoming year to meet the goals of the SE 2050 Commitment.



69 A Street  
South Boston, MA





# TEAMWORK

## McSAL SE 2050 TEAM



**AJ UNANDER, P.E., S.E.**  
EMBODIED CARBON CHAMPION  
DENVER OFFICE



**KATHLEEN TEER, P.E.**  
SE 2050 COMMITTEE MEMBER  
BOSTON OFFICE



**RYAN SULLIVAN, P.E.**  
SE 2050 COMMITTEE MEMBER  
BOSTON OFFICE



**ASTRID MATHEUS**  
SE 2050 COMMITTEE MEMBER  
MIAMI OFFICE



**ANDRES SANCHEZ**  
SE 2050 COMMITTEE MEMBER  
MIAMI OFFICE



**PATRICIA AGUIAR**  
SE 2050 COMMITTEE MEMBER  
NEW YORK OFFICE



**TYLER NORMAN**  
SE 2050 COMMITTEE MEMBER  
NEW YORK OFFICE

# EDUCATION

## EDUCATION GOALS

At McNamara ▪ Salvia, our 2024 goal is that every engineer will not only understand embodied carbon, but will be able to explain it to each other, to clients, and to the general public. We have provided a vast amount of resources for staff to become educated on the topic. We also provide special in-house presentations on the topic.

In a recent anonymous company survey 90% of our staff knew what Embodied Carbon was and 70% said it had come up on a recent project. This shows we are well on our way to educating the staff on the problem and our role in it as Structural Engineers. We intend to send similar surveys yearly to continually gauge staff's understanding and implementation of embodied carbon reduction techniques.

**“We must all be individual advocates for sustainability. However, as Structural Engineers our daily decisions can have over-sized impacts on the environment. It is our responsibly to continually affect change in our Industry through innovation and education.”**

– Kathleen Teer, P.E. | Associate Principal





## SHARING KNOWLEDGE

Clients are starting to catch on that structure is nearly always the lead contributor to embodied carbon and we welcome the spotlight. Various government regulations have begun to highlight embodied carbon, especially in Boston and Denver. This has created opportunities for us to share what we have learned regarding embodied carbon sources and reduction techniques. It is no longer a foreign concept to many clients, but often a top concern leading to greater conversation and collaboration on the topic.

We have also had success partnering with concrete suppliers and subcontractors now that many have seen our updated Performance-Based Concrete Specification on projects. Questions and concerns have come up, but once there is an understanding of the specifications and added GWP constraints, they have been on board.

There is still work to be done educating every client, down to the end-user, but we are encouraged by the focus on embodied carbon over the last year.

Early communication and quick feedback are critical to starting all projects on a path to successful reduction. McSal has a new in-house Timber Massing Tool created by our MACRO Workshop. This tool allows our Engineers to provide real-time design and optimal layouts using biogenic products.

The McSal Timber Massing Tool is used to quickly determine efficient timber material and layout, providing relevant volumes for embodied carbon and pricing checks

**Design Output**

McNAMARA · SALVIA  
STRUCTURAL ENGINEERS

Launch Summary Report

**Material Volumes**

CLT Panel	55.1%
Glulam	32.9%
Concrete	12.0%

**Material Volume Data:**

CLT Panel	0.573 cf/lf
Glulam	0.342 cf/lf
Concrete	0.125 cf/lf
<b>Total Timber</b>	<b>0.915 cf/lf</b>
<b>Total Concrete</b>	<b>0.125 cf/lf</b>

**Structural Configuration**

<b>Bay Dimensions</b>	31.25 ft X 24.286 ft
<b>Total Building Area</b>	765,000 sq. ft.
<b>Panel Size</b>	5 ply: 175-5s / 6-7/8"
Controlling	Vibration (94.8%)
<b>Joist Size</b>	7-1/4 x 31-5/8
Controlling	Moment Strength (88.0%)
<b>Girder Size</b>	15-1/2 x 33-5/8
Controlling	Moment Strength (97.3%)
<b>Largest Column Size</b>	21-3/4 x 35-5/8
Controlling	Compression (99.0%)
<b>Smallest Column Size</b>	7-1/4 x 9-1/2
Controlling	Compression (93.0%)

# REDUCTION

## REDUCTION STRATEGY

We are committed to having measurable reduction of embodied carbon in our projects. The first step in this process is accumulating and deciphering project data. This will help us to create targeted strategies and track our progress.

The following data will be used to track improvements in GWP reduction in 2024:

- Projects requiring a minimum reduction in GWP. What percentage is tied to concrete?
- Collection of EPD submittals including concrete mixes.
- Collection of WBLCA reports, whether by us or by a third-party consultant.

During the concept phase, we will complete an embodied carbon comparison study in conjunction with studies for structural system selection. This also provides a way to track project goals through all design phases. We will continue to collaborate with a local concrete suppliers to ensure our performance-based criteria is updated to reflect current material variabilities, markets, and technologies.

McNamara ▪ Salvia has an extensive portfolio of adaptive reuse projects. These projects give us opportunities to efficiently reuse existing structure and foundations, avoiding full replacement of carbon-rich structural elements.

“The greatest contribution to sustainability that a structural engineer can make is to do his or her job exceptionally well. A more efficient structure is a more sustainable structure.”

– Bart Sullivan, P.E. | Principal

## ADAPTIVE REUSE



## REPORTING PLAN

Since Embodied Carbon is a conversation on many of our larger projects, we take a combined approach of compiling this data. On some jobs we are the consultant requested to perform an LCA and will do so utilizing Tally in combination with our Revit models. On other projects, there is a third-party sustainability engineer contracted to perform an LCA and we have utilized their findings in our reporting as well.

We request EPDs for the structural steel and concrete on our projects through our Baseline Specifications. When these are not available (ie. during design) we utilize the EC3 Tool, NRMCA Regional Averages, AISC Industry Averages, and defaults in Tally to assign material GWP.





## ELECTIVE DOCUMENTATION

### EDUCATION:

- We encourage employees to continue educating themselves on SE 2050 and embodied carbon by directing them to the numerous resources on the SE 2050 website. The next internal presentation (McSal EDU) is planned for late Spring 2024. Our goal is to address any knowledge gaps highlighted by our internal embodied carbon survey.
- The McSal SE 2050 Network Library is accessible to all employees and will be updated regularly with new research, reduction techniques, and miscellaneous tools related to calculating and reducing embodied carbon in structures.
- AJ Unander, P.E., S.E. will continue this year as Embodied Carbon Champion. AJ is an Associate and Office Director working in Denver, Colorado and has had an interest in embodied carbon since studying at MIT under one of the leading researchers in the topic. The remaining members of the team can be seen on page 2.

### REPORTING:

- McNamara ▪ Salvia submitted five anonymous projects this year to the SE 2050 Database, with plans to increase this number every year.

### ADVOCACY:

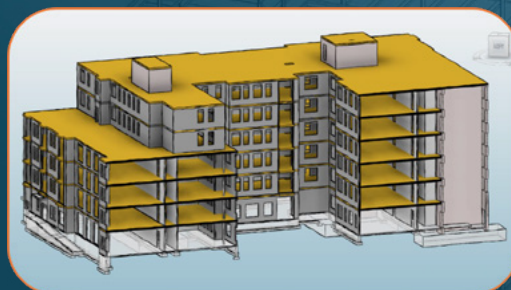
- Our staff has engaged in Embodied Carbon Charettes with Architectural Clients to brainstorm ways to improve sustainability while maintaining architectural vision. SE 2050 is highlighted as a driving force in the conversation.
- Sustainability Services have been added to our website, with our SE 2050 Commitment highlighted. Enhanced services include material tracking directly in BIM model formatted to preferred Global LCA tracking software.
- We continue to update our website with new company initiatives related to embodied carbon, SE 2050, and LCA services.
- Our template proposal will be revised to include language about our commitment to SE 2050.
- Bryan Maltais, P.E. Associate and in-house Mass Timber Champion, participated in a virtual presentation by WoodWorks entitled "Mass Timber in New England and Beyond: A Solution to Housing Challenges" on February 21, 2024. Additional presentations are expected.

**BRYAN MALTAIS, P.E.**

ASSOCIATE | MASS TIMBER CHAMPION



MASS TIMBER AT  
BUNKER HILL HOUSING





# ELECTIVES (CONT.)

## REDUCTION:

Below are a few of the of internal changes implemented in 2023:

- The baseline Cast-in-Place Concrete Specification includes a minimum 20% reduction in GWP from the current NRMCA Cradle-to-Gate Life Cycle Assessment of Ready-Mixed Concrete Regional Average.
- Early discussion is encouraged with the Design and Ownership Team to make them aware of this recommended baseline and suggest even more reduction.
- The baseline Cast-in-Place Concrete Specification has adjusted to a performance-based approach, eliminating the prescriptive-based approach of the past. This gives flexibility to the Concrete Supplier to reach the specified GWP while still meeting ACI performance measures.
- EPDs are required for all concrete mixes and structural steel products in our current baseline specification. Early discussion with Contractor and Concrete Supplier is encouraged to ensure testing and EPDs will be available in a timely manner not affecting the construction schedule.
- In some cases, 56-day or 90-day strength mixes are accepted, in lieu of traditional 28-day. This is dependent on concrete element, loading, and construction schedule. This proved to be an effective solution to increase SCMs.

## SPOTLIGHT ON:

### Harvard Enterprise Research Campus (ERC)

East and West Laboratory Buildings

Boston, Massachusetts



#### ERC STEEL TONNAGE REDUCTION TRACKING

Both lab towers have complex architectural massing. In particular the West Lab with dramatic faceted setbacks. McSal worked closely with the team to reduce steel tonnage while maintaining the unique expression. This was accomplished through a series of sloping columns, stepped beams, and carefully placed columns.

#### ERC CONCRETE

- Variable thickness foundation mat reduced total concrete volume by targeting thicker zones only where required by analysis.
- Average 67% SCM replacement with 90-day foundation mix.
- Embodied carbon footprint reduction for total project = 20%
- Embodied carbon reduction for concrete from NRMCA V3 benchmark = 25%

# LOOKING BACK

## LESSONS LEARNED

As we enter into our fourth year in the SE 2050 Commitment, we want to take stock of all we've learned in the first few years. Compiling and reporting embodied carbon data for the program has become easier since many of our projects now include WBLCAs and we can utilize those results directly to report to SE 2050. This strategy was part of our lessons learned in 2022.

We have started to provide LCA services for the structural materials found in our own Revit models, which gives us a way to track embodied carbon as the design phases progress. As the project approaches final construction, the design phase LCAs lose accuracy without a fully coordinated construction model. Coordination and early buy-in with the Construction Management team is essential in providing an accurate LCA post construction.

Not all ownership groups are willing (or able) to increase the project budgets to ensure reduction of embodied carbon. It is up to the Design Team, and in particular the Structural Engineer, to find creative ways to increase structural efficiency and reduce embodied carbon while reducing costs at the same time. We continue to educate and work closely with our clients to ensure we provide this reduction without compromise to budget, architecture, or program.

