

## SE2050

# 2025 Embodied Carbon

# **Action Plan**

# March 17, 2025



# JIRSA Hedrick STRUCTURAL ENGINEERS

# **DELIVERING COLLECTIVE INGENUITY**





## JIRSA HEDRICK 2025 EMBODIED CARBON ACTION PLAN Pt 1. Introduction

The third year of Jirsa Hedrick's involvement in SE2050 has been very successful with several milestones and achievements to boast. Jirsa Hedrick performed Life Cycle Assessments (LCA's) on two major projects; presented a sustainability focused presentation to several groups of architects at the Colorado AIA event; presented sustainability focused presentations at multiple architecture firms; participated in the Structural Engineer's Association of Colorado Sustainable Design Committee; created and shared sustainable design insight on social media. This ECAP will cover Jirsa Hedrick's SE2050 work from spring of 2024 through Spring of 2025. This ECAP will cover the work that has been done in that time in the four action categories of *Education, Advocacy, Reporting, Reduction.* 

Jirsa Hedrick has defined three phases to develop SE2050 information and goals to help define the scope of SE2050 work each year. The three phases established are: knowledge growth, knowledge implementation, and SE2050 target date reduction.

#### Knowledge Growth

- Perform initial LCA's for multiple project types.
- •Learn various LCA software to establish best software for JH specific needs.
- •Establish LCA calculation criteria such as waste and surplus increase multipliers.
- Establish baseline embodied carbon values for typical projects of various material types and occupancy.
- Learn about ongoing sustainable technologies including sustainable design strategies, sustainable products and sustanability focused legislation.

#### Knowledge Implementation

- Perform LCA's using established criteria for consistent LCA comaparison.
- Define standard LCA calculation policy in office LCA process manual.
- Implement various low cost sustainable design strategies into projects to initiate conversations with the design team, project ownership and construction teams to gain understanding of ease of implementation.
- Work with Sustainable Design Committee to establish local sustainable design resources.

#### SE2050 Target Date Reduction

- •Actively work towards 4% baseline embodied Carbon reduction per year in an effort to achieve 0 net embodied Carbon by 2050.
- Use LCA calulations during design to inform design decisions with sustainability as a serious constraint.
- •Implement major Carbon reduction strategies and technologies such as Carbon sequestration concrete products, mass timber design, material reuse, recycled materials, etc.
- Advocate for major carbon reduction in local structural designs.





## JIRSA HEDRICK 2025 EMBODIED CARBON ACTION PLAN Pt 2. Education Plan

#### **OVERVIEW:**

The Jirsa Hedrick embodied carbon education plan is intended to provide all Jirsa Hedrick employees with the necessary information to make informed embodied carbon design decisions. The embodied carbon education initiative will be accomplished through multiple carbon-focused office technical meetings as well as encouragement for attending outside seminars on sustainable design. Our carbon champion will lead these meetings and provide information from research, webinars, and interaction with other Denver area SE2050 signatory firms who have shared their lessons learned. Jirsa Hedrick currently holds technical meetings every Thursday for discussing miscellaneous technical topics; we anticipate the embodied carbon education initiative will take place during these technical meetings roughly once every few months.

#### Goals:

The primary goal of the Jirsa Hedrick embodied carbon education plan is to ensure all engineers have the knowledge necessary to make informed carbon reduction decisions in design. The success of our education initiative will be measured by our ability to achieve the following goals:

- 1. Inform design team about sustainable design in all major material types (ie wood, steel concrete, masonry, etc)
- 2. Inform engineers about the Life Cycle Analysis calculation process
- 3. Inform staff about SE2050 values and goals

#### Looking back on last year:

**1.** Provide a narrative of how the Embodied Carbon Reduction Champion will engage embodied carbon reduction at each office.

The Jirsa Hedrick Embodied Carbon Champion has been designated as the leader in finding out about new carbon reduction strategies and getting that information out to the technical design team. The embodied carbon champion attends sustainability focused seminars and meetings and presents any valuable lessons learned to the design team. It is the





responsibility of the carbon champion to ensure the design team is aware of trends and new concepts in sustainable design.

2. Present at least (1) webinar focused on embodied carbon and make a recording available to employees.

This year's internal sustainable design learning session was presented by Prometheus Concrete. Prometheus is developing biologically based cement substitutes to reduce the carbon footprint of concrete mixes. The head of engineering with Prometheus delivered an in-depth presentation explaining concrete production global emissions, current state of the cement industry and how Prometheus technology works to replace the cement in various concrete mixes to yield a concrete mix with substantially less embodied carbon.

A second sustainability focused presentation was delivered by the steel producer Arcelor-Mittal. A speaker from Arcelor-Mittal was invited to the Jirsa Hedrick office technical meeting to explain sustainable steel production strategies and discuss how Arcelor-Mittal produces steel with decreased embodied carbon compared to various other suppliers.

The presentations for the Prometheus and Arcelor-Mittal meetings were both recorded and preserved for employees to revisit in the future as needed.

#### Looking Forward to next year:

- Recurring Technical Meetings: There are always new subjects being presented at the Jirsa Hedrick technical meetings and next year we will have an array of new topics to explore including:
  - 1. Presentations from sustainable material companies
  - 2. Embodied carbon LCA tools
  - 3. Carbon reduction in concrete construction
  - 4. Carbon reduction in steel construction
  - 5. Carbon offset strategies
  - 6. Embodied carbon legislation
  - 7. Local Colorado embodied carbon resources and EPDs

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## JIRSA HEDRICK 2025 EMBODIED CARBON ACTION PLAN Part 3. ADVOCACY PLAN

#### Overview:

Jirsa Hedrick is eager to face the challenge of spreading awareness of embodied carbon reduction initiatives in the local Denver and greater Colorado area. We hope to spread awareness in as many ways possible as outlined below by utilizing face to face client communication, social media posts, business development networking, and policy creation/support.

#### Goals:

The primary goal of the Jirsa Hedrick embodied carbon knowledge sharing initiative is to grow the awareness and understanding of embodied carbon reduction in the local market with the hope that such awareness spreads nationally. The annual goals for external knowledge sharing are as follows:

- 1. Spread sustainable design knowledge within the local engineering community
- 2. Inform and persuade design teams toward sustainable design
- 3. Spread useful sustainable design information on social media platforms
- 4. Impact local sustainability focused design code provisions

#### Looking back on last year:

1) Describe the value of SE 2050 to clients.

All proposals for new projects include an overview of SE2050 values and how Jirsa Hedrick implements various strategies to stay in alignment with the goals of SE2050.

#### 2) Publicly declare your firm as a member of the SE 2050 Commitment.

Jirsa Hedrick has an active social media presence and has used its various platforms to not only announce SE2050 membership, but also discuss sustainable design topics that move the industry forward towards net zero design.

3) Give an external presentation on embodied carbon that demonstrates lessons learned.

Jirsa Hedrick has held various information sessions and presentations to architecture groups that share what we've learned so far. For the second year straight Jirsa Hedrick attended the AIA Colorado convention and presented a brief but informative talk about adaptive reuse. This presentation, called "Sustainability in Structural





Design", was also delivered at over a dozen architecture firms around the Denver area with the hope of increasing awareness of various structural strategies to reduce embodied carbon.

#### 4) Participate in local engineering sustainability committees.

Jirsa Hedrick's Carbon Champion is a member of the Structural Engineering Association of Colorado Sustainable Design Committee. Tasks of the committee include researching various sustainable design ideas, presenting information to the broader Structural Engineering Association of Colorado member body, developing sustainable design recommendations and where possible interacting with committees in charge of sustainable code creation. Some of the work done by the Jirsa Hedrick Carbon Champion includes review and suggested revisions to the Colorado Model Green Code and development of committee resources.

#### Looking Forward to next year:

- Client interaction: One of the most impactful means of knowledge sharing is in the early
  planning stages of a project through persuasion of architects and owners to the value of
  carbon reduction in material selection. By explaining the possible strategies for embodied
  carbon reduction early in a project the design team has the best chance of incorporating
  sustainable design features early on and designing within those constraints. In addition, Jirsa
  Hedrick will continue presenting about "Sustainable Structural Design" to several local
  architecture firms to educate architects of structural sustainability strategies.
- Social Media Posts: Jirsa Hedrick typically posts project updates, local building coverage, company events and exciting news on a weekly basis to multiple social media accounts. As part of the SE2050 knowledge sharing initiative, we will post about sustainability related news and products throughout the year.
- Business Development Networking: Jirsa Hedrick typically attends monthly business
  development meetings with local industry professionals. As part of the SE2050 knowledge
  sharing initiative, Jirsa Hedrick will engage in embodied carbon reduction discussions and
  work to grow the knowledgebase in the local market.





## JIRSA HEDRICK 2025 EMBODIED CARBON ACTION PLAN Part 4. Reporting

#### Overview:

Jirsa Hedrick has completed a handful of life cycle analysis as part of our Phase I stage of embodied carbon reduction. This initial phase of participation is focused towards establishing baseline design values to gain understanding of the embodied carbon associated with our typical designs. For this second year of LCA evaluation, we have used the lessons learned from previous LCAS and branched out to a new software (TallyCAT) to compare the functionality with what we have used previously (Beacon). The types of projects and the LCA results are described in further detail below.

#### Goals:

The current overall goal of our structural life cycle analysis is to establish design baseline values that can be used to inform future decisions. Establishing this baseline embodied carbon value will require several steps including:

- 1. Perform life cycle analysis for multiple projects that are at or near completed design
- 2. Establish consistent methodology for LCA calculations
- 3. Incorporate ASHRAE 240P guidance on waste and surplus 'Material Increase Multipliers'
- 4. Compute an office wide average carbon count for projects







#### LCA #1 - Belleview North Tower

#### **Overview:**

The first LCA completed by Jirsa Hedrick is for a new multi-family apartment and hotel in the Denver Tech Center. The building is entirely cast in place concrete with post tensioned concrete floors. This project was selected for the first LCA this year because of the fact the structural design was complete when beginning the LCA, and the fact the entire structure is cast in place concrete with readily available EPD's for the various concrete mixes used. The analysis only included A1-A3 LCA scope and only included structural elements.

#### **Results:**

Belleview North Tower LCA Results			
Total CO2e	10,558,056	kg CO2e	
	188	kg CO2e/m²	

The LCA totals are shown in the table above and element breakdown as shown in the bar chart above. As expected, the bulk of CO2e is from the PT floor elements which make up most of the concrete demand and have high amounts of reinforcing. The quantities of structural elements were obtained directly from the Revit model, processed through Beacon software and then increased per the table below.







Belleview North Tower Material Increase Multipliers				
COLUMN CONCRETE INCREASE	1.0	WALL REBAR INCREASE	1.05	
WALL CONCRETE INCREASE	1.0	SLAB REBAR INCREASE	1.10	
SLAB CONCRETE INCREASE	1.0	FOUNDATION REBAR INCREASE	1.10	
FOUNDATION CONCRETE INCREASE	1.0	STEEL INCREASE	1.05	
COLUMN REBAR INCREASE	1.10			

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#### LCA #2 - 38th and Huron

#### **Overview:**

The second LCA submitted to SE2050 this year is for a new multi-family apartment building that is entirely cast in place concrete with post tensioned concrete floors. This project was selected because of the fairly typical building geometry, the fact the structural design was complete when beginning the LCA, and the fact the entire structure is cast in place concrete with readily available EPD's for the various concrete mixes used. The analysis only included A1-A3 LCA scope and only included structural elements (ie, walls, floors, columns, foundations & steel). This LCA was the first completed using EC3's TallyCAT platform.

#### Results:

38 <sup>th</sup> & Huron LCA Results				
Total CO2e	11,125,403	kg CO2e		
	196	kg CO2e/m²		





The LCA totals are shown in the table above and element breakdown as shown in the chart above. As expected, the bulk of CO2e is from the PT floor elements which have regular reinforcing amounts, but make up the largest element volume by far. The quantities of concrete and steel elements were obtained directly from the Revit model and processed through EC3/TallyCAT platform. The material increase multipliers for this project utilized EC3's built in values. This project had not yet entered construction when this LCA was performed and thus the LCA utilized EC3's recommended baseline EPD values. The total GWP for this project is slightly higher than the averages computed in the previous LCA's, and that is possibly due to the baseline EPD values used rather than project specific EPD's.





#### Pt 5. Reduction

#### Overview:

Jirsa Hedrick has used the first two years of SE2050 involvement to develop life cycle assessment methodology standards with the goal of producing a baseline understanding of the embodied carbon for typical projects. Jirsa Hedrick has focused on concrete structures for the first several life cycle assessments with the intent to add other building types in future years. The methodology of the life cycle assessments was discussed in the previous section and this section will describe future reduction goals.

This year also presented an opportunity to discuss and implement reduction strategies early on in a project's conceptual stages. The results of that coordination are discussed below.

#### Goals:

The reduction strategy and reporting plan goals for the next year:

- 1. Continue use and increase familiarity with embodied carbon LCA software
- 2. Generate an LCA with embodied carbon data for 2 projects minimum
- 3. Develop an internal project baseline for embodied carbon
- 4. Upload embodied carbon LCA data to the SE2050 database
- 5. Implement embodied carbon reduction strategies during project early design stages

#### Looking back on last year:

Last year, Jirsa Hedrick produced two LCA's for two of our larger recent projects, the results of those LCA's are shown in the previous section. The average GWP per floor area from those completed LCA's is 192 kg CO2e/m<sup>2</sup>, up from 163 kg CO2e/m<sup>2</sup> last year. While this is an increase from the previous year, this is in line with industry average of this building size/type.

Last year Jirsa Hedrick was able to perform a simplified LCA during the DD phase of a project and show the building ownership how much embodied carbon could be reduced by requiring aggressive GWP targets for the concrete mixes. See the attached report showing the proposed carbon reductions.







#### Looking Forward to next year:

With at least two more LCA outputs to compare, it is expected a kg CO2e/m<sup>2</sup> baseline may be established in 2026. With that baseline established, Jirsa Hedrick can begin working toward annual carbon reduction targets of approximately 4% per year.

