

SE2050

**2024 Embodied Carbon
Action Plan**

March 26, 2024



**STRUCTURAL
ENGINEERING
INSTITUTE**



JIRSA | Hedrick

STRUCTURAL ENGINEERS

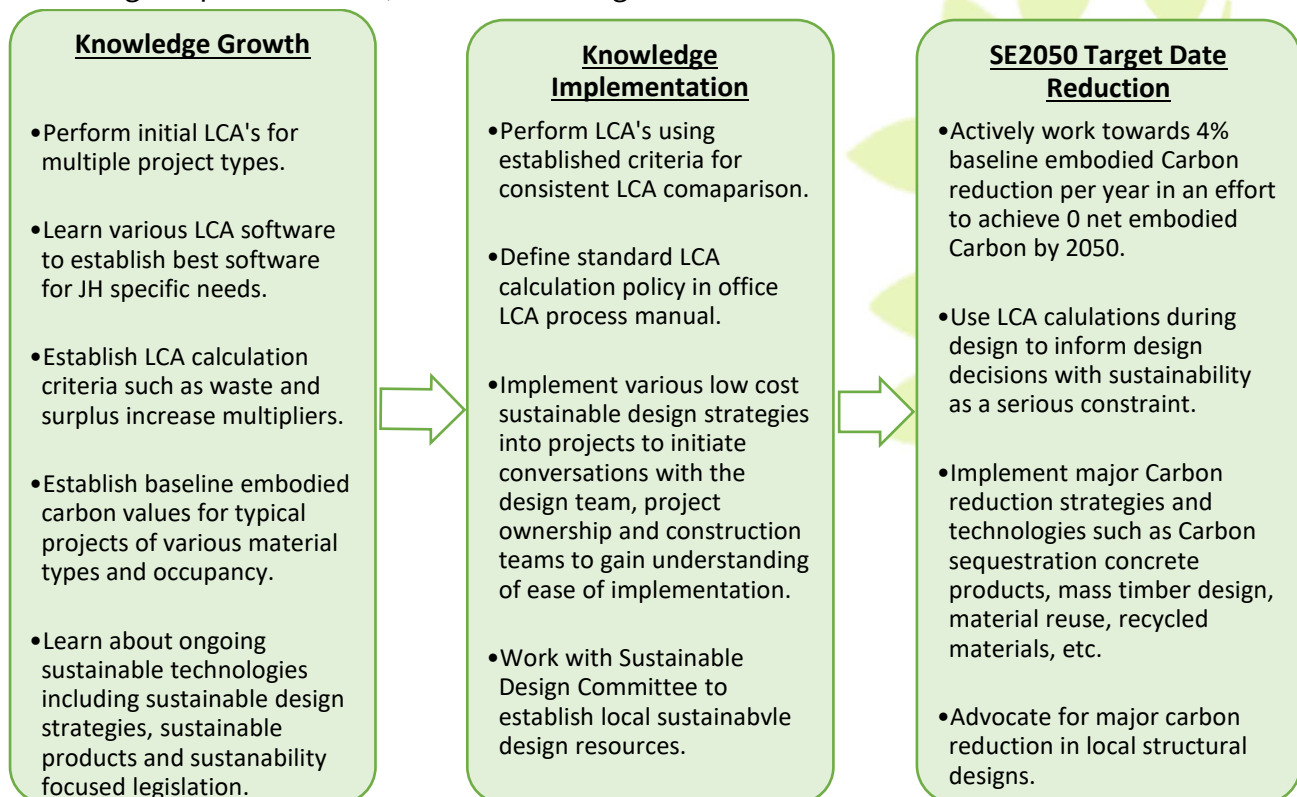
DELIVERING COLLECTIVE INGENUITY

JIRSA HEDRICK 2024 EMBODIED CARBON ACTION PLAN

Pt 1. Introduction

The second year of Jirsa Hedrick’s involvement in SE2050 has been very successful with several milestones and achievements to boast. Jirsa Hedrick performed its first Life Cycle Assessments (LCA’s) on two major projects; presented a sustainability focused presentation to several groups of architects at the Colorado AIA event; spread deeper insight into sustainable structural design within the office through multiple in-house sustainability technical meetings; participated in the Structural Engineer’s Association of Colorado Sustainable Design Committee; created and shared sustainable design insight on social media. Due to SE2050’s change of policy regarding ECAP submittal and project LCA uploads, this ECAP will cover Jirsa Hedrick’s SE2050 work from the end of 2022 through Spring of 2024. 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 developing 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.



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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.

The internal education plan began with the presentation of Embodied Carbon 101. The presentation discussed important introductory topics such as common terminology, important definitions, and high level overview of material specific reduction strategies. This presentation is archived and available for future reference for any new or interested employees to reference.

3. Provide narrative outlining plans for minimum (2) firm-wide presentations per year on the topic of embodied carbon.

There have been several firm wide presentations about sustainable design given in 2022 and 2023. Notable topics in these presentations include:

- Concrete design embodied carbon reduction strategies
- Changes from prescriptive to performance based concrete mix designs
- Changes to local sustainable code requirements (ie Denver Green Code & Colorado Buy Clean)

Looking Forward to next year:

- Recurring Technical Meetings: A follow up series will be presented roughly once every few months. Each technical meeting is 1 hour long and will cover an array of embodied carbon related topics including:
 1. SE2050 long term action plan
 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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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. One highlight of sustainable advocacy in 2023, Jirsa Hedrick attended the AIA Colorado convention

and presented a talk called “Green Concrete: Turning Carbon into Clean”. Several audience members came up to the speaker after each talk and exclaimed gratitude for the explanation of how they can enable their structural design teams to achieve straightforward, no-cost carbon reduction strategies.

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.

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 be presenting a presentation “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 at least once per month.
- **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.

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Part 4. Reporting

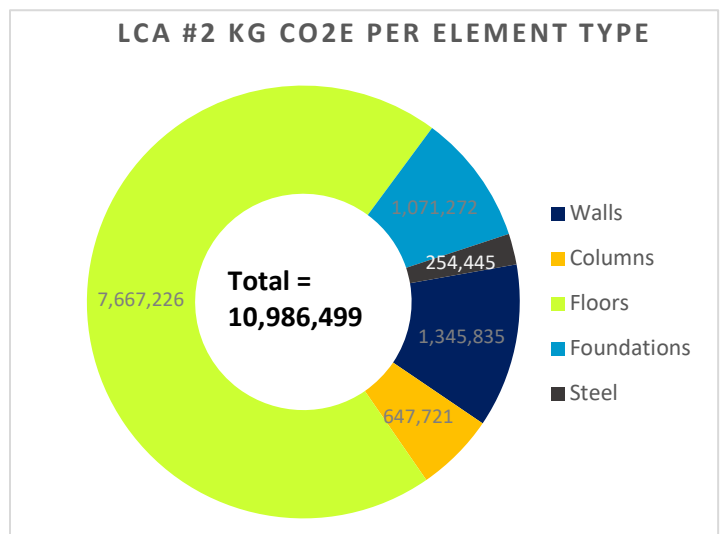
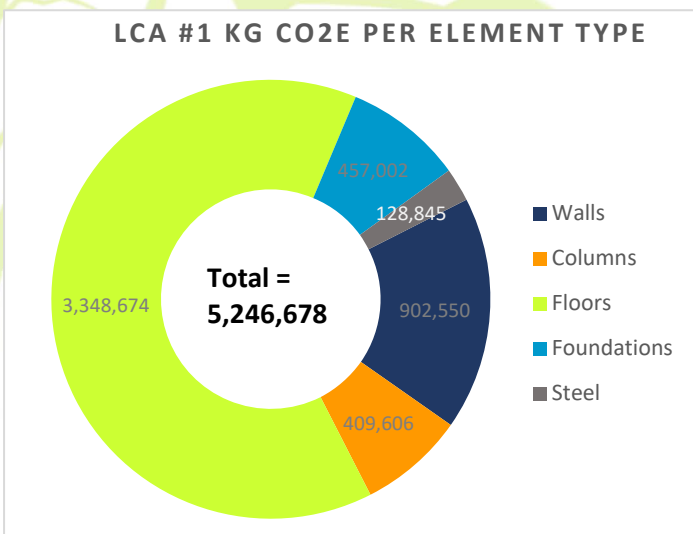
Overview:

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 year, we have focused on establishing consistent LCA methodology that can be repeated for many projects to come using Beacon LCA software. 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 – One River North

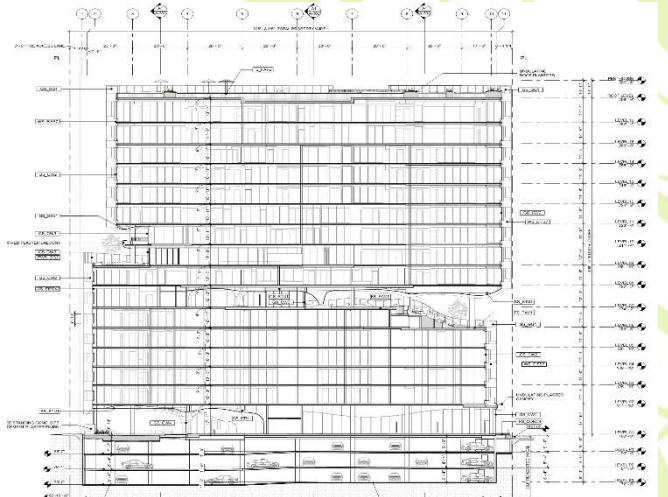
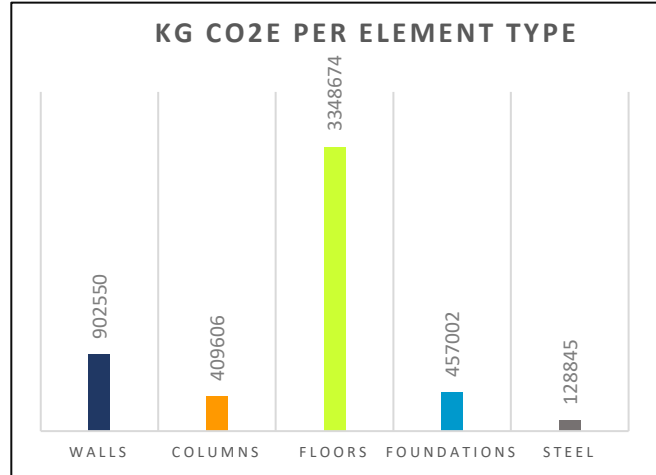
Overview:

The first LCA completed by Jirsa Hedrick is for one of Denver’s most iconic new buildings: One River North. This multi-family apartment building is entirely cast in place concrete with post tensioned concrete floors. This project was selected for our first LCA because of the Carbon Champion’s familiarity with the design, 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:

One River North LCA Results		
Total CO2e	5,246,678	kg CO2e
	154	kg CO2e/m ²

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 have abnormally 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.



One River North Material Increase Multipliers			
COLUMN CONCRETE INCREASE	1.02	WALL REBAR INCREASE	1.05
WALL CONCRETE INCREASE	1.02	SLAB REBAR INCREASE	1.01
SLAB CONCRETE INCREASE	1.02	FOUNDATION REBAR INCREASE	1.01
FOUNDATION CONCRETE INCREASE	1.05	STEEL INCREASE	1.05
COLUMN REBAR INCREASE	1.10		

LCA #2 – Evans West Development

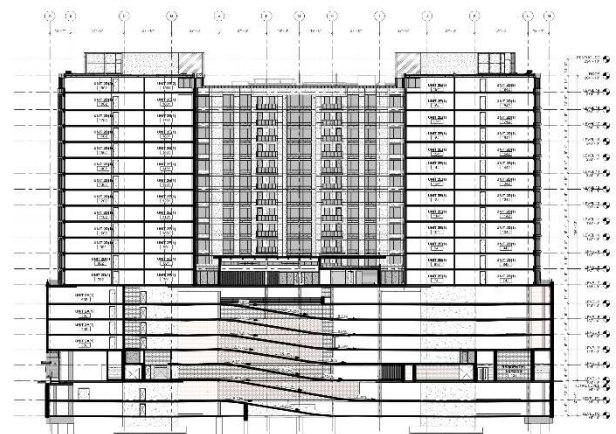
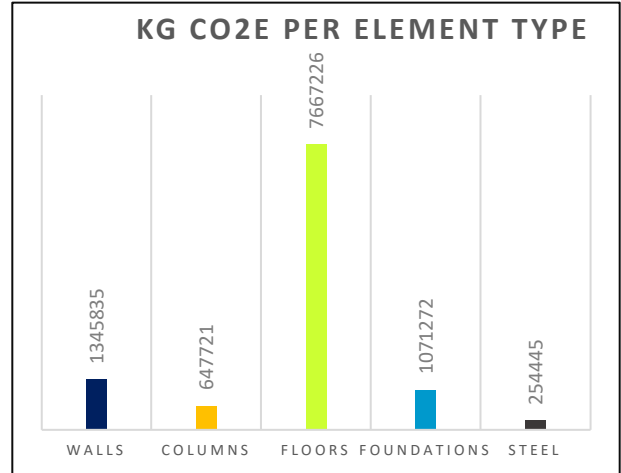
Overview:

The second LCA completed by Jirsa Hedrick 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).

Results:

Evans West Development LCA Results		
Total CO2e	10,986,499	kg CO2e
	172	kg CO2e/m ²

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 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, processed through Beacon software and then increased as needed per the table below. Note that the material increase multipliers have been based on in-house estimates to account for waste and surplus not covered in the LCA calculations. These multipliers will be modified in future LCA’s to align more closely with newly published ASHRAE 240P recommendations.



Evans West Material Increase Multipliers	
COLUMN REBAR INCREASE	1.10
WALL REBAR INCREASE	1.05
SLAB REBAR INCREASE	1.01
FOUNDATION REBAR INCREASE	1.01
STEEL INCREASE	1.05

Pt 5. Reduction

Overview:

Jirsa Hedrick has used the first 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.

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

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 163 kg CO₂e/m². This is on the lower end of GWP values for concrete multi-family residences so there is a need for more LCA outputs to establish a conservative baseline to work from.

Looking Forward to next year:

With at least two more LCA outputs to compare it is expected a kg CO₂e/m² baseline may be established. With that baseline established, Jirsa Hedrick can begin working toward annual carbon reduction targets of approximately 4% per year.



