

EMBODIED CARBON ACTION PLAN

SE2050 NET ZERO COMMITMENT

RJC Engineers
2024



Engineers



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1.0 RJC'S COMMITMENT

RJC Engineers (RJC) is an employee-owned engineering firm that celebrates creative thinking, prompt service, and technical excellence in the design and maintenance of structures. RJC provides structural engineering, structural restoration, building science, parking facility design, structural glass engineering, and building energy modeling services. Bringing the best of RJC to every project for over seven decades, the firm integrates ingenuity and practicality to create success for its clients and their projects.

RJC recognizes that the decisions we make today as structural engineers can impact society for generations. With this in mind, we acknowledge our role in shaping a more sustainable future and fully support the vision that all structural engineers shall understand and make efforts to reduce and ultimately eliminate embodied carbon in their projects by the year 2050.

For over seven decades, we have promised “Creative Thinking. Practical Results” to our clients and industry partners. While our promise remains the same a lot has changed within industry. Once thing that has not changed fast enough however, is the high carbon load of buildings. Worryingly atmospheric CO2

levels have risen from 311ppm (in 1950) to over 400 ppm during our first year as a SE2050 signatory. As creative thinkers passionate about solving problems, we see our commitment to SE2050 as an opportunity to develop and share bold, innovative, and practical solutions.

Beyond structural engineering and restoration, RJC specializes in building science and energy modelling, glass and façade engineering, and parking facility design. Our building performance team has Life Cycle Analysis expertise to measure and track environmental impacts across the full building life cycle, including embodied carbon. Our engineers and technologists have worked on numerous LEED, Passive House, Toronto Green Standard, and BC Step Code projects.

Is RJC ready to educate, explore, question, solve, report, and share? Yes, we are.

This Embodied Carbon Action Plan (ECAP) outlines how we at RJC will capitalize on our strengths and, creatively, practically drive down carbon emissions associated with our projects while simultaneously helping the industry.

2.0 EMBODIED CARBON TEAM

Many hands make light work. Professional development, internal training, and systems optimization are integral parts of RJC, and we have long-standing Technical Excellence Committees, each with a focus relating to specializations within RJC. These groups provide a wealth of expertise as well as mechanisms for distribution of information across the firm's offices and disciplines.

Two of RJC's Technical Excellence Committees are at the forefront of progressing RJC's SE2050 initiatives: the Structural Technical Liaison Group (STG) and the Sustainable Design Liaison Group (SDG). These two groups will work hand-in-hand to advise on and roll-out SE2050 initiatives for RJC's various regions and specializations.

To further help coordinate these efforts, we are creating the concept of **Embodied Carbon Ambassadors**. This group will be subject matter experts spooled up from staff already working within the embodied carbon space (i.e. our LCA practitioners) as well as other structural staff interested in diving more deeply into this arena. These people will be "go-to" resources, and help disperse the load of education and knowledge sharing.

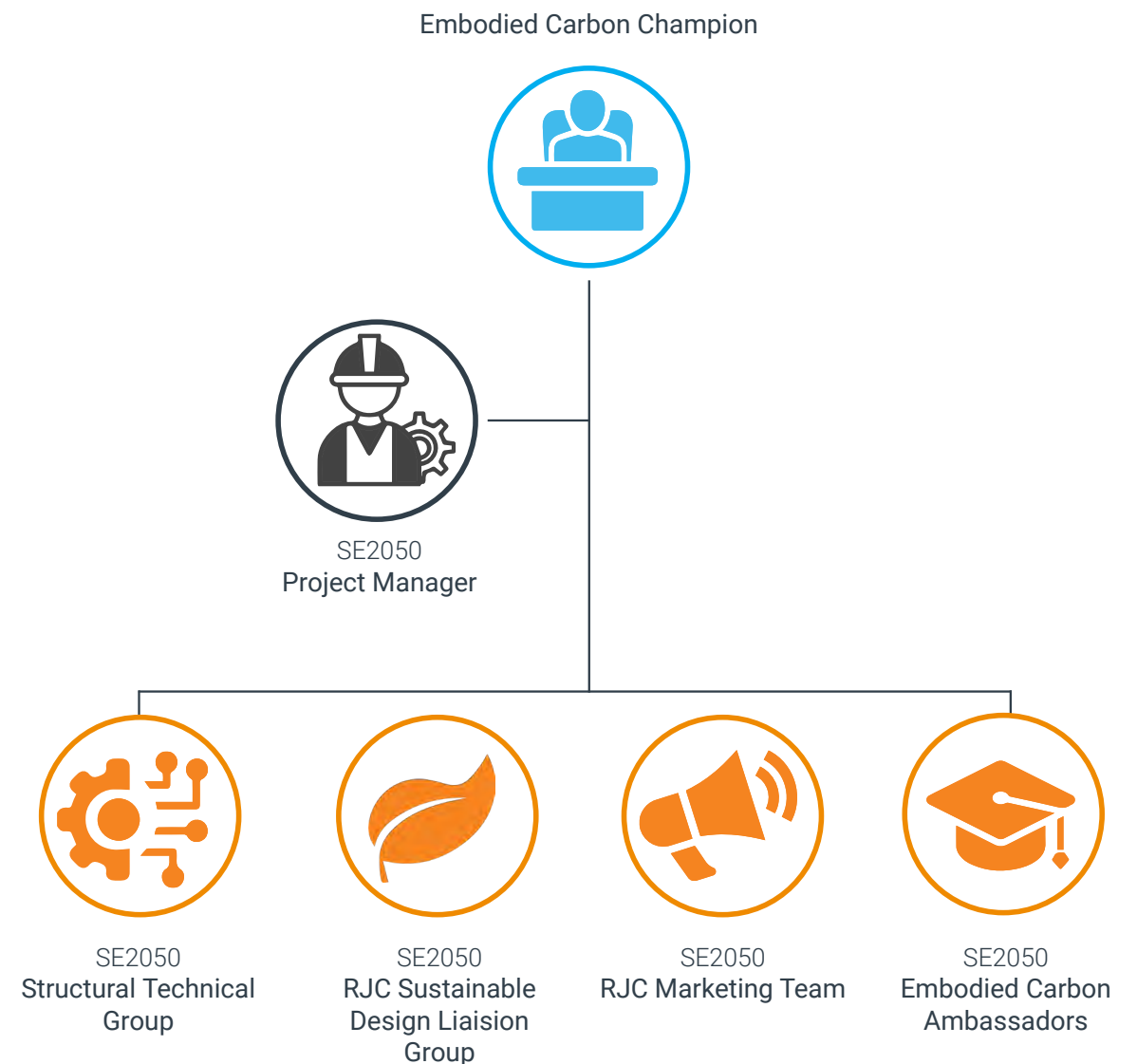


2.0 EMBODIED CARBON TEAM - continued

While all RJCers will be a part of much of our SE2050 journey, we have identified people who will provide special focus and be tasked with leading the SE2050 initiatives.

Our Embodied Carbon Champion, Dominic Mattman, is also chair of RJC's Structural Technical Group, which is responsible for all technical aspects of RJC's Structural Engineering Practice. This means the same person who heads our SE2050 team also chairs the group tasked with management and development of technical resources, training and improving our staff, and coordination of RJC's contributions to industry related to structural engineering (i.e. Code committees, etc.).

Dominic is assisted by Wendy Macdonald, our SE2050 Project Manager, who will help with day-to-day management. RJC's Structural Technical Group, Sustainable Design Liaison Group, Marketing Team, and our new Embodied Carbon Ambassadors will help with ideas, coordination, and implementation across the firm.



2.0 EMBODIED CARBON TEAM - continued



Dominic Mattman

BASc, MAsC, P.Eng., LEED® AP | Associate

Embodied Carbon Champion

Dominic provides leadership for our SE2050 implementation, directing how embodied carbon reductions are planned across the firm, and coordinating with the related structural initiatives headed by RJC's Structural Technical Liaison Group (STG).



Wendy C. Macdonald

P.Eng., ENV SP, LEED® AP BD + C | Sustainability Consultant

SE2050 Project Manager

Wendy will coordinate the day-to-day implementation of the SE2050 ECAP process on behalf of our Embodied Carbon Champion, overseeing and directing the ECAP development and enactment.



Terry Bergen

CTech, LEED® AP, CPHC | Managing Principal

SE2050 RJC Board of Directors' Liaison

Terry will provide updates to RJC's Board of Directors, ensuring that our SE2050 commitments and deliverables align with our strategic objectives and overall plan for the firm.



Duncan Rowe

BASc, MEng, P.ENG. LEED® AP, BECxP, CPHD | Principal Performance Project Designer

Chair Sustainable Design Liaison Group

As Chair of RJC's Sustainable Design Liaison Group (SDG), Duncan leads the group who coordinates sustainability related initiatives across the firm. Working hand-in-hand with RJC's Structural Technical Liaison Group, the SDG will be coordinating education efforts, distributing information about low carbon strategies.



Mike Moffatt

BASc, P.Eng., LEED® AP | Executive Principal

SE2050 Executive Committee Liaison

Mike offers strategic support to RJC's SE2050 team at the Executive level, confirming SE2050 program budget and initiatives are communicated appropriately to RJC's Board of Directors, and strategies are implemented in alignment with Board directives.



Tanya Kennedy Flood

BBA, CITP | Corporate Marketing and Communications Leader

SE2050 Communications Lead

Tanya is responsible for support the development and delivery of education and advocacy initiatives through effective communication strategies. Together with our SE2050 Education Lead, Tanya is tasked with developing strong and effective communication plans to raise embodied carbon awareness internally and externally.

3.0 EDUCATION PLAN

Beyond the redistribution and expansion of our embodied carbon team, our education plan consists of three primary strategies:

1. Continued basic literacy
2. Cross pollination
3. Custom learning

Continued basic literacy

Maintaining what we gained through our 2023 firm-wide Embodied Carbon Basic Literacy training, we will maintain this level playing field by including the training in our onboarding materials. The new Embodied Carbon page on RJC's Knowledge Hub will continue to provide an easy to access location for information, tools and templates. To make interactive discussion more readily available to all-staff, we will launch an MS Teams channel dedicated to the discussion of Embodied Carbon, and the channel will be moderated by our Embodied Carbon Ambassadors.

Cross Pollination

We've realized our structural designers would benefit from more information about how life cycle assessments are performed, and our life cycle assessment practitioners would benefit from more information about structural design. To support this, selected individuals from our structural teams will do a deeper

dive and take [OneClick LCA's Construction LCA Bootcamp](#). Our plan is individuals across various offices, and with differing levels of seniority will undergo the program. Not everyone needs to be an expert LCA practitioner, but we need a growing number of designers and individuals within leadership to understand the process in enough depth to appreciate the best ways to affect good, low carbon change.

Conversely, RJC already has a wealth of education videos relating to structural design, BIM and specification writing. As part of our cross-pollination efforts, we will point our LCA Practitioners to specific videos and resources, or create new ones if need be: basic structural literacy training for specific non-structural staff.

Custom learning

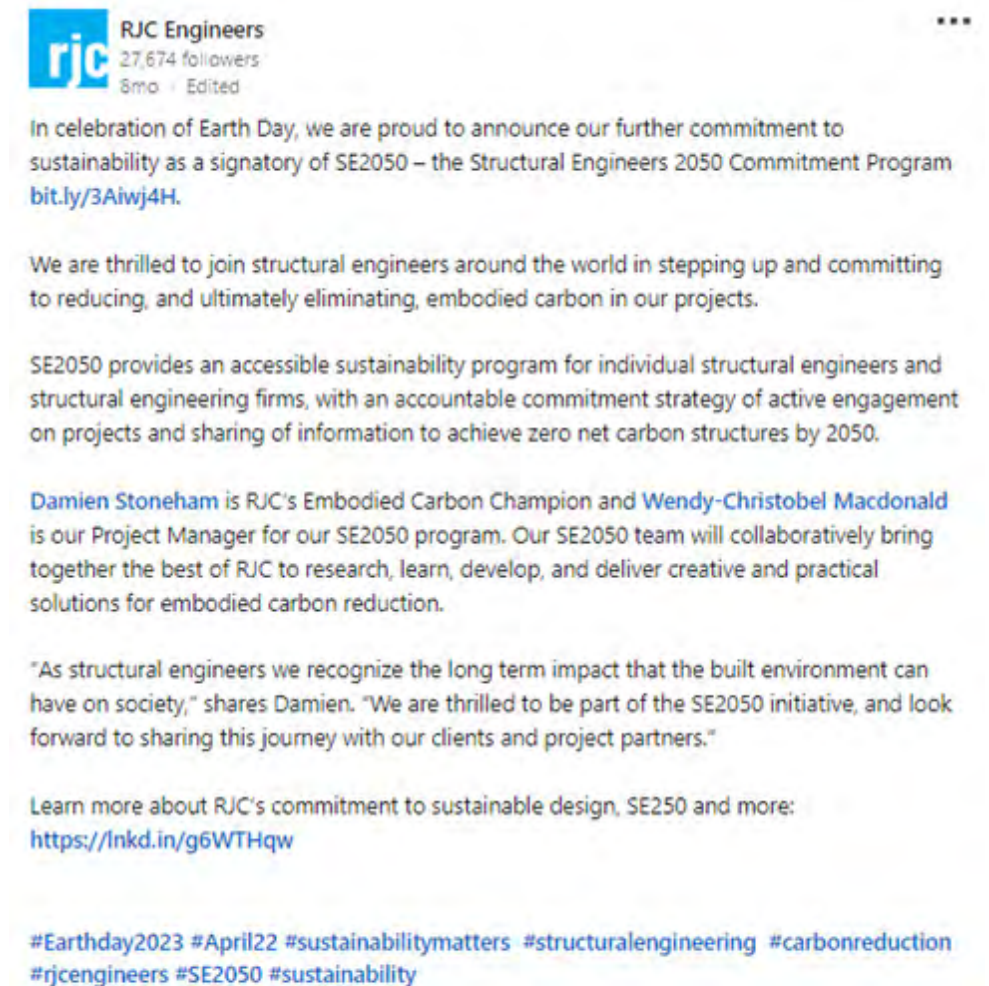
We've recognized that our offices, spread coast to coast and with variations in size, specializations and clientele, each benefit from slightly different mechanisms to most effectively engage RJCers about low carbon buildings. Codes and climate are changing and staff are beginning to feel the urgency in understanding how they can best engage with carbon reduction. In 2024 we will craft various, bespoke, in-house education sessions, specific to location and discipline.

4.0 KNOWLEDGE SHARING NARRATIVE

As an industry leader, RJC readily shares knowledge through industry publications, seminars, conferences, webinars, lunch and learns and more. We use many mediums to take full advantage of opportunities to share our knowledge, celebrate our successes, detail our case studies, and provide lessons learned with the larger industry and public.

We are proud to acknowledge our commitment to SE2050 on our [website](#) and link to our ECAP; we [announced our commitment on LinkedIn](#) on Earth Day 2023, we [post about embodied carbon on our blog](#), and we publish our [case studies](#) so others can learn from them. We have developed our first iteration of boilerplate proposal language highlighting our commitments, our ability to provide LCA services, and/or to help others by providing structural material quantities.

With 2023 as RJC's 75th anniversary, we used the anniversary as added incentive to dig into our past and undertake embodied carbon analyses of a selection of past projects. As this study wraps up in 2024, we will be eager to share what we've learned. We plan on hosting a presentation of our results for RJC staff, with invitation extended to clients, government, and industry representatives.



RJC Engineers Joins SE2050 as a Signatory - RJC Engineers
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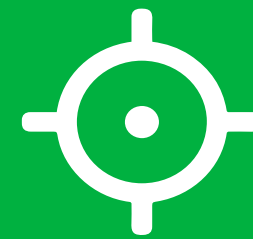
5.0 REDUCTION STRATEGY

With 75 years of projects, our people are keen to have a better understanding of how our existing designs perform when it comes to embodied carbon. Our 75th Anniversary LCA study was and continues to be significant in launching us on a strong reduction strategy. That initiative pushed us to create the database which will aid us in tracking our results internally before sharing with our wider SE2050 partners. The database will be instrumental in helping us develop benchmarks based on historical “business-as-usual” design, and indicate how we’ll need to adjust to align with our target.

We also developed our RJC’s Revit Quantities Tools which facilitates scalable data gathering. Our next step is finding the best way to present the resulting embodied carbon information on our drawings.

With these foundations in place, we’re feeling ready to start baking them into our workflow process.

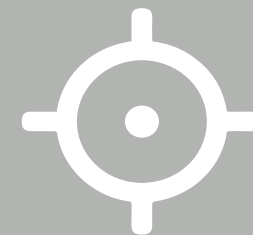
2023 was the year of beginning to develop our own tools and databases, and 2024 will be the year of beta testing integrating them into the workflow, and establishing benchmarks.



Short-term goals (< 1 year)

Beta test scalable workflow process.

Establish regional and project type benchmarks.



Long-term goals (5+ years)

Back-cast from 2050 to establish data informed targets and tracking.

Implement actionable strategies aligned with targeted timelines.

Drive the embodied carbon across our design portfolio to net-zero by 2050.

6.0 REPORTING PLAN

Our 2024 reporting plan is to draw on the RJC 75th Anniversary LCA project. We will select from the projects targeted for inclusion in our internal database and these will form the basis of our SE2050 project data submission. The projects for the Anniversary Study have been selected from projects out of two of RJC's major offices (Toronto and Vancouver). They represent concrete structure, recent projects (within the past decade). Most of the projects are Multi-Family Residential Buildings (MURBs), although some healthcare and office buildings are also included. LCAs for these buildings will be performed using OneClick LCA, inclusive of the A-C stages. We'll rely on EPD database within OneClick LCA unless there are specific product EPDs we need to source.

The LCA Database we developed for the 75th Anniversary Project, in conjunction with our new RJC's Revit Quantities Tools, are intended to be incorporated into project workflow to enable easy collection of project data. Our plan is baked for 2024. What's even more interesting are the conversations we'll be having about possibilities for more widespread adoption in 2025...



7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.1 ADMINISTRATIVE

TABLE 2: SUMMARY OF ADMINISTRATIVE REQUIREMENTS		
Requirement/Elective	Status	Comments
Submit Commitment Letter from firm leadership.	Complete	Firm commitment letter submitted with sign-up, September 22, 2022.
Distribute an Internal Announcement announcing firm's pledge to join SE2050.	Complete	Internal email announcement sent by RJC Executive Committee, December 20, 2022.
Select and nominate an internal embodied carbon champion.	Complete	Selected. See Embodied Carbon Team section.
Declare firm as a member of the SE2050 Commitment.	Complete	Signed-up, September 22, 2022. Commitment posted on RJC website and on LinkedIn .
Submit a high-resolution logo for inclusion on SE2050's website.	Complete	Submitted.
Share embodied carbon resources with firm.	Complete	Link to embodied carbon resources included with internal announcement.

7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.2 EDUCATION

As we began to engage with our SE2050 commitment, we created three small embodied carbon teams, each with a focus related to SE2050: our SE2050 Technical Team, SE 2050 Education Team, and SE2050 Marketing Team. These teams, led by our Embodied Carbon Champion and SE2050 Project manager were our primary plan for implementation of SE2050 initiatives across our offices. These groups met at the end of 2022 and throughout 2023 to confirm strategies.



2023 Education Electives:

- ✓ Provide a narrative of how the Embodied Carbon Champion will engage embodied carbon reduction at each office.
- ✓ Present at least one (1) webinar focused on embodied carbon and make a recording available to employees (include resource in on-boarding materials). This could be created internally, pulled from an external source (with permission), or pulled from a publicly available source such as the Boston Society for Architecture. Include this resource in your orientation and on-boarding program.
- ✓ Create an Embodied Carbon digital resource wiki and/or forum on your firm's internal website for staff to create, share, and discuss Embodied Carbon educational resources.
- ✓ Engage with a CLF Regional Hub. This could mean attending presentations or working sessions and reporting back to firm, or co-chairing a hub.

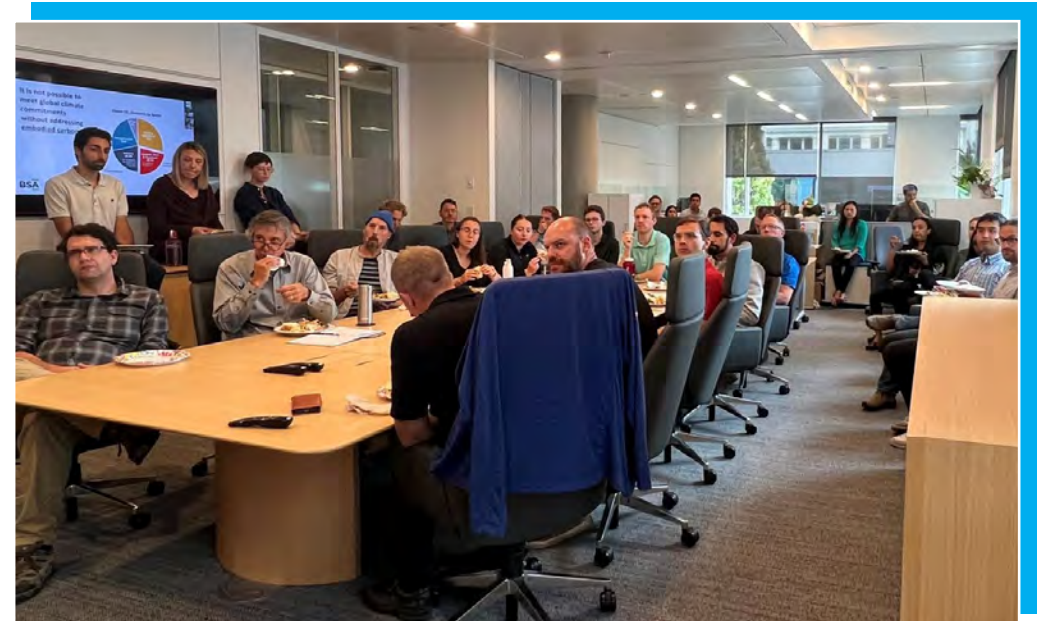
7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.2 EDUCATION - continued

Basic literacy – viewing parties

With 2023 as our inaugural year as signatories, the first priority of our 2023 Education Plan was to make sure everyone at RJC understood what it means for RJC to be SE2050 signatories. This began with presentations to the Executive Committee, and followed with an internal announcement, sharing the news with all RJCers. We then orchestrated a wide-spread rollout of Embodied Carbon Basic Literacy Training, using the *Boston Society for Architecture – Embodied Carbon 101 Youtube video* teamed with a preamble recording of our SE2050 Project Manager explaining what it means that RJC is now an SE2050 signatory, and an overview of the 2023 ECAP.

Over the course of a total of 14 lunch & learns across 11 offices, over half of RJC’s ~700 employees watched the video at scheduled “Viewing Parties” at the major offices, offering the opportunity to learn while enjoying lunch provided by RJC, and enabling conversations among peers on the topic. For those unable to attend, a recording of the video is available to all staff via RJC’s internal intranet.



While our SE2050 commitment is limited to our structural designers, as a multi-disciplinary firm, it is notable that RJC leadership determined Embodied Carbon Basic Literacy Training is valuable for people in all positions and disciplines within RJC, and the Viewing Parties were offered to all staff.

7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

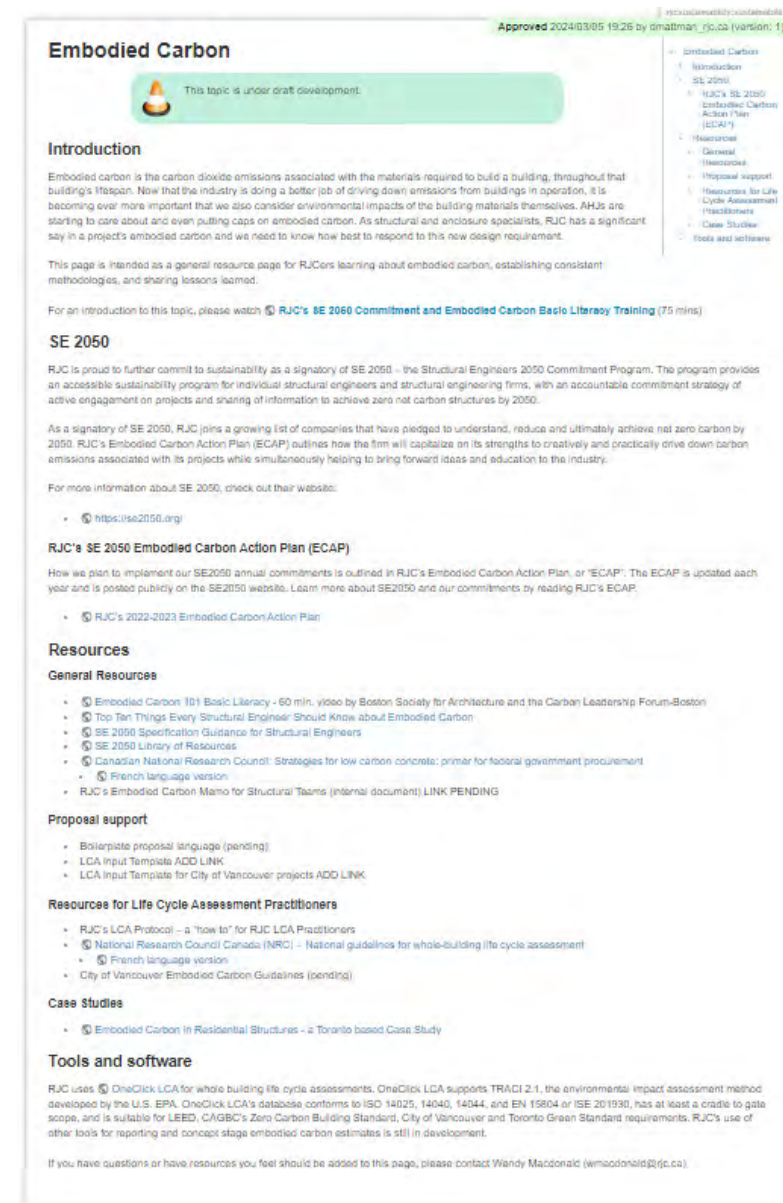
7.2 EDUCATION - continued

Knowledge Hub

2023 saw the launch of the Embodied Carbon information pages within RJC’s intranet, dubbed our “Knowledge Hub”. The Knowledge Hub is designed to function as wiki, with knowledge added as it becomes available. Technical specialists monitor the Hub, and addition of information is limited to designed Approvers and Editors. Our Embodied Carbon page continues to evolve, and currently includes resources for LCA practitioners and structural designers, links to the video of *RJC’s SE 2050 Commitment and Embodied Carbon Basic Literacy Training*, SE 2050 information, templates, protocols, and published case studies.

Engagement with CLF

Through 2023, one member of our Embodied Carbon team (Veronica Ochoa) sat on the Board of CLF Vancouver providing insight and direction into CLF evolution on the West Coast. CLF-Vancouver expanded to become CLF-British Columbia, and Terry and Wendy attended the Victoria, BC kick-off event to support this endeavour.



7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.3 REPORTING

Projects for submission

To start off, we opted to select five projects which already were required to undergo some form of LCA. These ranged from projects pursuing a LEED credit and therefore Whole Building Life Cycle Assessment, and others which had been tasked with using the SE 2050 ECOM Tool to provide estimates of upfront carbon in the structural design.



2023 Reporting Electives:

- ✓ Submit 5 projects with structural engineering services to the SE 2050 Database across the firm.
- Compare the embodied carbon emissions from multiple projects across your firm. Analyze and document what data or pieces of information are most important and communicate the findings to your firm.
- *In progress*

7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

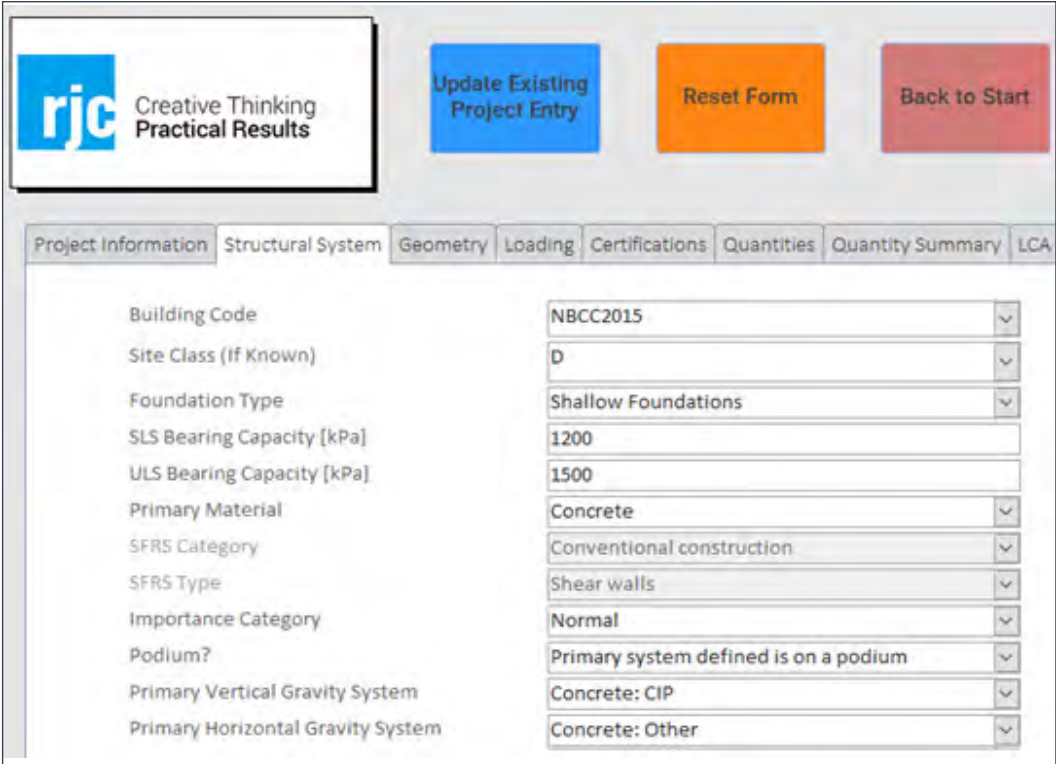
7.3 REPORTING - continued

Compare projects across firm

We had high aspirations for our first year! Originally we had envisioned developing a data analysis tool through Sharepoint and/or PowerBI, with visualization and comparison of embodied carbon from multiple projects using metadata with key categories (office, location, building type, category, etc). We ended up pivoting from our original plan, and instead developed multiple tools that form the foundation of a long-term, scalable data collection and storage system. One of these tools being our own LCA Database tool that incorporates input requirements from the SE2050 project import spreadsheet, so our data can easily support our SE2050 commitments.

With 2023 as RJC's 75th anniversary, we used the anniversary as added incentive to dig into our past and undertake embodied carbon analyses of a selection of past projects. The data from this larger undertaking is being tracked in our new tools and can be used to establish company benchmarks. The project is still

in progress, but as it intentionally is representative of different project types and locations, it will help with our analysis and the findings will be communicated across the firm in 2024.



The screenshot displays the RJC LCA Database tool interface. At the top left is the RJC logo with the tagline "Creative Thinking Practical Results". To the right are three buttons: "Update Existing Project Entry" (blue), "Reset Form" (orange), and "Back to Start" (red). Below these is a navigation bar with tabs for "Project Information", "Structural System", "Geometry", "Loading", "Certifications", "Quantities", "Quantity Summary", and "LCA". The "Project Information" tab is active, showing a list of fields with corresponding dropdown menus or input boxes:

Field	Value
Building Code	NBCC2015
Site Class (If Known)	D
Foundation Type	Shallow Foundations
SLS Bearing Capacity [kPa]	1200
ULS Bearing Capacity [kPa]	1500
Primary Material	Concrete
SFRS Category	Conventional construction
SFRS Type	Shear walls
Importance Category	Normal
Podium?	Primary system defined is on a podium
Primary Vertical Gravity System	Concrete: CIP
Primary Horizontal Gravity System	Concrete: Other

7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.4 REDUCTION

Incorporation of sustainably harvested biogenic materials

Two of the projects submitted to the SE2050 database in 2023 have a project requirement to use local, sustainably harvested wood for primary structural system material. As a result of this requirement, our team has been involved in in-depth conversations about Forest Stewardship Council (FSC) Certified wood, “Legal Wood” as defined by LEED, and Certified vs. Legal vs. Responsible Sources as defined by ASTM-D7612-10. Further to this, the availability of these locally.

RJC has dedicated wood specialists in offices across Canada. We provide local expertise backed with specialized knowledge in all aspects of wood design. With increased appetite for use mass timber and other wood based structural systems, it will be increasingly critical to be mindful of wood being sustainably sourced.

2023 Reduction Electives:

- ✓ Incorporate sustainably harvested biogenic materials on at least one project.
- ✓ Propose other embodied carbon reduction strategies and describe their value.
- Develop and implement a workflow that makes it easier to make early design decisions based on embodied carbon.
-In progress
- Communicate the embodied carbon impacts of different design options to clients with creative data visualization.
-In progress

7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.4 REDUCTION - continued

Other embodied carbon reduction strategies – carbon capture in cement

Dominic Mattman, Chair of RJC's Structural Technical Group and our 2024 Embodied Carbon Champion, was appointed to participate on an expert advisory panel to support the Canada Green Building Council and University of Toronto in a joint initiative to study carbon capture and utilization in cementitious building materials. Panel will meet quarterly for the duration of the project (2023-Q1 through 2026-Q3). The "[Burying Carbon in Buildings: Advancing Carbon Capture and Utilization in Cementitious Building Materials](#)" research project, partially funded by the Canadian Government, is looking at how carbon might be captured and used in concrete as a means to lower Canada's GHG emissions. While this is not yet a strategy that RJC can readily use on projects, we feel Dominic's involvement on this panel of industry experts is a valuable contribution to possible future strategies.



Scientific research underpins everything we do to fight climate change. This funding provides critical support, allowing government and academia to work together in exploring practical and achievable climate change solutions. By leveraging our unique expertise, we can foster collaboration across disciplines, sectors, communities, and research bodies.

The Honourable Steven Guilbeault

Minister of Environment and Climate Change Canada



As the national organization representing members and stakeholders across the green building spectrum, CAGBC can access industry expertise to help advance research and mobilize the sector to implement market solutions. We are proud to partner with the University of Toronto on a project that has the potential to significantly reduce embodied carbon emissions from the cement industry. The results will contribute to the collective effort to decarbonize construction.

Thomas Mueller

President and CEO, CAGBC



This research collaboration between Canada Green Building Council and the University of Toronto addresses the urgent challenge of low carbon materials and construction in Canada. A primary pillar of this will provide a scientific assessment of the implications of existing and emerging low carbon techniques and technologies applied to cement, and concrete composites. Identification and transparency of gaps, deficiencies, and disparities which may hinder potential to achieve Canada's low carbon cement and concrete goals is an immediate priority and will be addressed in this study.

Daman Panesar

Professor, Department of Civil & Mineral Engineering, Faculty of Applied Science & Engineering, University of Toronto

7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.4 REDUCTION - continued

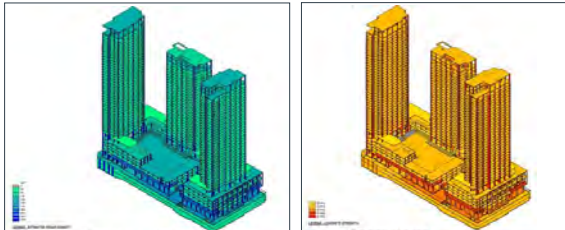
Developing workflow/Creative data visualization - RJC's In-House Revit Quantities Tools – in progress

Fall 2023 saw the launch of RJC's Revit Quantities Tools, and we've begun the process of adjusting our BIM protocols to help us on our journey of understanding and reducing embodied carbon in our designs. The RJC Revit Quantities Tool is an innovative solution to calculate structural material quantities more efficiently. It simplifies a traditionally time-consuming and error-prone process in gathering quick and accurate data which is crucial for embodied carbon calculations. The data from the tool isn't just numerical—it can be presented graphically or in tables, offering clients and contractors clear insights into construction costs and embodied carbon measures. Traditional methods of computing quantities from Revit models have been labour-intensive and prone to inaccuracies.

RJC has bridged this gap with:

- Precision and Speed: The tool allows for swift, high-quality data extraction.
- Accurate Data: With accurate data on structural materials, more precise embodied carbon calculations are possible.
- Versatility: Data can be showcased graphically or tabulated, aiding clients and contractors in making informed decisions.

This tool is still under development and has not yet been incorporated into standard workflow processes. It was introduced to RJC structural designers and BIM modellers during lunch and learns in fall 2023.



OVERALL QUANTITY TAKEOFF - ESTIMATED CONCRETE AND REBAR		
MATERIAL NAME	VOLUME	ESTIMATED REBAR MASS
35 MPa	10850 m ³	1302000 kg
50 MPa	960 m ³	101000 kg
60 MPa	2700 m ³	341000 kg
70 MPa	3930 m ³	494000 kg
80 MPa	7170 m ³	940000 kg
Grand total: 2720	25620 m ³	3178000 kg

7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.5 ADVOCACY

Describe the value of SE2050/Publicly declare your firm as a member of the SE2050 Commitment

Our [website](#) describes the value of SE2050 and notes our pride to join a growing list of companies that have pledged to understand, reduce and ultimately achieve net zero carbon by 2050. We include a link to our 2023 ECAP which further details our pledge and the reasons. On Earth Day 2023; we [announced our commitment on LinkedIn](#), we [post about embodied carbon on our blog](#), and we publish our [case studies](#) so others can learn from them. We have developed boilerplate proposal language highlighting our commitments, our ability to provide LCA services, and/or to help others by providing structural material quantities. All these are ways we continue to trumpet the importance of lowering embodied carbon, and our link to SE2050.

2023 Advocacy Electives:

- ✓ Describe the value of SE2050 to clients. How can your design teams collaborate to reduce embodied carbon?
- ✓ Publicly declare your firm as a member of the SE2050 Commitment however you see fit (e.g. website, LinkedIn, etc.).
- ✓ Give an external presentation on embodied carbon that demonstrates a project success or lessons learned. Get connected at a CLF regional hub near you and be sure to post the recording.
- ✓ Engage with structural material suppliers in your region to communicate the importance of EPDs and low-carbon material options.
- ✓ Propose alternative methods for advocacy and describe their value.


7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.5 ADVOCACY - continued

External Presentations & Case Studies

We share what we've learned. An example of this is our [*Embodied Carbon in Residential Structures: A Toronto based case study*](#) – which was jointly conducted by [RJC Engineers](#) and [BDP Quadrangle](#), dated Sept 12, 2023.

We collaborated with other SE firms, compare the results to Canadian Reference standards (TGS, ZCB, VBBL) and presented the study to the city of Toronto and partners involved in policy. Spurred the discussion and unification on area definitions. while not comparing our own projects, it provides info for the GTA market).



Embodied Carbon in Residential Structures
A Toronto based case study

SUMMARY
Embodied carbon, released during building manufacturing and construction, is a critical environmental measure. Often overshadowed by operational carbon, its significance grows with building efficiency improvements. Emissions, mainly during construction, coincide with a crucial period for climate risk mitigation. The purpose of this study is to inform policy makers, industry professionals, citizens, and any other relevant or interested stakeholders, of the issues which need to be addressed and the background information to make educated decisions to impact meaningful change.

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rjc.ca Creative Thinking Practical Results

7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.5 ADVOCACY - continued



In RJC presentations to prospective clients, we often include a serious of slides on sustainability, including one specifically noting our SE2050 commitment.

RJC presented at the [CCBST 2022 – 16th Canadian Conference on Building Science and Technology](#) on her paper “Exploring a Multi-Faceted Approach to Design a Carbon Neutral Passive House”. The case study focuses on a multi-unit residential building in Victoria, BC, examining the relationship between operational and embodied carbon, and exploring the feasibility of achieving carbon neutrality by prioritizing biogenic materials. The results show that the carbon neutral design has the lower amount of greenhouse gases while also having the most biogenic carbon, making it the most efficient design for operation and embodied carbon.

Ontario Building Envelope Council

Program Sponsor Exhibit Venue Student Competition Photo Gallery

1:00 pm - 2:00 pm | Rachel Shantz (Session Chair) MS, PhD

Low Carbon Buildings

Exploring A Multi-Faceted Approach To Design A Carbon-Neutral Passive House

The objective of this paper is to explore carbon neutral Passive House design. Passive House presents an opportunity to reduce operational carbon by a significant amount compared to a traditional building. However, as buildings become more energy efficient, the reduction of embodied carbon becomes more important. There is a knowledge gap in the embodied carbon impacts of more energy efficient buildings, in particular Part 3 construction standards such as the U.S.GBC Net Zero Carbon Standard outline steps for achieving carbon neutral construction. In this case study, a life cycle assessment (LCA) using OneClick LCA software is performed for three scenarios. Case 1 is a Part 3, multi-unit residential building (MURB) in Victoria, BC, following business as usual design criteria. Case 2 uses its theoretical passive house compliant version as an improved design prior to Case 3, which explores the feasibility of achieving carbon neutrality by prioritizing biogenic materials. The LCA considers Stage A-D and a building lifetime of 50 years. A multi-faceted approach outlined an alternative means of potentially achieving carbon neutrality with a focus on the structural and building envelope components. Two types of wood frame structures are compared: laminated veneer lumber with engineered wood joints and cross-laminated timber (CLT). Concrete is used for the foundation and core with high volumes of supplementary cementitious materials (SCM) added to reduce carbon emissions in the Case 3. Cellulose is explored as an alternative insulation option. Wood panels along with other steel are explored as lower embodied carbon building systems. Results are compared to the baseline building with the air-sealed building and structural materials. As seen in the results, the carbon neutral design has the lowest amount of greenhouse gases while also having the most biogenic carbon, making it the most efficient design for operational and embodied carbon.

Veronica Ochoa, RJC Engineers

Veronica is a built environment professional with experience working as both client and consultant. Her client side experience includes managing engineering consultants and reviewing their deliverables, as well as contributing to corporate net zero carbon strategies for compliance with wider environmental targets, such as circular economy, Science Based Targets and wellbeing in buildings.

Veronica's technical know-how stems from her experience utilizing dynamic thermal modeling software to deliver analysis accounting for operational carbon and latent embodied carbon. She is also experienced in managing environmental and wellbeing certifications sought by blue chip clients to meet operational real estate targets and undertaking bespoke environmental research as needed for each project.

7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.5 ADVOCACY - continued

Engage with structural material suppliers

RJC has been involved in discussions with Concrete Ontario, which represents concrete ready-mix suppliers. Discussions have been to explore and better understand, the performance gap between embodied carbon based on the drawings and specifications produced by the structural engineer, and what is produced in the field (which can vary due to construction schedule requirements, cold-weather applications and over-specification of concrete mixes). Understanding and minimizing this gap helps move beyond the EPDs towards understanding, reporting and tracking embodied carbon of concrete on projects. One detailed study was conducted in 2023, however, the labor intensive requirements on the supplier's side is being streamlined to allow more projects to be reviewed in 2024.

Propose alternative methods for advocacy and describe their value

RJC has an integral role in the development of Canadian Codes and Standards for wood-frame and mid-rise wood-frame developments. We participate at a national level on code groups to develop changes for wood, including those that are leading the way to allowing taller wood buildings.

7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.6 LESSONS LEARNED

Our first year as an SE2050 signatory offered us some key lessons that have helped in framing our second year's action plan.

- We realized having separate SE2050 teams had value but also the potential to silo information. Our 2024 ECAP reflects multiple shifts in strategy to address this:
 - o RJC already has established methods of encouraging consistency across offices and services. This year's pivot to draw more heavily on our Technical Excellence Committees (our Structural Technical Group and Sustainable Design Liaison Group in particular) is one way we hope to engage our existing infrastructure to support our embodied carbon goals.
 - o By making RJC's Structural Technical Group Chair also our Embodied Carbon Champion, we further enable new initiatives to be disseminated via existing processes.
 - o To support our rapidly expanding knowledge base and to service all markets even more effectively, our Embodied Carbon Champion will be supported through our new group of Embodied Carbon Ambassadors who will share in the task of being "knowledge keepers" of embodied carbon initiatives.
- We learned that across RJC's many disciplines and locations, there was quite a range in level of understanding about embodied carbon, a range of how much local codes require said understanding, and a range of strategies already being implemented. There's a lot going on. While the Embodied Carbon Literacy Training was valuable as a preliminary step, deeper staff engagement comes with relevancy. People want to know how this affects them, their clients, their projects. This is why our 2024 ECAP includes for more focused training, tailored according to location and a person's role within RJC.

7.0 2023 RETROSPECTIVE AND LESSONS LEARNED

7.6 LESSONS LEARNED - continued

- We learned to be flexible and take advantage of opportunities. When we signed up for SE2050, we had not yet envisioned RJC's 75th Anniversary LCA Study. Yet, when someone asked the question "what can we do to celebrate RJC's legacy in the industry?" and this idea was raised, we seized the opportunity. This meant we didn't make as much progress on a couple of the electives as we'd hoped, but also means we made greater progress than anticipated in developing a robust internal database. This, in turn, means our benchmarking exercise in 2024 will be more robust.





8.0 ELECTIVE DOCUMENTATION AND 2024 TARGETS

8.1 EDUCATION

TABLE 2: SUMMARY OF EDUCATION REQUIREMENTS		
Requirement/Elective (2) required, (4) recommended (5) selected for 2024	Status	Accomplishments and Planned Actions
<p>Provide a narrative of how the Embodied Carbon Reduction Champion will engage embodied carbon reduction at each office.</p>	Ongoing	<p>2022: Education re: SE2050 to RJC leadership. Selection of Embodied Carbon Champion, formation of SE2050 Technical, Education, and Communication teams.</p> <p>2023: Rollout of Embodied Carbon Action Plan to technical excellence groups.</p> <p>2024: Establishment of Embodied Carbon Ambassadors , and increased use of Sustainable Design Liaison Group and Structural Technical Group for engagement (in lieu of previously noted SE2050 teams).</p>
<p>Present at least one (1) webinar focused on embodied carbon and make a recording available to employees. This could be created internally, pulled from an external source (with permission), or pulled from a publicly available source such as the Boston Society of Architecture.</p> <p>Include this resource in your orientation and on-boarding program.</p>	<p>2023 – complete 2024 – in process</p>	<p>2023: Rollout of Embodied Carbon Basic Literacy Training to 11 offices via 14 Viewing parties. (Training included preamble with SE2050 Project Manager explaining RJC’s SE2050 commitments, followed by <i>Boston Society for Architecture – Embodied Carbon 101</i> Youtube video.) Recording available for all staff through RJC’s Knowledge Hub (ongoing), and resource is included in onboarding material for new staff.</p> <p>2024: Webinar with findings of RJC’s 75th Anniversary LCA initiative. Available to staff, clients, and industry partners.</p>

8.0 ELECTIVE DOCUMENTATION AND 2024 TARGETS



8.1 EDUCATION - CONTINUED

<p>Create an Embodied Carbon digital resource wiki and/or forum on your firm’s internal website for staff to create, share, and discuss Embodied Carbon educational resources.</p>	<p>2023 - complete 2024 - In process</p>	<p>2023: Developed page within RJC’s Knowledge Hub, we are in the process of developing a central database for staff to access embodied carbon related information and resources. 2024: To make interaction more readily available to all-staff, establish an MS Teams channel dedicated to the discussion of Embodied Carbon. Channel to be moderated by Embodied Carbon Ambassadors.</p>
<p>Incorporate embodied carbon reduction in your onboarding process for all new employees.</p>	<p>2024 - In process</p>	<p>2024: Recording of 2023 Embodied Carbon Basic Literacy Training (preamble with SE2050 Project Manager explaining RJC’s SE2050 commitments, followed by <i>Boston Society for Architecture – Embodied Carbon 101</i> Youtube video included in onboarding material for new structural staff.</p>
<p>Initiate an embodied carbon interest group within your firm and outline their goals. This group may more broadly address sustainability, but they must include embodied carbon.</p>	<p>2024 - In process</p>	<p>2024: Establish Embodied Carbon Ambassador group, capitalizing on RJC’s existing Technical Excellence Committees, specifically the Structural Technical Group and Sustainable Design Liaison Group, to champion Embodied Carbon initiatives.</p>
<p>Engage with a CLF Regional Hub. This could Mean attending presentations or working sessions and reporting back to the firm, and/or co-chairing a hub.</p>	<p>2023 - complete</p>	<p>2023: Veronica Ochoa, of our Building Performance team and SE2050 Education Team, sat on Board of CLF-Vancouver.</p>



8.0 ELECTIVE DOCUMENTATION AND 2024 TARGETS

8.2 REPORTING

TABLE 2: SUMMARY OF REPORTING REQUIREMENTS		
Requirement/Elective (1) Required, (2) recommended (2) Selected for 2024	Status	Comments
<p>Submit a minimum of two (2) projects with structural engineering services to the SE2050 Database. It is not a requirement to submit more than five (5) total projects across the firm. Firms are expected to follow the spirit of the SE2050 Program in determining how many total projects firm must submit. Offices that only offer construction administration services or with fewer than five full-time employees need not be considered.</p>	<p>2023 - complete 2024 - In process</p>	<p>2023: Five projects submitted. 2024: We will be selecting projects from our 75th Anniversary LCA project and will submit at minimum five projects for 2024.</p>
<p>Compare the embodied carbon emissions from multiple projects across your firm. Analyze and document what data or pieces of information are most important and communicate findings to your firm.</p>	<p>2024 - In process</p>	<p>2024: Continue to populate RJC's LCA Database via the RJC 75th Anniversary LCA project, and use this to analyze findings to communicate to firm.</p>

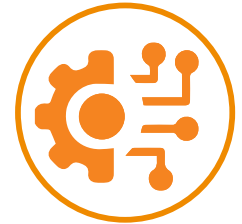


8.0 ELECTIVE DOCUMENTATION AND 2024 TARGETS

8.3 REDUCTION

TABLE 2: SUMMARY OF REDUCTION REQUIREMENTS		
Requirement/Elective (1) Required, (4) recommended (4) Selected for 2024	Status	Comments
Develop and implement a workflow that makes it easier to make early design decisions based on embodied carbon.	2023 – in-process 2024 - In process	2023: Developed internal database and RJC’s Revit Quantities Tool. 2024: Beta test low embodied carbon workflow process for select projects using new tools. Incorporate visual tools into drawings to encourage low embodied carbon choices.
Communicate the embodied carbon impacts of different design options to clients with creative data visualization. Inclusion of these visualizations in Elective Documentation is optional (i.e. not required if firm would prefer to keep marketing materials private).	2023 – in-process 2024 - In process	2023: Developed RJC’s Revit Quantities Tool which includes a data visualization component. 2024: Use RJC’s Revit Quantities Tool to present embodied carbon information visually on drawings.

8.0 ELECTIVE DOCUMENTATION AND 2024 TARGETS



8.3 REDUCTION - CONTINUED

<p>Incorporate sustainably harvested biogenic materials in at least one project.</p>	<p>2023 – in-process 2024 - In process</p>	<p>2023: Our two North Island College Student Housing projects have specific requirements to use sustainably harvested wood products.</p> <p>2024: Ongoing. Projects are currently under construction.</p>
<p>Propose other embodied carbon reduction strategies and describe their value.</p>	<p>Ongoing</p>	<p>2024: From 2023 Q1 through to 2026 Q3, our 2024 Embodied Carbon Champion (Dominic Mattman) appointed to participate on an expert advisory panel to support the Canada Green Building Council and University of Toronto in a joint initiative to study carbon capture and utilization in cementitious building materials. Panel will meet quarterly for the duration of the project.</p>

8.0 ELECTIVE DOCUMENTATION AND 2024 TARGETS



8.4 ADVOCACY

TABLE 2: SUMMARY OF ADVOCACY REQUIREMENTS		
Requirement/Elective (2) Required, (4) recommended (4) Selected for 2024	Status	Comments
Describe the value of SE2050 to clients. How can your design teams collaborate to reduce embodied carbon? Please attach any associated marketing materials.	2023 – complete 2024 – ongoing	<p>2023: Our website now describes the value of SE2050. On Earth Day 2023; we announced our commitment on LinkedIn. We post about embodied carbon on our blog, and we publish our case studies so others can learn from them. We have developed boilerplate proposal language highlighting or commitments, our ability to provide LCA services, and/or to help others by providing structural material quantities. We also have a slide we include in presentations to clients and other potential partners when talking about RJC and sustainability.</p> <p>2024: as well as continuation of initiatives above, we plan to find ways to be more consistent about including information about embodied carbon and our SE2050 involvement in our proposals and marketing.</p>
Publicly declare your firm as a member of the SE2050 Commitment however you see fit (e.g. on your website, LinkedIn, or other social media)	2023 – complete 2024 – ongoing	<p>2023: Our website now describes the value of SE2050. On Earth Day 2023; we announced our commitment on LinkedIn.</p> <p>2024: ongoing.</p>

8.0 ELECTIVE DOCUMENTATION AND 2024 TARGETS



8.4 ADVOCACY - CONTINUED

<p>Give an external presentation on embodied carbon that demonstrates a project success or lessons learned. Get connected at a CLF regional hub near you and be sure to post the recording.</p>	<p>2023 – complete 2024 – ongoing</p>	<p>2022/2023: RJC (Veronica Ochoa) presented at the CCBST 2022 – 16th Canadian Conference on Building Science and Technology on the paper “Exploring a Multi-Faceted Approach to Design a Carbon Neutral Passive House”.</p> <p>2024: Share the findings of our RJC’s 75th anniversary LCA study by hosting a presentation of our results for RJC staff, with invitation extended to clients, government, and industry representatives.</p>
<p>Engage with structural material suppliers in your region to communicate the importance of Environmental Product Declarations (EPDs) and low-carbon material options.</p>	<p>Ongoing</p>	<p>2023: RJC has been involved in discussions with Concrete Ontario, which represents the ready-mix suppliers, on the performance gap between the GWP based on the drawings and specifications produced by the structural engineer and what is produced in the field.</p>
<p>Propose alternative methods for advocacy and describe their value.</p>	<p>Ongoing</p>	<p>Ongoing: RJC is at the forefront of wood design in Canada, from residential to institutional buildings. Engaged by provincial and federal governments, we consult on the latest updates to building codes for wood design. RJC has an integral role in the development of Canadian Codes and Standards for wood-frame and mid-rise wood-frame developments. We participate at a national level on code groups to develop changes for wood, including those that are leading the way to allowing for taller wood buildings.</p>

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