

An aerial photograph of a modern, multi-level building under construction, nestled in a dense forest. The building's structure is primarily composed of light-colored wood, with some sections featuring a dark, perforated metal mesh. The surrounding landscape is lush with green trees and moss-covered hillsides. The overall scene conveys a sense of sustainable architecture integrated with nature.

**ASPECT** STRUCTURAL  
ENGINEERS

# Embodied Carbon Action Plan 2024





# Contents

"We all seem to think that sustainability has to mean these huge project changes. But, really, a thoughtful approach to every piece of the building structure is all that's needed. Every decision we make, big or small, makes an impact on embodied carbon."

**Caroline Butchart**  
Sustainability Lead, Senior Engineer

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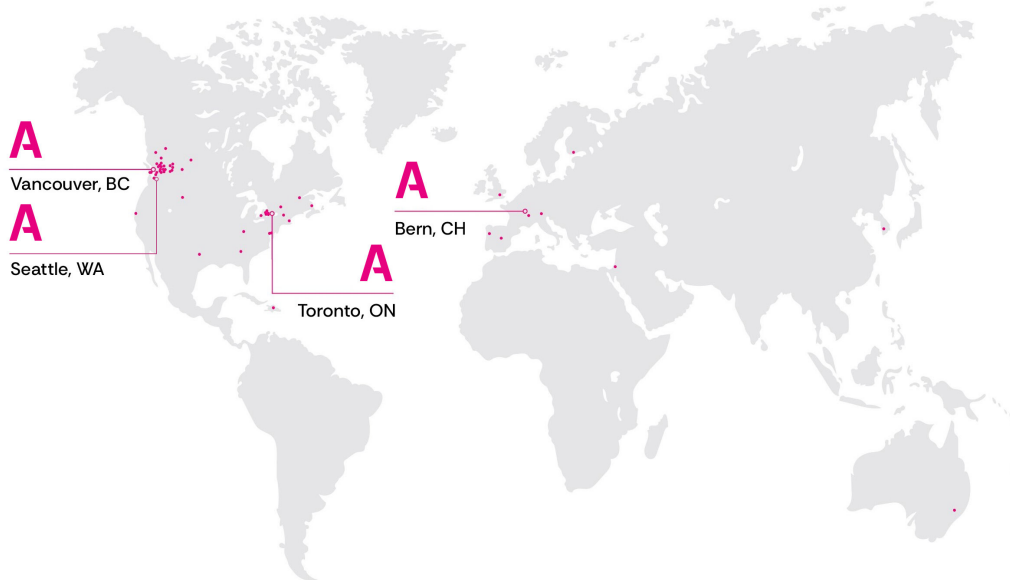
## About us

ASPECT Structural Engineers is a globally acclaimed, full-service structural engineering firm and mass timber consultancy.

Founded in 2016, we are now a cohesive team of more than 50 engineers, technicians, and support staff. Through thoughtful yet pragmatic design practices and rigorous training, the engineers at ASPECT understand not only their role in contributing to a project, but also how to support the roles of others.

Many members of the ASPECT team started their careers in other disciplines, pulling from their experience working with carpenters, contractors, suppliers, or architects to contribute to a wider understanding of the value that structural engineers can bring to a project. Our team-based approach focuses on better design, improved constructability, and unwavering accountability.

From the beginning, ASPECT has been driven by the importance of true sustainability, underscoring our commitment to understanding, and educating others on the benefits of, mass timber. Beyond producing award-winning structural engineering work for everything from office buildings, to bridges, to custom homes, we also dedicate a substantial amount of time to working with other industry leaders – suppliers, architects, and clients – to work through new ways to design and build for the future using mass timber. Our diverse team is active in markets around the world, with dedicated offices in Canada (Vancouver and Toronto), Switzerland (Bern), and the United States (Seattle).



## Our Commitment to SE 2050

Accountability is one of ASPECT's core values. Not only does this include accountability to all those with whom we work, but also to the planet. We must do our part to ensure the environment is healthy and habitable for generations to come.

Buildings and their construction account for around 40% of energy-related carbon dioxide emissions. By 2030, it is estimated that embodied carbon will account for 50% of the total carbon emissions over a building's life. To meet our commitments to the Paris Agreement, we know that we need to act now to reduce emissions across all buildings, not just flagship projects.

ASPECT joined the SE 2050 commitment in 2021, to ultimately eliminate embodied carbon in our projects by 2050. Through the SE 2050 program, we will be able to track the embodied carbon impacts of our structural systems, assess the trends for various systems and establish achievable reduction targets over time.

This Embodied Carbon Action Plan has been compiled in accordance with the SE 2050 guidance. This document is the fourth version, and will continue to be updated annually to reflect targets achieved, changes to plans and lessons learned.

The results from embodied carbon calculations in the period March 2023 – March 2024 will be uploaded to the SE 2050 database during the month of March 2024.

## ASPECT SE 2050 Team

### Caroline Butchart

M.Eng., C.Eng., MStructE, LEED Green Associate | Sustainability Lead, Sr. Engineer

A proven technical and sustainability leader, Caroline's experience spans continents, with direct contributions to large-scale, architecturally ambitious developments in the UK, Europe, and Canada. With more than a decade of experience, and a comprehensive understanding of a range of building materials and typologies, Caroline provides dedicated structural sustainability leadership that underscores ASPECT's in-house capabilities. Throughout her career, Caroline has consistently demonstrated an undeniable interest in (and passion for) building re-use, particularly design for low embodied carbon, and design for disassembly.

Joining ASPECT in 2023, Caroline performs the dual role of Senior Engineer and Sustainability Lead for the firm. In addition to her project leadership, Caroline champions internal sustainability initiatives for all ASPECT team members around the world, contributing to our standards of practice, questioning our approaches, and mentoring our growing staff. Outside of ASPECT, she is also a frequent guest lecturer for schools such as the *British Columbia Institute of Technology (BCIT)*. Caroline hosted the *BC Embodied Carbon Awards in 2023*, and is the co-author of the *EGBC Embodied Carbon Guidelines for Structural Engineers*. She also sits on the *CAGBC Embodied Carbon Technical Advisory Group*.



### Rachel Kazaka

M.Eng., E.I.T. | Embodied Carbon Reduction Champion, Project Engineer

A driven engineer who is passionate about sustainability, Rachel graduated in 2017 with honours from the *University of Ottawa* with a Bachelor of Applied Science in Civil Engineering, specializing in Structural and Geotechnical Engineering. With an interest in preparing for and helping to rebuild after natural disasters, she moved to Vancouver, BC to pursue a Master's of Engineering at the *University of British Columbia*, specializing in Structural and Earthquake Engineering.

Rachel worked for three years on forestry and power-generation projects after graduation, visiting remote parts of the province to observe construction projects to see her designs come to life, and view first-hand the impact on the surrounding environment. Since joining ASPECT, Rachel has become an integral part of our firm-wide sustainability initiatives, as well as a champion for carbon reduction plans on project teams.



## Internal Announcement

ASPECT's commitment to SE 2050 was announced internally in 2021, and all staff are able to read our Embodied Carbon Action Plan (ECAP) on our internal knowledge-sharing platform. This 2024 ECAP is our fourth submission, following a recent internal presentation on our sustainability commitments. As ASPECT grows, all new staff are introduced to our commitment through a formal company onboarding process.





# Education

At ASPECT, we prioritize staff education around three core areas: awareness building, habit building, and knowledge building.

By focusing on these three areas, we strive to create the space for engineers to relate to the “why”, understand the scale of their daily decisions, and change the way they do their work. Our internal education program provides all ASPECT engineers with the tools to understand the problem at hand, and to place that problem in a much larger context.

As part of this internal education program, in 2024 we introduced our “Small Wins, Big Impact” initiative. Project budgets and schedules can often see embodied carbon reductions pushed to the side, and this ASPECT initiative creates a friendly, office-wide embodied carbon reduction competition. This embodied carbon reduction competition incentivizes emissions reductions, creating a culture (and reinforcing the habit) of designing for embodied carbon reductions. Over time, this initiative will generate a database of information related to project decisions, and help us to understand where we were most effective at reducing carbon.

In addition, we continue to provide internal education opportunities around emissions reductions and circularity, and frequently invite speakers to present internally at our office “Lunch ‘n Learn” series.

## Elective



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

- Our Sustainability Lead and our Embodied Carbon Reduction Champion are engaging with all engineers across our four offices through our “Small Wins, Big Impact” initiative, as well as through internal training and dedicated project support.
- Employees in our Vancouver office are required to read the Engineers and Geoscientists BC (EGBC) “Sustainability Guidelines” and implement carbon reduction strategies.
- Our Toronto office has assigned an Embodied Carbon Calculation champion who supports embodied carbon calculations for every project, regularly providing one-on-one training to others.
- Our internal sustainability group has expanded in 2024, increasing our ability to gather project data and produce resources for internal decision making.

### **Present at least one (1) webinar focused on embodied carbon and make a recording available to employees**

- Sustainability Seminars are prepared and presented to all staff annually. Recordings of past presentations are made available through the firm’s knowledge-sharing platform. Topics included an introduction to the Embodied Carbon Calculation Tool, concrete general notes, and other updates. This year’s presentation will be focused on embodied carbon in policy, and ensuring all ASPECT engineering team members are up to speed on regulations most applicable to their work. The presentation will be held prior to the end of the fiscal year.

### **Incorporate embodied carbon education in your onboarding process for all new employees**

- Since May 2022, all new employees are required to watch the recorded Sustainability Internal Education Seminars as part of the onboarding process.

### **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**

- A dedicated Sustainability page has been created on ASPECT’s internal knowledge-sharing platform, providing a space where employees can view our current and past ECAPs, various guidelines, past presentations and seminars, as well as design resources and local policy. This page is regularly updated to reflect the rapidly-evolving knowledge in this area.

### **Nominate an Embodied Carbon Reduction Champion for your firm**

- Our Embodied Carbon Reduction Champion is Rachel Kazaka. Rachel is based out of our Vancouver office.

# Reporting

Since committing to SE 2050, ASPECT has conducted Embodied Carbon Calculations on a variety of projects, differing in size, location, and building material.

Our internal, proprietary embodied carbon calculator (ECC) spreadsheet can be used to assess the upfront emissions on any project, and is tied to a Bill of Materials Export from REVIT. This ECC spreadsheet analyzes the Product stage (A1-A3) and the Construction Process stage (A4-A5) of a building's life cycle.

The ECC spreadsheet draws data from the latest product-specific Environmental Product Declarations (EPDs) sourced from EC3. Industry Average EPDs are used where product-specific declarations are not available, and lastly, Carbon Leadership Forum material benchmarking values are used in the absence of EPDs.

Results from the tool are used internally to build our database of projects. This database helps inform targets for future projects, and ensures we are meeting the requirements of embodied carbon policy. Results from our embodied carbon calculator spreadsheet are exported to an embodied carbon report, which can be issued externally to help educate and inform clients and architects on the embodied carbon of structural materials. We also use results from this spreadsheet to meet our reporting requirement to the SE 2050 Database.

## Elective



### Submit a minimum of 5 projects with structural engineering services to the SE 2050 Database

- We will submit data from the 2024 fiscal year to the database by March 2024.

### For multi-office firms, describe how each office is measuring and reporting embodied carbon

- In addition to the above, we are working with The University of Toronto to help put together a large database of building material use. This involves sending multiple projects to the University for them to conduct their own quantity calculations and embodied carbon calculations.

## Embodied Carbon Report – Example Project

Modules A1-A5 (Substructure and Superstructure)

**TOTAL EMBODIED CARBON = 3,075,943 kgCO<sub>2</sub>e**

This is equivalent to



**1,875**  
people's consumption of  
meat, dairy and beef for 1 year



**3,770**  
one-way flights from  
New York to London



**770**  
average family cars running  
for 1 year

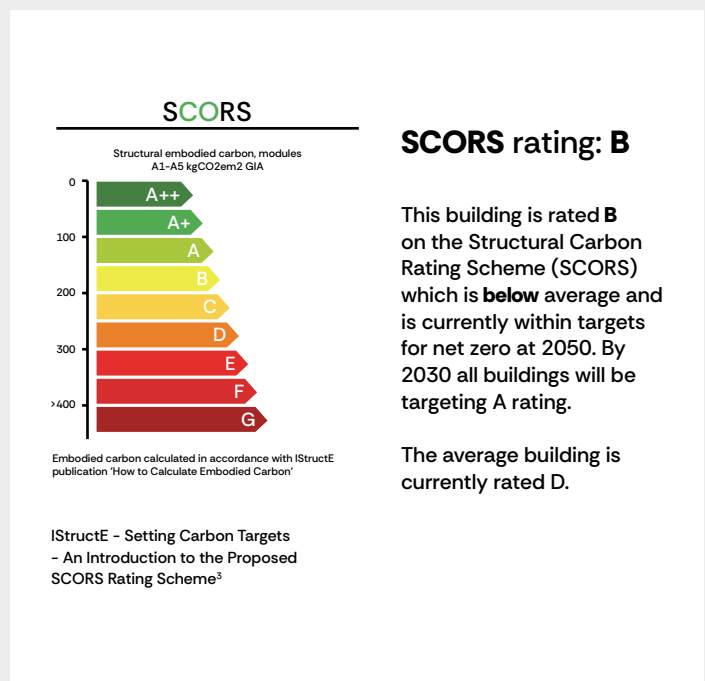


**161,086**  
mature trees absorbing  
CO<sub>2</sub> in 1 year

**EMBODIED CARBON RATE = 192 kgCO<sub>2</sub>e/m<sup>2</sup> GIA**  
(Total Embodied Carbon divided by Gross Internal Floor Area)

**SEQUESTERED CARBON = -93 kgCO<sub>2</sub>e/m<sup>2</sup> GIA\***

\* see Sequestration section in preceding Information sheet for clarification on this value



# Reduction

Reducing the embodied carbon in our designs is key to meeting our commitment to SE 2050, and increasingly important to us meeting client and local policy requirements, which we've seen steadily increase in recent years.

Over the last three years, ASPECT has collected a growing database of embodied carbon calculations associated with a variety of our projects. In 2024, we initiated a "Small Wins, Big Impact" initiative, through which engineers compete to maximize embodied carbon reductions. All engineers have a minimum target for 2024. The goal of this initiative is to show engineers how embodied carbon reductions can be folded into our design process with little to no additional cost. Additionally, we are currently working to produce an internal checklist for engineers to review their own designs for potential embodied carbon reduction opportunities.

## Elective



### **Update your specifications to incorporate embodied carbon performance.**

- We have implemented a maximum allowable GWP rate to our concrete specifications.
- We are undertaking a collaborative study on strategies for success when specifying low carbon concrete. This involves us being heavily involved in the tender phase, as well as recognizing that alternate metrics for success, beyond lowest cost, need to be developed and defined on a project-by-project basis.

### **Communicate the embodied carbon impacts of different design options to clients with creative and effective data visualization.**

- The results from the ASPECT Embodied Carbon Calculation Spreadsheet are often issued externally as a report to clients or form the basis of a project team presentation. We have incorporated an embodied carbon section as standard in our Schematic Design Report Template, and are currently working to incorporate this data into the titleblock of our drawings. Our ECC report explains the importance of embodied carbon, particularly why it is a central concern, and provides information on comparisons between schemes, material types, and other key design decisions.
- An extract of the infographic from the "Low Carbon Now" initiative with BDP Quadrangle is presented to developers primarily for them to use as a guide for building net-zero multi-unit residential buildings. The Engineering study was led by Entuitive and supported by ASPECT.

### **Participate in a LEED® project design charrette.**

- Rachel Kazaka participated in a LEED project design charrette for an industrial-type project in Richmond, BC. One of the strategies discussed that impacts embodied carbon was the addition of a green roof, which would sequester carbon and significantly reduce energy consumption. However, as this meeting was held at a relatively late stage in the design phase of the project, the owner deemed the addition undesirable. As a result, it has been noted that LEED discussions should be held at an earlier design phase.

### **Incorporate sustainably harvested biogenic materials on at least one project.**

- As of 2021, the majority of our projects include wood products. Wherever possible we suggest strategies for adopting bio-based wood structures with minimal additional cost.



# Advocacy

Advocating for change and sharing knowledge is one of the most impactful ways we can reinforce the industry's motivations towards carbon reductions.

We firmly believe that collaboration across all members of the construction industry is essential to accelerate change. Our Sustainability Lead is an active volunteer with the Carbon Leadership Forum (CLF) BC, and served as chair of this local hub from 2022-2023. Additionally she is a volunteer on the CAGBC Embodied Carbon Technical Advisory Group, and a co-author of the EGBC Guidance on Embodied Carbon for Structural Engineers. Externally we share knowledge regularly through a series of blog posts on our website, and social media. These cover a range of topics including an introduction to calculating embodied carbon, easy ways to reduce embodied carbon in design, and a short introduction to the benefits of circularity and design for disassembly (something our sustainability lead is extremely enthusiastic about). Embodied carbon success stories related to our project work are proudly shared on the firm's LinkedIn page. Here, we see positive engagement from clients, industry members and the public.

## Elective



### Describe the value of SE 2050 to clients

- We include a section on collaboration and data sharing within the ECC report which is issued to clients. This talks about our commitment to SE 2050 and has direct links to SE 2050.org.
- We include a section on sustainability and our commitment to SE 2050 on all of our proposals.

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

- This is included in our proposals and is included in the news section of our website.

### Engage with structural material suppliers in your region to communicate the importance of Environmental Product Declarations (EPDs) and low-carbon material options

- We are collaborating with University of Toronto on paths towards meaningful embodied carbon reductions in concrete supply for major projects. Additionally, we are in discussion with the President of Concrete Ontario on ways to progress the use of low carbon concrete in the local market.

### Article:

ASPECT Climate Chronicles  
– Part 2: How to Reduce  
the Embodied Carbon of  
a Building

[READ NOW](#)





# Lessons Learned

Since committing to SE 2050 in 2021, we have learned some key takeaways from the calculations, studies, seminars, and community discussions.



## Building Efficiently

We take a hierarchical approach to emissions reductions, with the efficiency of structural systems taking precedence over the specification of low-carbon products. This results in carbon reductions at the lowest cost to the project. Concrete continues to be a major source of emissions of our projects, and our approach to tackling this is to first reduce, and then to specify low carbon.

Lightwood frame buildings perform extremely well in terms of embodied carbon. We should be encouraging their use as much as possible over mass timber.



## Specifying Low Carbon

We have implemented a “maximum embodied carbon” rate within our concrete specifications. Our concrete embodied carbon limits have been successfully employed in both British Columbia and Ontario without impacting construction schedule. We are continuously looking for ways to improve our specifications, including specifying materials in a way that allows for supplier feedback.



## Early Project Engagement

Early engagement on projects has proven to be beneficial. When we have been able to provide input projects prior to re-zoning we were able to influence the building shape and basic massing, thereby eliminating some transfer elements and reducing concrete volume. Often our input comes too late, and wherever possible, suggestions for embodied carbon reduction opportunities are incorporated into our fee proposals.



## Community Feedback

We see positive feedback and engagement from clients, the structural engineering community, and the public when we post about our embodied carbon reduction work on social media platforms.

# In Conclusion

Embodied carbon reductions are time critical and the volume of emissions are globally significant. If we are to meet our 2050 goals, we also need to meet our intermediate 2030 goals. Time is of the essence, and the construction industry needs to do more.

We are actively pursuing emissions reductions internally, and providing education and advocacy externally to encourage widespread industry change, and to assist in breaking down the roadblock of cost as a barrier to emissions reductions. ASPECT is active through industry collaborations, round tables, webinars, and industry guidelines. As we work toward our commitment to SE 2050, we hope to see further movement in the direction of low-carbon construction, and we look optimistically for positive results for the planet.

