DIALOG®

EMBODIED CARBON ACTION PLAN 2025

Contents

Front Cover:
Vivo for Healthier Generations Expansion
Calgary, AB **506 kg CO_2e / m^2**

Rear Cover:
Lethbridge Agrifood Hub
Lethbridge, AB **221 kg CO_2e / m^2 (15 kg CO_2e / m^2 biogenic)**

This is a living document that is reviewed annually. Questions, comments, and feedback is encouraged and may be directed to the ***SE2050 Embodied Carbon Champions***:

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OUR IMPERATIVE

Buildings generate nearly 40% of annual global Greenhouse Gas (GHG) emissions, and approximately two-thirds of the building area that exists today will still exist in 2050. Not only do we create these buildings, but these are also the very places where we live, work, and play. In December 2017, DIALOG signed on to the American Institute of Architects (AIA) 2030 Commitment. This Commitment focuses on reducing the operational greenhouse gas emissions during a project's lifetime. This commitment was an important milestone for our industry; showing that design must take on more responsibility and leadership in reducing the greenhouse gas emissions caused by the buildings we create.

In August 2021, DIALOG proudly signed on to the S2050 Commitment Program. Developed and managed by the Structural Engineering Institute (SEI) of the American Society of Civil Engineers (ASCE), the mission of the SE 2050 commitment is to achieve net zero embodied carbon in the structures we design by 2050. This will transform the practice of structural engineering at DIALOG using a holistic, firm-wide, project based, and data-driven approach. By prioritizing the reduction of embodied carbon, using less and/or less impactful structural materials, we can all more easily work toward the end goal of net zero embodied carbon structural systems by 2050.

As a fully-integrated design practice, DIALOG has the unique opportunity to profoundly address and reduce both the operational and embodied greenhouse gas emissions of our built environment.

WE ARE PASSIONATE ABOUT DESIGN
WE BELIEVE IT CAN AND SHOULD
MEANINGFULLY IMPROVE
THE WELLBEING OF OUR COMMUNITIES
AND THE ENVIRONMENT WE ALL SHARE

The SE 2050 Commitment Program is defined by four distinct actions:

1. **Educate** the designers of the built environment on the best practices of sustainable structural design and construction that will lead to net zero embodied carbon by 2050;
2. **Engage** in an embodied carbon tracking program within our practice, thereby enabling the establishment of appropriate embodied carbon reduction targets until net zero is realized;
3. **Report** on the current embodied carbon impacts and trends of various structural systems for different regions in which we practice; and,
4. **Advocate** and communicate with clients, the design community, and the public to build an understanding about embodied carbon and impacts of the built environment.

INTRODUCTION TO EMBODIED CARBON

Embodied carbon is a term used to communicate the equivalent global warming potential arising from the materials and construction of a structure within the built environment. This is typically defined through the modules listed below, excluding modules B6 and B7, which are considered 'Operational Carbon'.

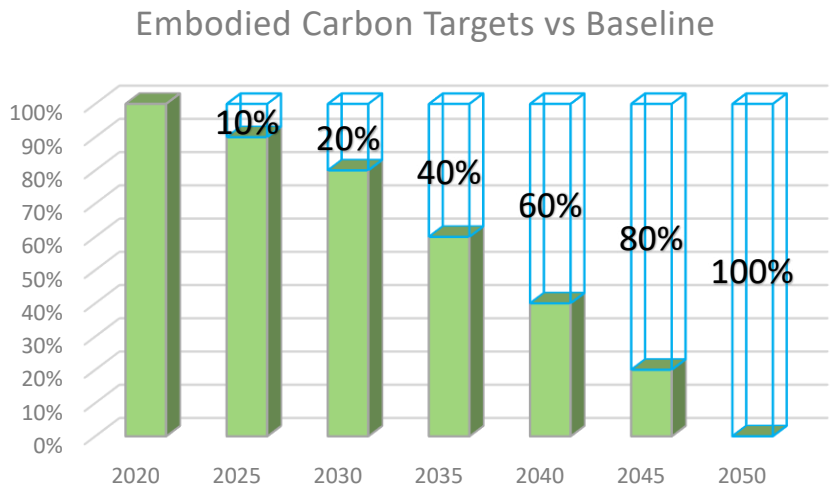
Product	A1 – Raw Material Supply
	A2 – Transport
	A3 – Manufacturing
Construction	A4 – Transport
	A5 – Construction Activities
Use	B1 – Use
	B2 – Maintenance
	B3 – Repair
	B4 – Replacement
	B5 – Refurbishment
	B6 – Operational Energy Use
	B7 – Operational Water Use
End of Life	C1 – De-construction/Demolition
	C2 – Transport
	C3 – Waste Processing
	C4 – Disposal

The materials used, the sizes of structural elements, the loads used for the design, and many other decisions made through the design of a project affect each of these modules. For the purpose of the SE 2050 Commitment Program, we will be focusing on modules A1 through A5, which represent the bulk of the embodied carbon of a project and the aspect of a design we can most directly and immediately affect.

TARGETS

The following milestones and targets are proposed for all DIALOG studios. We understand that adoption and change will not be linear. As the teams gain experience and efficiency with conducting Life Cycle Analyses (LCAs), and as project requirements and industry best practices shift to support this initiative, we will see an exponential increase in meeting our reduction targets. These targets will be reviewed and updated as required, to ensure goals are realistic but still challenging. Where local jurisdictions adopt a faster timeline for embodied carbon reductions, those requirements will be met.

Year	Goal
2021-2024	Begin conducting and reporting on LCA findings on all projects
2025	**Continue LCA's on all projects**
2025	10% reduction
2027	Milestone check-in to assess DIALOG 's progress towards 20% reductions in 2030
2030	20% reductions
2035	40% reductions
2040	60% reductions
2050	**NET ZERO**



REDUCTION STRATEGY

Reduction of embodied carbon is of utmost importance to achieve both the goals of the SE 2050 Commitment Program and contribute to a sustainable future. We will be implementing several strategies to achieve these reductions as outlined in the following sections.

Defining the Project

The first step in reducing the embodied carbon of our projects is to thoroughly scrutinize the project requirements with the client to determine if the proposed project is the right fit. We plan to educate our design teams to follow the hierarchy of carbon reduction potential as outlined in The Institute of Structural Engineers' *'Design for Zero'*. Involving our structural engineers early in design conversations, before solutions are agreed upon, maximizes our potential impact in implementing this hierarchy and reducing the embodied carbon of our projects. These can be summarized as:

Build Nothing: Can the proposed use be accommodated within existing building stock?

Build Less: Can existing structures be reused with minimal new construction?

Build Clever: How can the design of the new structures tailor the loading and serviceability requirements for minimize the structural mass, while promoting long-term durability and potential re-sue opportunities? Can we prioritize optimum structural arrangements (smaller structure grids, minimal transfer elements), and utilize low-carbon materials?

Build Efficiently: Can construction waste and emissions be reduced?

Completing Embodied Carbon Calculations

Structural planning decisions during early-stage design such as respacing the typical bay sizes, reconsidering the design floor loading, or changing the building height can have a direct impact on the final embodied carbon for the structure or project. It is vital to communicate this awareness, and ensure that our design teams, clients, and the broader design community understand how these choices at the design level can affect the result.

To support this, our goal is to complete embodied carbon calculations in the form of LCAs for all our structural projects. This allows us to leverage the data produced, better understanding the embodied carbon of our own projects, and creating a benchmark for DIALOG. This information is also used to help set industry-wide and national benchmarks through the SE 2050 commitment and through other advocacy work.

At DIALOG, we have outlined our process for calculating embodied carbon in our Embodied Carbon Playbook. The Embodied Carbon Playbook provides a framework to leverage DIALOG's integrated team to holistically address embodied carbon on our projects. The Playbook clearly identifies the role of each discipline in tracking and reducing the embodied carbon of our projects, beginning at the pre-design stage and ending at operations. It also introduces the various embodied carbon calculators currently available for use, describing the pros and cons, and best suited applications. The Playbook is a comprehensive guide that structural engineers and all disciplines alike can consult as a reference at any stage of a project or design.

For large projects, this process also defines completing multiple embodied carbon calculations through the various stages of a project. This allows for early collaboration with the design team to explore various structural framing configurations and layouts, including the use of different building materials for construction. Embodied carbon calculations can then be calculated and compared for the different options. At later stages of design, such as design development and contract documents, these calculations can be re-done to verify whether the early design decisions achieved the anticipated results.

Project Specifications

Our engineers in collaboration with the specifications team are currently undertaking the task of updating the content of our Master Specifications with regards to the design and procurement of the key building materials such as concrete, structural steel and reinforcing steel. The specifications for low-embodied carbon concrete have been completed and are integrated into our standard specifications package. The process involves industry research to update the contents with the most accurate market information, reflecting what is currently available on the market and accounting for variability such as project geography, and location-dependent material availabilities. With this update, our specifications will be incorporating a performance-based approached for reducing embodied carbon of materials. A performance-based specification allows the greatest flexibility for a project team and material suppliers to achieve embodied carbon reduction goals, maintaining competitiveness of the bidding process. As our specifications evolve alongside industry innovation and advancements, we can ensure our projects are in line with industry best practice.

EDUCATION PLAN

We recognize that decisions factoring in embodied carbon is a cultural shift from the customary design decisions structural engineers make daily. Accordingly, it is important to provide the resources and education necessary to develop a broad base of embodied carbon knowledge. Our goal is to foster a culture withing DIALOG where embodied carbon is as important in our structural designs as serviceability and safety. We plan to achieve this goal through the selection of Embodied Carbon Champions in each studio, encouraging engineers to prioritize embodied carbon in their selection of continuing education opportunities, and broadly sharing our learnings.

Embodied Carbon Champions

Each of our studios have identified a representative to champion our practice-wide effort. Their role will range from supporting the other disciplines on their projects, such as answering questions related to embodied carbon or conducting life cycle assessments, to developing and presenting continuing education sessions for the team. In addition, they will advocate for studio needs, maintain awareness of global trends and foster relationships with industry leaders. They will communicate and coordinate with their counterparts to ensure there is consistency across the practice, and that the intended milestones are being met. These Embodied Carbon Champions are listed below. We encourage DIALOGers to reach out to their respective Champion for more information.

Continuing Education

On-going education sessions will be continuously developed in-house and presented to the studio teams. These sessions will be open to all disciplines with a focus for engineers and architects. As the teams gain traction and project experience, future sessions will be developed to tailor certain topics, with some sessions eventually being offered on a reoccurring basis, as refreshers or when a new member to the team is added.

Upcoming Sessions

Summer 2025	Practical Embodied Carbon Calculations
Fall 2025	Embodied Carbon Knowledge Sharing
Winter 2025	Embodied Carbon Lessons Learned

We will also encourage and prioritize attendance at external learning opportunities related to embodied carbon.

Knowledge Sharing

A key to successfully reducing the embodied carbon of our projects is to share the lessons learned as we develop our processes, both successes and failures. These will be shared through quarterly discipline-wide emails.

Additionally, DIALOG has ten Practice Roundtables. In their topic area, the role of each Practice Roundtable is to champion our practice-wide strategy, to advocate for local studio needs, to maintain awareness of global industry trends, to support their associated Knowledge Networks, to direct our learning and development curriculum, and to advance us toward the leading edge of practice. Achieving our 2050 commitment will require leveraging the expertise

of DIALOGers. Two of these roundtables will play an outsized role in the embodied carbon discussion and have been engaged in developing this action plan.

GREEN PRACTICE ROUNDTABLE

The mandate of the Green Practice Roundtable (GPRT) is in developing and implementing practice-wide strategy to deliver on DIALOG's mandate to improve the health of the environment we all share through providing tools and resources, transforming our culture and design process, and improving how our studios operate.

SPECIFICATIONS ROUNDTABLE

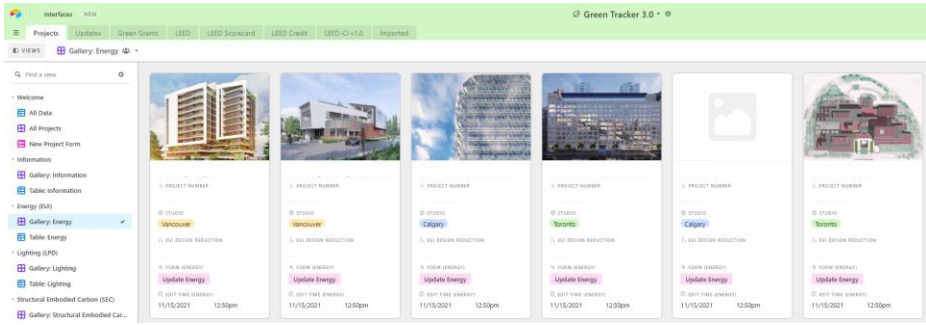
The mandate of the Specifications Roundtable (SRT) is to foster a strong research and specifications group in support of DIALOG's project excellence, and shepherd specification knowledge sharing across the firm.

REPORTING

Our means of completing embodied carbon calculations is outlined in DIALOG's Embodied Carbon Playbook. This playbook outlines the tools used to calculate embodied carbon at each stage of a project. In general, embodied carbon calculations for the purpose of reporting to the SE 2050 Commitment Program will include all primary structural elements. Other disciplines will supplement with calculations for their respective elements; however, these will not be included in the values for the structure. The typical scope for our calculations will include modules A1 through A5, which includes material extraction, transport to the manufacturing facility, manufacturing, transport to the construction site, and construction.

Reporting will be done using DIALOG's Green Tracker v3. The Green Tracker is a tool developed to streamline collection and reporting of sustainability data for our projects. The purpose of the Green Tracker is to become a firmwide database that tracks all the metrics that are important from a sustainability perspective for all our projects - beginning with the energy-related metrics relative to the AIA 2030 and SE 2050 commitment. It is an intuitive tool that easily integrates the measuring and reporting aspects of a project's Energy Use Intensity in the design process. Long term, we add metrics to this database as needed help us compare the sustainability of our projects, from water use to walkability.

We aim to complete embodied carbon calculations on all our structural projects, understanding there will be a learning curve while proficiency with the software is established.



Green Tracker v3 Interface

ADVOCACY

We recognize that as design professionals, we are relied upon for our expertise. We can leverage our relationships with clients, other consultants, and the community at large to broaden the understanding of embodied carbon in the construction industry. The following strategy will be used to communicate with clients, the design community, and the public to build an understanding about embodied carbon and impacts of the built environment:

We have shared our commitment to SE 2050 on our company website:

- *DIALOG Signs on the SE 2050 Commitment Program* (https://www.dialogdesign.ca/stories/dialog-signs-on-to-se2050-commitment-program/)
- *DIALOG Signs Open Letter to World Governments: The Time to Act on Climate Change is Now* (https://www.dialogdesign.ca/stories/dialog-signs-open-letter-to-world-governments-the-time-to-act-on-climate-change-is-now/)

We will include our SE 2050 Commitment in our standard proposal package. We are working to develop our standard proposal language and information to educate our clients on the role of embodied carbon in climate change, and the opportunities our projects present to address this contribution. Our goal is to include this information in all our proposals.

We will engage in conversations with our colleagues in industry to advance the embodied carbon conversation. Through our Specifications and Green Practice Roundtables, we have and will continue to engage in regular conversations with our industry contacts to understand current trends within the construction industry. This allows us to understand reasonable approaches to reducing embodied carbon that are supported by industry. These conversations will inform how we specify materials, how we revise our structural systems to optimize the use of materials, and any tradeoffs that may result.

We will prepare a presentation to share with our design colleagues. Through our membership in professional organizations, we will volunteer to prepare a presentation regarding the importance of the consideration of embodied carbon in the design industry and strategies that may be employed to reduce embodied carbon in the design of structures.

We will engage and educate our clients about embodied carbon. We will be active in talking to clients on projects. We will also be presenting at conferences and directly to client groups on advances in embodied carbon reduction in structural materials.

LESSONS LEARNED

In our journey towards reducing embodied carbon of our projects we've garnered invaluable insights. Through careful observation and experience, we've come to acknowledge several key lessons that have significantly impacted our approach to projects.

1. **Accountability Among Our Team:** Implementing embodied carbon calculations across all projects necessitates a collective commitment from our team. We've learned that accountability plays a pivotal role in ensuring the completion of these calculations. Establishing clear responsibilities and fostering a culture of transparency has been instrumental in this regard. Regular check-ins and continuous education have been vital to keep everyone aligned and motivated. Our Embodied Carbon Champions will complete monthly audits of their respective studios of LCAs completed and lessons learned.

2. **Cooperation with and Engagement of Contractors:** Introducing new practices or materials aimed at reducing embodied carbon can be met with skepticism or reluctance. Addressing this challenge requires effective communication, highlighting the long-term benefits, and providing necessary support and resources to ease the transition.

    a. *Building Awareness with Contractors:* Securing contractor buy-in and fostering accountability are fundamental to successful implementation of structural embodied carbon reduction measures. Collaborative efforts, clear communication, and education can motivate contractors to embrace sustainable practices and uphold their commitments to reducing embodied carbon.
    b. *Formwork Requirements for Concrete Systems:* Opting for structural systems that increase structural efficiency often results in more complicated formwork (e.g., Concrete beam and girder system versus concrete flat slab). We've learned to work with contractors to balance these trade-offs and achieve the project goals.
    c. *Stripping Times for Formwork with Slower-Strength Concrete:* Opting for slower-strength concrete may extend stripping times but can contribute to lower embodied carbon. Finding the optimal mix that meets both performance and embodied carbon criteria is key.
    d. *Finishing and Curing Requirements for HVSCM Concrete:* High-Volume Supplementary Cementitious Material (HVSCM) concrete offers significant potential for reducing embodied carbon. However, proper finishing and curing techniques are crucial to ensure its structural integrity and longevity. Early collaboration with contractors is fundamental to communicating the differences these reduced embodied carbon concrete mixes may present.

3. **Perceived or Actual Cost Premium:** A common concern surrounding sustainable construction practices is the perceived or actual cost premium. We've learned that while some sustainable initiatives may entail initial investment, communicating the environmental benefits transparently to stakeholders is essential in dispelling misconceptions and fostering acceptance of sustainable solutions. DIALOG will create an internal central reference compiling cost premiums of various structural options to facilitate these conversations.

4. **Understanding Feasibility in Each Market:** Market dynamics and local conditions significantly influence the feasibility of implementing structural embodied carbon reduction strategies. We've learned to conduct thorough market assessments, considering factors such as material availability, labor skills, regulatory landscape, and client preferences. Tailoring our approach to suit specific market contexts ensures pragmatic and effective implementation of sustainable practices.

Our journey towards addressing structural embodied carbon has been marked by challenges and learnings. By fostering accountability, embracing innovation, and navigating complexities with resilience and adaptability, we continue to advance towards our sustainability objectives, one project at a time.

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