DIALOG®

EMBODIED CARBON ACTION PLAN 2022

Contents

This is a living document that is reviewed annually. Questions, comments, and feedback are encouraged and may be directed to the Embodied Carbon Action Plan Development Team:

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OUR IMPERATIVE

Globally, the building sector, materials and operations, account for over 33% of the annual emissions of greenhouse gases (GHGs), with building materials alone contributing 11%. Furthermore, two-thirds of the building area that exists today will still exist in 2050[1]. Not only do we create these buildings, but these are also the very places where we live, work, and play. At DIALOG, we're passionate about design. We believe it can, and should, meaningfully improve the wellbeing of our communities and the environment we all share. In December 2017, DIALOG signed on to the American Institute of Architects (AIA) 2030 Commitment. This commitment was an important milestone for our industry; showing that design must take on more responsibility and leadership in offsetting the GHG emissions caused by the buildings we create. As a fully-integrated design practice, DIALOG has the unique opportunity to profoundly address and reduce both the operational and embodied GHG emissions of our built environment.

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The Structural Engineering (SE) 2050 Challenge, an initiative conceived and developed by members of the Carbon Leadership Forum, was designed to ignite structural engineers and their firms to meet embodied carbon benchmarks with ambitious reduction goals and be recognized for the significant role they can play towards these targets. The SE 2050 Commitment Program was later developed and managed by the American Society of Civil Engineers (ASCE), with the mission to support the SE 2050 Challenge, and transform the practice of structural engineering in a way that is holistic, firm-wide, project based, and data-driven.

As of August 2021, DIALOG has proudly signed on to the SE 2050 Commitment Program. By prioritizing the reduction of embodied carbon, using less materials and/or less carbon intensive structural materials, we can all strive toward the end goal of net zero embodied carbon structural systems by 2050.

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

In the building industry, embodied carbon refers to the GHG emissions arising from the manufacturing, transportation, maintenance, and disposal of building materials, and related construction activities. This is typically defined through the modules listed below, but excluding modules B6 and B7, which are considered 'Operational Carbon'.

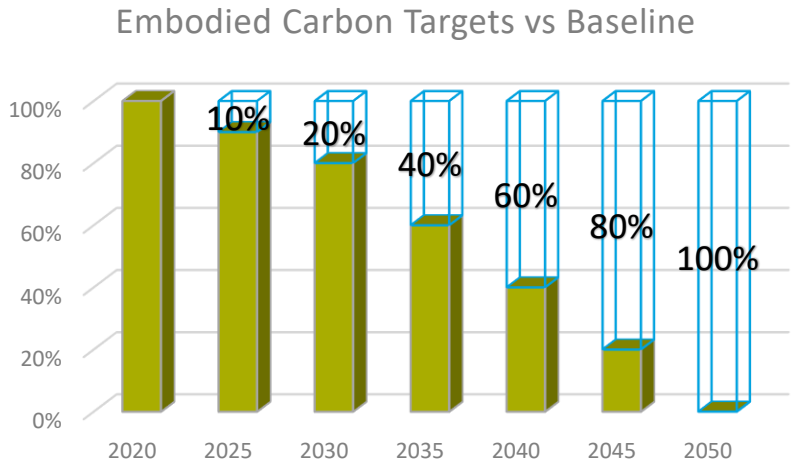
Product	A1 – Raw material supply
	A2 – Transport
	A3 – Manufacturing
Construction	A4 – Transport
	A5 – Construction installation
Use	B1 – Use
	B2 – Maintenance
	B3 – Repair
	B4 – Replacement
	B5 – Refurbishment
	B6 – Operational Energy Use
	B7 – Operational Water Use
End of Life	C1 – De-construction/Demolition
	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 represents approximately 55% of the total embodied and operational carbon[2] of a project and the aspects of design and construction that we, as structural engineers, can most directly and immediately affect.

TARGETS

The following milestones and targets are proposed for all five DIALOG studios. We anticipate 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 become more standardized, we expect to see an exponential increase in meeting our reduction targets. These targets will be reviewed and updated as required, to confirm goals are realistic but still challenging. Where local jurisdictions adopt a faster timeline for embodied carbon reductions, those requirements will be met.

Year	Goal
2021-2023	Begin conducting and reporting on LCA findings 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
2045	80% reductions
2050	**NET ZERO**



REDUCTION STRATEGY

In line with the SE 2050 Commitment Program, reduction of embodied carbon in our projects is a key factor contributing to a sustainable future. We will be implementing several strategies in our structural design process to achieve these reductions in the structures we design.

Defining the Project

At the start of a project, the greatest reductions in the embodied carbon of our structural designs can be achieved by thoroughly scrutinizing the project requirements with the architect and client, to determine if they are properly aligned with the overall project vision and sustainable construction practices. 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: Can the new structure use the minimum design loads and serviceability requirements? 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 Pre-design or Schematic Design) including 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 essential to communicate this awareness, and confirm that our design teams, clients, and the broader design community understand how these choices at the design level can affect the end result.

To support this, our goal is to complete embodied carbon calculations for all our structural projects. This allows us to leverage the data produced, and better understand the embodied carbon of our own projects, thus creating a benchmark for DIALOG as a whole. 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, our internal interdisciplinary embodied carbon working group has outlined our process for calculating embodied carbon in our Embodied Carbon Playbook (the Playbook). The Playbook provides a framework to leverage DIALOG's integrated team structure 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 various embodied carbon calculators currently available for use, describing the pros and cons, and best suited applications. The Playbook is a comprehensive guide that all disciplines can consult as a reference at any stage of a project.

DIALOG's Embodied Carbon Playbook, launching Summer 2022

For large projects, the Playbook 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

DIALOG is currently 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 process involves industry research to update the contents to reflect 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 the 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, while maintaining competitiveness of the bidding process. As our specifications evolve alongside industry innovation and advancements, we can ensure our projects align with industry best practice.

EDUCATION PLAN

We recognize that considering embodied carbon in decision making 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 within DIALOG where embodied carbon is as important in our structural designs as safety and serviceability. We plan to achieve this goal through empowering 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 five studios has 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 LCAs, to developing and presenting continuing education sessions at DIALOG. In addition, they will advocate for local needs, maintain awareness of global trends and relationships with industry leaders. They will also 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.

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Continuing Education

On-going education sessions will be continuously developed in-house and presented to the practice. These sessions will be open to all disciplines. The planned sessions for the 2022 calendar year will mostly feature introductory information and content. As the teams gain traction and project experience, future sessions will be developed to tailor to certain topics, with some sessions eventually being offered on a reoccurring basis, as refreshers or when a new member is added to the team.

2022 Planned Sessions

Spring 2022	Introduction to Embodied Carbon: LCAs for All
Spring 2022	LCA How-To (Part 1): Tools and Methodologies
Summer 2022	LCA How-To (Part 2): Reporting and Optimizing
Summer 2022	Embodied Carbon Reduction Strategies
Future	Circular Design Principles

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, presentations, and DASH (DIALOG's intranet) posts.

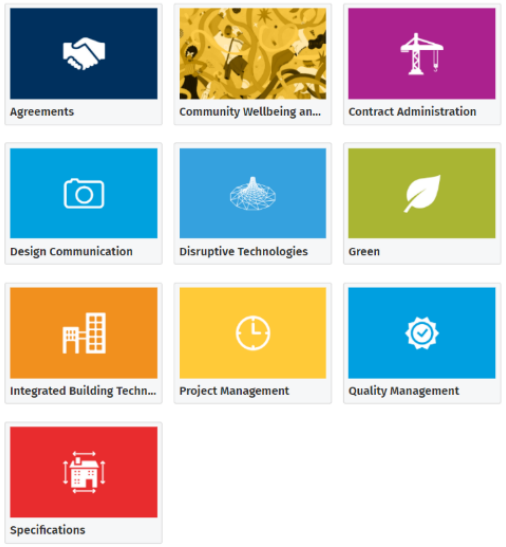
DIALOG has ten Practice Roundtables. In their topic area, the role of each Practice Roundtable is to champion our practice-wide strategy, to advocate for local studio needs, to maintain awareness of global industry trends, to direct our learning and development curriculum, and to advance us toward the leading edge of practice. Achieving the SE 2050 Commitment will require leveraging the expertise of all DIALOGers. In particular, two of these roundtables will play an outsized role in the embodied carbon discussions.

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 and wellbeing of the environment we all share through providing tools and resources, transforming our culture and design process, and improving how our studios operate. Most notably, the GPRT created an internal interdisciplinary working group to create the Embodied Carbon Playbook and will work with the design teams for any feedback and improvements on it. This working group is developing our approach to reducing the embodied carbon of our projects, focusing on our processes for considering embodied carbon, the SE 2050 Commitment, and advocacy.

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. The SRT has been undertaking the task of updating DIALOG's Master Specifications for the design and procurement of the key building materials, which was previously described on page 5.



DIALOG Practice Roundtables

REPORTING

Our means of completing embodied carbon calculations outlined in DIALOG's Playbook. The Playbook is a guide of all of DIALOG's professional disciplines that outlines the tools and processes 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. This will be the minimum embodied calculation completed on our projects, with other disciplines supplementing calculations for their respective elements depending on the scope and goals of the project. These other disciplines will not be included in the reported values for the structure. The typical scope for structural calculations will include modules A1 through A5, which encompasses 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 serve as a practice-wide database that tracks all the metrics that are important from a sustainability perspective for all our projects including but not limited to embodied and operation carbon. The goal is to leverage the data from our past projects to inform the design of our future projects and quantify our sustainability efforts.

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

Green Tracker

ADVOCACY

We recognize that as design professionals, we are relied upon for our expertise. We can leverage our relationships with clients, other consultants, contractors, and the community at large to broaden the understanding of embodied carbon in the design and construction industry. Changes to our structural designs alone will not eliminate embodied carbon from our structures, and we will require support from these groups to further reduce the embodied carbon of our projects beyond the reach of design alone. This underscores the importance of advocacy.

The following strategies 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**
- **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 reduce the embodied carbon impact of our projects. Our goal is to include this information in all our proposals.

We will engage in conversations with our colleagues and clients 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 and broaden the industry-wide understanding of reducing embodied carbon. 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 continuously participate in education and research, to share our design knowledge within our fellow professional communities. Through our membership in professional organizations, we will volunteer to prepare presentations 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 also look for opportunities to write and publish white papers and other research articles

CALL TO ACTION

Our structural engineering team is presented with a profound opportunity to reduce the embodied carbon impact of our projects, which in turn contributes to a global effort to mitigate the adverse effects of global climate change. Through the actions outlined in this Action Plan, we must make expedient changes to our processes to meaningfully improve our understanding of embodied carbon and the strategies we can employ to reduce embodied carbon on our projects. We must also advocate for change within the design community and construction industry and learn from our experience to guide and improve our future designs. As structural engineers, we wholeheartedly embrace and commit to these initiatives.

[1] IEA. (2019). 2019 Global Status Report for Buildings and Construction. International Energy Agency. United Nations Environment Programme.

[2] J. Orr, O. Gibbons, W. Arnold. (2020). A brief guide to calculating embodied carbon. Institute of Structural Engineers.