

Embodied Carbon Action Plan

2021

Who We Are

We are an integrated structural engineering and construction firm, based in Golden, Colorado with 4 offices throughout the Rocky Mountain Region, with 100 employees. We are a firm built around the idea that structural engineers should return to a master builder role by taking ownership of the design of structural systems, cost estimating, and at-risk construction, and now – environmental impacts. Our mission to “revolutionize the way structures are designed and built” is exactly why we have prioritized the modernization of our practice to address the climate and environmental impacts of our design and construction. Additionally, we are excited in our belief that structural engineers can and will step into a role of leadership and education for our architect and owner clients to create new avenues and priorities of decision making and design.



Why We Joined

We are a signatory to the SE2050 commitment because we wanted to express publicly our commitment to reducing the environmental impact of our design and construction, and to join the collective industry effort around innovation and accountability. Through our shared efforts, knowledge, and learning, the challenge of reducing our industry’s contribution becomes an “open-source” effort, which is necessary to have a real and timely effect on climate change.

KL&A's 10 Strategies for Reducing Embodied Carbon

- 1. Start Now**
- 2. Big Rocks First**
- 3. Innovate and Iterate**
- 4. Reuse Existing Buildings, Reuse Existing Components of Buildings**
- 5. Use More Biogenic Materials**
- 6. Use Less Cement, Implement Concrete Innovations**
- 7. Design for Long Life, Loose Fit, Easy Care**
- 8. Understand and Reduce the "Green Premium" (dollar cost vs. environmental cost)**
- 9. Earn Carbon Credits**
- 10. Open- Source Effort (share, encourage, make accessible)**

REQUIREMENTS

DISTRIBUTE FIRM WIDE ANNOUNCEMENT OF YOUR FIRM'S PLEDGE TO JOIN THE SE2050 COMMITMENT AND SHARE ECAPS.

July 2020 KL&A announced firm-wide our commitment and pledge to the SE2050 challenge through all company meetings and a company-wide educational presentation on embodied carbon. We also announced our pledge to the SE2050 to our clients in the Fall of 2020.

PROVIDE A BRIEF NARRATIVE DESCRIBING HOW YOUR FIRM IS PROMOTING A FIRM-WIDE EDUCATION PROGRAM FOR EMBODIED CARBON REDUCTION AND THE FIRM'S COMMITMENT TO SE2050, INCLUDING AN EMBODIED CARBON 101 FOR THE FIRM.

At KL&A we have developed a small but mighty team of engineers to focus on embodied carbon and its reduction: Team Carbon. KL&A's embodied carbon knowledge base will first begin with Team Carbon, acting as company experts for structural engineers and are consulted on projects and process/standards.

We have presented an Embodied Carbon 101 lecture which is recorded and available company wide. We also provide Team Carbon updates and long-term strategy at each all-company meeting, which occurs biannually. All project and client managers were further educated to encourage a focus on embodied carbon early in our design process.

Internally to Team Carbon, we have developed a training series that covers business strategy, LCA technical, Tally 101 and Tally technical, and the carbon impacts of structural materials and their unique reduction opportunities. Every member of Team Carbon is trained to develop and interpret Structural Life Cycle Assessments using Tally as well as schematic design GWP estimates. All training sessions are recorded to allow for effective onboarding and company-wide access.

Within KL&A, Team Carbon is collaborating with our materials' standard committees to revise our project specifications, develop baseline structural system GWPs and associated cost, as well as reduction strategy implementation into our typical design processes. To date, KL&A has addressed our concrete specifications to encourage carbon reductions in concrete mix designs.

EMBODIED CARBON REDUCTION CHAMPION

Alexis Feitel, Team Carbon Unit Director and Structural Designer out of the Golden, CO office.

Alexis is working to develop and establish Embodied Carbon knowledge, reduction strategies, and implementation into design and construction practice at KL&A.

teamcarbon@klaa.com

ELECTIVES

HAVE ONE REPRESENTATIVE OF YOUR FIRM ATTEND QUARTERLY EXTERNAL EDUCATION PROGRAMS PROVIDED BY SE2050, CLF, OR OTHER EMBODIED CARBON RESOURCES.

Multiple Team Carbon members attend embodied carbon focused presentations and conferences, such as Carbon Leadership Forum, Global Concrete Summit Sustainability, Engineering Change Lab USA, Getting to Zero, and Advancing Mass Timber Construction 2021. Members also attend CLF Rocky Mountain Regional Hub meetings and were part of the discussion panel regarding lower embodied carbon concrete mix designs and alternative solutions for this Hub.

Often working together with local sustainability consultant Ambient Energy, KL&A Team Carbon members have also presented to small groups of architects, developers, contractors, and engineers on embodied carbon topics.

ATTEND A PRESENTATION OR DEMO OF AN LCA BASED TOOL USED TO CALCULATE EMBODIED CARBON.

Team Carbon members have attended presentations of LCA based tools used to calculate embodied carbon, such as Tally, Athena, and EC3.

INITIATE AN EMBODIED CARBON INTEREST GROUP WITHIN YOUR FIRM AND PROVIDE A NARRATIVE OF THEIR GOALS.

Team Carbon is our dedicated team, focused on embodied carbon reduction and implementation into design and construction practice at KL&A. Our goals and strategies are outlined throughout this ECAP.

DISTRIBUTE TO ORGANIZATION

Shared SE2050 library of resources and Top 10 Carbon Reducing Actions for Structural Engineers documents provided by SE2050 with technical staff at KL&A.



REPORTING/MEASURING

REQUIREMENTS

PROVIDE A NARRATIVE ON HOW YOUR FIRM PLANS TO MEASURE, TRACK, AND REPORT EMBODIED CARBON DATA.

KL&A can provide GWP estimates at the schematic design phase to aid in material and system selections, as well as full Structural LCAs, based on bill of materials, always including recommendations and pathways to embodied carbon reductions.

We have a robust library of product and industry EPDs, including comparisons and running GWP averages across our library, as well as calculated embodied carbon coefficients.

We are currently using Tally LCA software to produce Structural and Enclosure LCAs. We actively encourage our architectural partners to develop the capabilities to also perform LCAs so that we can collaborate to best perform Whole Building LCAs. Our LCA methodology follows Tally's: cradle-to-grave scope, End-of-life allocation assumptions, and relies on the current available database. LCA results are always reviewed, interpreted, and manually modified as needed to provide a more accurate GWP quantification of a specific building and its components. We selected the Tally LCA software as it best integrates with our current structural design practice of BIM modeling using Revit, which allow for direct use of the structural bill of materials.

DESCRIBE THE INTERNAL TRAINING FOR EMBODIED CARBON MEASUREMENT.

As described in our Education section, we have developed a Tally 101, Tally technical, and LCA technical training to educate our team members on embodied carbon quantification. These trainings cover both GWP quantification using EPDs, EPD interpretation and appropriate comparative use, and GWP quantification through building LCAs. Our education process results in an understanding of where the embodied carbon impacts occur in cradle-to-grave stages, which is unique to each structural material, pathways for reduction, and best end-of-life scenarios.

SE2050 DATABASE SUBMISSIONS – SUBMIT AN ANNUAL MINIMUM OF (2) PROJECTS PER U.S. STRUCTURAL OFFICE BUT NEED NOT EXCEED (5) TOTAL PROJECTS PER FIRM.

To date, KL&A has performed (40) Structural LCAs, approximately (20) per annum since Team Carbon began. These LCAs include projects that have been constructed and projects that are currently in design and construction. We will submit at least (5) of these LCAs to the SE 2050 database by the end of 2021.

Moving forward, we will selectively perform Structural LCAs, to create a robust and well-rounded internal database, which will allow us to better understand our embodied carbon impact and reductions across building types, systems, materials, and manufacturers.

ELECTIVES

MEET YOUR TARGET AVERAGE EMBODIED CARBON REDUCTION FROM THE PREVIOUS YEAR.

Although we did not set a specific carbon reduction goal, we did meet our goal to perform an LCA on 25% of our project revenue from the year 2020, by the end of 2021. Our ultimate goal is to reduce embodied carbon to zero, but we must first establish our firm baseline and develop our embodied carbon knowledge of structural systems and materials and their targets for reductions.

FOR A PROJECT SUBMITTED TO THE DATABASE, ASK THE ARCHITECT OR OWNER IF THE PROJECT HAS A CARBON BUDGET OR IF THERE ARE ESTABLISH PROJECT SUSTAINABILITY GOALS AT THE PROJECT KICKOFF MEETING.

KL&A actively discusses sustainability goals with project teams. The majority of our projects set operational carbon targets, but do not focus on embodied carbon. If a project does not have embodied carbon targets, we first begin with project team education of embodied carbon in structural and architectural materials, then encourage actual reductions. At the least, each project will endeavor to reduce embodied carbon through concrete mix designs, supported by our concrete specifications.





REDUCTION STRATEGY

REQUIREMENTS

SET AN EC REDUCTION GOAL FOR THE COMING YEAR AND AN IMPLEMENTATION NARRATIVE. (QUALITATIVE GOALS FOCUSED ON EDUCATION ARE APPROPRIATE FOR THE FIRST YEAR)

Before we are able to set appropriate quantitative embodied carbon reduction goals, we are first focusing on education and developing GWP quantification processes, documentation, and data collection. The foundational process standards and data tracking will allow us to determine baseline embodied carbon quantities per building type, structural system, and material type. We will also rely on the SE2050 database, to further develop and understand these baselines and believe this industry database will be a valuable tool for Structural Engineers to address our effects on the natural environment. Until refined baselines are understood, internal and external to KL&A, we will focus on embodied carbon reductions on individual projects and set appropriate and ambitious goals for each.

ELECTIVES

INCORPORATE DATA VISUALIZATION INTO YOUR ECAP

KL&A currently includes “context” within our embodied carbon reports, comparing the building and component GWP to that of cars’ emissions, home electricity, etc. This helps communicate the quantitative impacts of our buildings to clients and owners. Data graphics are also included in our reports, typically focusing on GWP, material quantities, and their relationship to each other. KL&A supports SE 2050’s encouragement of data visualization, as it is important that embodied carbon quantification and literature is accessible and understandable by a larger and non-technical audience.

PROVIDE A PROJECT CASE STUDY, SHARING EMBODIED CARBON LESSONS LEARNED.

KL&A has performed a GWP and cost case study on the built Platte Fifteen mass timber building in Denver, Colorado. This was recently published by Think Wood and WoodWorks and is located here: [Platte 15 Life Cycle Assessment and Cost Case Study](#)

UPDATE SPECIFICATIONS AND INCORPORATE EMBODIED CARBON PERFORMANCE. INCLUDE EMBODIED CARBON IN YOUR SUBMITTAL REVIEW REQUIREMENTS.

In 2021, KL&A revised our base concrete specifications to encourage and allow for concrete mix designs with reduced embodied carbon. The specifications are a move toward performance-based specifications, similar to those implemented in Marin County, CA. KL&A is encouraging local concrete suppliers to develop mix designs with reduced cement content. Our new specifications also encourage submission of EPDs during the submittal review process. We intend to track the embodied carbon reductions realized by our specification changes. In the near future, we will be revising our steel, wood, and mass timber specifications to encourage further carbon reductions and sustainable materials.

COLLABORATE WITH YOUR CONCRETE SUPPLIER TO REDUCE EMBODIED CARBON IN MIX DESIGNS.

As mentioned above, we are actively collaborating with local concrete suppliers and project contractors for the development of mix designs with reduced cement content, including development of EPDs. We are educating them about the importance of concrete innovation and collaborating to understand the potential effects on cost, finishability, cure time, and performance.

Another important aspect of mix design innovation is the inclusion and support of our architectural clients. We are actively collaborating with our clients to further advance concrete innovation and cement reduction on our projects.

INCORPORATE BIOGENIC MATERIALS ON AT LEAST ONE PROJECT ANNUALLY

KL&A is adept at wood light frame and mass timber structural design. We have numerous projects per year that incorporate biogenic construction materials like dimensional lumber, cross laminated timber, and glulam. We are focused on the embodied carbon quantification of these systems, to encourage their use, as we believe effective use of wood construction products is a component of the overall strategy to reduce our industry's embodied carbon impacts.

PROVIDE A NARRATIVE OF HOW CIRCULAR ECONOMY HAS BEEN USED ON YOUR PROJECTS. INCORPORATE RE-USE OR DESIGN FOR DECONSTRUCTION INTO AT LEAST ONE PROJECT.

KL&A has previously designed projects that incorporated reused oil and gas pipe, reuse of existing building components, and full reuse of existing buildings. Circular economies, not only reduce waste and therefore embodied carbon, but they also provide local economic benefits and support local supply chains.

KL&A is currently studying and developing strategies and processes for deconstruction practice, direct reuse of building components, inventorying of building components, and deconstruction plans for new construction projects. This effort is in support of a local municipality, working to encourage, store, track, and reuse steel building components of an existing site.



REQUIREMENTS

PROVIDE A NARRATIVE ABOUT HOW YOU PLAN TO SHARE KNOWLEDGE AND DATA TO ACCELERATE ADOPTION OF EMBODIED CARBON REDUCTION.

We wholeheartedly believe in knowledge and experience sharing, and advocacy through education. The design practice of reducing embodied carbon in our infrastructure requires immediate implementation, therefore it is crucial that we all balance business competition with collective advancement and innovation. Accessibility of the information will be an important component to accelerate the speed of implementation, industry wide. We will actively participate in SE2050, its database, and its directives.

KL&A Team Carbon is presenting on the topic of embodied carbon to our engineers, multiple architectural clients, and developers. Greg Kingsley, CEO and President of KL&A, has presented on embodied carbon topics at numerous industry conferences (e.g., Wood and Everything After (Miami), AEI Conference 2021 (Boulder), Advancing Mass Timber Construction (Dallas), Getting to Zero (NYC)), seminars (e.g. 2021 SEAC Fall Seminar (Denver), Wood Design Virtual Symposium (WoodWorks)) and presentations (e.g. Denver Rotary Club, Swinerton Construction Happy Hour, and architectural offices including Sasaki, Cuningham, VFLA, SA+R, and others. In our advocacy, we attempt to address embodied carbon reduction strategies, associated costs, and the GWP background data – with the goal to provide perspective of practical and actionable solutions.

DESCRIBE THE VALUE OF SE2050 TO CLIENTS. HOW CAN WE COLLABORATE TO DRIVE ADOPTION?

As mentioned previously, we are collaborating with our architectural clients through education and encouragement of embodied carbon reductions in our projects. We see client collaboration as a key component of our success to reduce the impacts of our designs – through efficiency of program layouts, system selection, product selection, collaborative LCAs, and owner/developer education. The more consultants who encourage, pursue, and succeed in embodied carbon reductions, the more industry innovation will occur, reinventing the status quo of architectural and engineering consulting services.



ELECTIVES

SHARE YOUR COMMITMENT TO SE2050 ON YOUR COMPANY WEBSITE.

KL&A has declared our commitment through our website, marketing materials, and client and industry presentations. Discussing the SE2050 and Arch2030 commitments is an element of our advocacy and education plan.

GIVE AN EXTERNAL PRESENTATION ON EMBODIED CARBON THAT DEMONSTRATES A PROJECT SUCCESS OR LESSONS LEARNED.

As mentioned previously, KL&A presents regularly on the topic of embodied carbon, incorporating our case studies and project successes of the constructed Platte Fifteen project, existing building design, and building component reuse.

PROVIDE A NARRATIVE OF HOW YOU HAVE ENCOURAGED INDUSTRY AND POLICY CHANGE INCENTIVIZING AVAILABILITY OF LOW-CARBON AND CARBON SEQUESTRATION MATERIALS.

KL&A was actively involved in the early adoption of the 2018 IBC provision of mass timber building types in Denver, Colorado, making it the third jurisdiction in the U.S. to allow taller mass timber construction, thus encouraging broader use of biogenic structural materials.

KL&A is involved in the CLF Rocky Mountain Hub and is participating in their legislation working group, aimed at embodied carbon policy in Colorado.

KL&A has participated in crafting draft legislation through ACEC, SEAC, and CLF for Colorado policy.



REVOLUTIONIZING THE WAY STRUCTURES ARE DESIGNED AND BUILT

