



EMBODIED CARBON ACTION PLAN ECAP

STRUCTURAL ENGINEERING
INSTITUTE
SE2050 CHALLENGE



PROFESSIONAL ENGINEERING CONSULTANTS, PA



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SECTION ONE

OCTOBER 1, 2021

Zach Bowden, PE, announced to the structural division that Professional Engineering Consultants, PA (PEC) had been accepted as a signatory firm in the SE2050 Commitment to Net Zero.

PEC is prepared to meet the requirements set forth by the Sustainability Committee of the Structural Engineering Institute with the goal of substantially reducing embodied carbon in the design and construction of structural systems by 2050.

The process begins with the initial production of this document, the Embodied Carbon Action Plan (ECAP). The ECAP will be updated annually and improved upon as more knowledge is gained regarding embodied carbon and effective reduction strategies.

There are four main components to the ECAP as illustrated on the slides to follow. Each component includes the actions taken and goals set to make progress towards the goal of net zero carbon by 2050.

INTRODUCTION

EDUCATION



SECTION TWO

The goal of the education component of the ECAP is to engage design professionals in the industry with the purpose of promoting awareness of what embodied carbon is and the impact design decisions can have on it.

- **Distribute firm-wide announcement about joining SE2050**

On October 18th, 2021, PEC's commitment to SE2050 was shared within the company and with the public through social media channels.

- **Narrative of how the firm is promoting education on embodied carbon and commitment to SE2050**

PEC is committed to furthering the education of all design professionals on the impacts of embodied carbon and the measures that can be taken to work toward its reduction. The SE2050 committee provides updates at the monthly structural roundtable meetings. In addition, each design professional is invited to join in monthly presentations focused on embodied carbon.



SECTION TWO...CONTINUED

- **Embodied Carbon Champion**

Zach Bowden, PE, was elected to be the Embodied Carbon Champion for PEC. Zach is a Project Engineer and Team Lead in the Fort Collins, CO office. His role as the Embodied Carbon Champion is to encourage all PEC engineers to think about sustainable design and to push colleagues into discussing sustainable design with clients.

- **"Embodied Carbon 101" Presentation**

On January 28, 2022 PEC gathered to have all structural engineering staff watch the presentation as created by the American Institute of Architects over the basics of embodied carbon. Topics such as how to measure, manage, and implement embodied carbon reduction strategies were discussed.

In addition, the structural division at PEC encourages its staff to attend monthly design and detail training. The purpose of these meetings is to address structural design and detailing practices for a variety of materials. Any topic that an employee wishes to be discussed can add to the meeting. The PEC SE2050 committee will utilize these meetings to provide presentations on what embodied carbon is and to discuss effective reduction strategies.

- **Distribute ECAP within Your Firm upon Publishing + Make One Webinar Focused on Embodied Carbon Available to Employees**

- Present the document "How to Calculate Embodied Carbon" to all technical staff.
- Minimum one employee to attend a presentation or demo of an Life Cycle Assessment (LCA)-based tool used to calculate embodied carbon, such as Tally, Athena IEB, or One Click LCA.



REPORTING

SECTION THREE

The SE2050 Challenge requires its signatory firms to report a minimum of two to five projects a year. The reported projects are used to establish industry benchmarks and determine future goals for the sustainable design of structural systems.

- **Measuring, Tracking, and Reporting of Embodied Carbon**

One of the challenges facing the SE2050 initiative is consistency in reporting. Each firm is able to utilize different methods to track and report the embodied carbon in their projects. To remain consistent, PEC will follow the directives as outlined in the document *"How to Calculate Embodied Carbon"* by the Institution of Structural Engineers.

SECTION THREE...CONTINUED

There are four life cycle stages to consider for a structure. The first is the product stage during which the materials necessary for a structure are produced. The second is the construction process stage during which the materials are transported to the site and energy is expended in order to complete the structure. Once the structure is complete, it enters into the use stage. After it's useful life, it enters the end of life stage. PEC's reporting will reflect LCA for the first two stages (otherwise known as modules A1-A5). Once the structure is complete, it is the preference of the owner whether to perform an LCA during the use and end of life stages for the building.

The basics of calculating embodied carbon involves taking a quantity of material used multiplied by the carbon factor which results in the amount of embodied carbon. This process is repeated for all materials used on the project. Software programs such as Autodesk's Revit are able to calculate quantities of materials based upon the modeled elements of a design. These quantities will be the basis of the embodied carbon calculations.

REPORTING



REPORTING

SECTION THREE...CONTINUED

When available, environmental product declarations (EPDs) can be used to determine a product's environmental impact based on a Life Cycle Assessment (LCA). They provide the designer with more information regarding the overall impact of selecting a certain product or material. EPD's will be utilized whenever they are available for a viable product option.

- **Internal Training**

To aid the goal of reducing embodied carbon, the initial step is to inform designers of what embodied carbon is and how their design decisions can impact it. In addition to the education goals outlined in the section above, PEC will ensure that design tools are available for use to aid in sustainable design.

Information relating to embodied carbon and reduction strategies will be accessible to all design professionals at PEC. Additionally, LCA software add-ins shall be available upon request and training on how to effectively use the software will be provided.

- **Report Five Structures to the SE2050 Project Database**

PEC works in a variety of markets including but not limited to aviation, education, military, healthcare, industrial, government, and energy. We also design utilizing a variety of materials. The projects PEC reports will reflect a mix of building uses and construction materials. The diversity in reported projects will aid in establishing a baseline for current practices and future goals to reduce embodied carbon.

SECTION FOUR

- **Determine approach for tracking embodied carbon on structural projects**

In order to establish goals and make progress towards them, the current practices must be observed and analyzed for areas to improve. The first year of PEC's participation in the SE2050 Challenge will be focused on completing this task.

- **Determine a user-friendly program that can be used to track embodied carbon.**

There are numerous options available to aid in tracking embodied carbon. PEC will utilize Revit plug-ins that track quantities of various materials to determine where the largest sources of embodied carbon exist within individual projects. PEC will provide training for the structural department on how to properly employ Revit plug-ins through in-house webinars and live training. The data gathered from Revit plug-ins will then be analyzed to determine the most effective strategies that can be taken to reduce the embodied carbon on future projects.

- **Determine how data will be tracked and analyzed.**

The data collected from Revit plug-ins will be recorded in a spreadsheet, where embodied carbon will be correlated with different building materials, various scales of projects, and various design strategies. Once collected and recorded, the spreadsheet will be used to produce a summary of its findings which will include strategies that our structural department can implement to reduce embodied carbon.

- **Determine who will be responsible for tracking individual projects.**

It is the responsibility of PEC's SE2050 committee to report select projects to SE2050. However, it is beneficial to track more than the required number of projects in order to establish our own baseline within the company. Each designer will have the option to add their data to an internal document to establish current design practices and their impact on embodied carbon.



EMBODIED CARBON
REDUCTION STRATEGIES

SECTION FIVE

- **Determine a Plan to Share and Distribute Knowledge and Data to the Industry on the Adoption SE2050**

PEC will develop a plan to give scheduled internal and external presentations on the embodied carbon action plan. Educating at the industry level our goals, strategies, and progress.

- **Internal Encouragement Plans and Goals**

In our first year, PEC will internally share our commitment to SE2050 and host regular lunch-and-learns presenting our ECAP progress and plans. Encouraging staff to be active members in the professional societies to stay informed on what is happening in the industry and further share their expertise.

- **External Distribution Plans and Goals**

PEC hosted an external presentation about SE 2050 to the Structural Engineers Association of Kansas and Missouri (SEAKM) on February 16, 2022. As PEC continues to develop our embodied carbon program goals and strategies, PEC will share this knowledge with other firms, organizations, and clients.

PEC would like to share our knowledge and progress of embodied carbon with industry clients. Oftentimes, there are small changes that can make a large difference in the amount of embodied carbon in a structure. Sharing these options with clients can prompt slight changes in standard practices that will aid in the reduction of embodied carbon.

- **Plans and Goals to Consult Other Firms**

By the end of 2025, PEC will engage and mentor a firm new to the embodied carbon plan.