



EMBODIED CARBON ACTION PLAN (ECAP)

STRUCTURAL ENGINEERING INSTITUTE
SE 2050 CHALLENGE



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SECTION ONE

INTRODUCTION

On 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 SE 2050 Commitment to Net Zero.

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

Each of the four main components includes the actions taken and goals set to make progress towards the goal of net zero carbon by 2050.





SECTION TWO

EDUCATION

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.

Embodied Carbon Champion

Zach Bowden, 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 promote sustainable design with clients.

Promoting education on embodied carbon and commitment to SE 2050 within the company

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 SE 2050 committee provides monthly newsletters that provide education on sustainability in structural design and relevant news.

SECTION TWO

EDUCATION

Minimum one employee to attend a presentation or demonstration of a Life Cycle Assessment (LCA)-based tool used to calculate embodied carbon.

In addition to in-house presentations, we are pleased to share that we have presented to more than 500 individuals in architecture firms since launching the program. Additionally, we've exposed future engineers to PEC's ECAP and the basics of sustainable structural design.

Interest in our workshop, "Sustainability in Structural Design," has dramatically increased after receiving approval from The American Institute of Architects (AIA).

Engagement has increased within PEC, as several conversations are occurring around sustainable materials choices. Additionally, we've received numerous requests to develop and deliver follow-up workshops focused on mass timber.





SECTION THREE

REPORTING

PEC reports a minimum of 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 SE 2050 initiative is consistency in reporting. Each firm is able to utilize different methods to track and report the embodied carbon in their projects. PEC utilizes the data available from SE 2050's embodied carbon order of magnitude (ECOM) spreadsheet. We have also developed a spreadsheet to input specific environmental product declarations (EPDs) for products when available to have the most accurate embodied carbon totals possible.

There are four life cycle stages to consider for a structure. The first is the **product stage** when the materials necessary for a structure are produced. The second is

the **construction process stage** when 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 the structure'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 the life cycle assessment (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.

SECTION THREE

REPORTING

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 are the basis of the embodied carbon calculations.

When available, EPDs have been used to determine a product's environmental impact based on a LCA. They provide the designer with more information regarding the overall impact of selecting a certain product or material.

Report Five Structures to the SE 2050 Project Database

PEC works in a variety of markets including commercial, education, energy, federal, healthcare, industrial and manufacturing, mission critical, municipal, state, and transportation. PEC designs utilize a variety of construction materials and the projects reported will reflect that mix of materials and building uses. The diversity in reported projects will aid in establishing a baseline for current practices and future goals to reduce embodied carbon.



SECTION FOUR

EMBODIED CARBON REDUCTION STRATEGIES

Determine approach for tracking embodied carbon on structural projects

Each year of PEC's participation in the SE 2050 Challenge will be focused on making progress on our goal commitment.

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 track quantities of various materials to determine where the largest sources of embodied carbon exist within individual projects. The data gathered will then be analyzed to determine the most effective strategies to reduce embodied carbon on future projects.

Determine how data will be tracked and analyzed.

The data collected 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 findings which will include strategies 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 SE 2050 committee to report select projects to SE 2050. However, it is beneficial to track more than the required number 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.





SECTION FIVE

ADVOCACY

Determine a Plan to Share and Distribute Knowledge and Data to the Industry on the SE 2050 Adoption

PEC will develop a schedule of internal and external presentations on the embodied carbon action plan. Education at the industry level will help establish goals and strategies, and track progress.

Internal Encouragement Plans and Goals

PEC shares internally our commitment to SE 2050 and hosts regular lunch-and-learns presenting our ECAP progress and plans. We encourage staff to become active members in professional societies to stay informed on what is happening in the industry and share their expertise.

External Distribution Plans and Goals

PEC has facilitated multiple presentations about SE 2050 to the Structural Engineers Association of Kansas and Missouri (SEAKM). As PEC continues to develop our embodied carbon program goals and strategies, PEC will share this knowledge with other firms, organizations, and clients.

PEC will share our knowledge and progress of embodied carbon with industry clients. Small changes can make a large difference in the amount of embodied carbon in a structure. Changes in standard practices that will aid in the reduction of embodied carbon.



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