

Study of Methods to Reduce Carbon Emissions in Structural Engineering

Authors : Richard Krijnen, Alan Wang

Abstract : As the world is aiming to reach net zero around 2050, structural engineers must begin finding solutions to contribute to this global initiative. Approximately 40% of global energy-related emissions are due to buildings and construction, and a building's structure accounts for 50% of its embodied carbon, which indicates that structural engineers are key contributors to finding solutions to reach carbon neutrality. However, this task presents a multifaceted challenge as structural engineers must navigate technical, safety and economic considerations while striving to reduce emissions. This study reviews several options and considerations to reduce carbon emissions that structural engineers can use in their future designs without compromising the structural integrity of their proposed design. Low-carbon structures should adhere to several guiding principles. Firstly, prioritize the selection of materials with low carbon footprints, such as recyclable or alternative materials. Optimization of design and engineering methods is crucial to minimize material usage. Encouraging the use of recyclable and renewable materials reduces dependency on natural resources. Energy efficiency is another key consideration involving the design of structures to minimize energy consumption across various systems. Choosing local materials and minimizing transportation distances help in reducing carbon emissions during transport. Innovation, such as pre-fabrication and modular design or low-carbon concrete, can further cut down carbon emissions during manufacturing and construction. Collaboration among stakeholders and sharing experiences and resources are essential for advancing the development and application of low-carbon structures. This paper identifies current available tools and solutions to reduce embodied carbon in structures, which can be used as part of daily structural engineering practice.

Keywords : efficient structural design, embodied carbon, low-carbon material, sustainable structural design

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