



Carbon Value Engineering: Integrated Carbon and Cost Reduction Strategies for Building Design

<https://research.thinkwood.com/en/permalink/catalogue2268>

Author: Robati, Mehdi
Oldfield, Philip F.
Nezhad, Ali Akbar
Carmichael, David

Organization: UNSW Sydney
Multiplex Australasia

Publisher: Cooperative Research for Low Carbon Living

Year of Publication: 2019

Country of Publication: Australia

Format: Report

Material: CLT (Cross-Laminated Timber)
Glulam (Glue-Laminated Timber)

Application: Floors
Walls
Beams

Topic: Environmental Impact
Cost

Keywords: Value Engineering
Embodied Carbon
Hybrid Life Cycle Assessment
Capital Cost
Environmentally-extended Input-Output Analysis

Language: English

Research Status: Complete

Summary:

The research presents a Carbon Value Engineering framework. This is a quantitative value analysis method, which not only estimates cost but also considers the carbon impact of alternative design solutions. It is primarily concerned with reducing cost and carbon impacts of developed design projects; that is, projects where the design is already a completed to a stage where a Bill of Quantity (BoQ) is available, material quantities are known, and technical understanding of the building is developed.

This research demonstrates that adopting this integrated carbon and cost method was able to reduce embodied carbon emissions by 63-267 kgCO₂-e/m² (8-36%) when maintaining a concrete frame, and 72-427 kgCO₂-e/m² (10-57%) when switching to a more novel whole timber frame. With a GFA of 43,229 m² these savings equate to an overall reduction of embodied carbon in the order of 2,723 – 18,459 tonnes of CO₂-e. Costs savings for both alternatives were in the order of \$127/m² which equates to a 10% reduction in capital cost.

For comparison purposes the case study was also tested with a high-performance façade. This reduced lifecycle carbon emissions in the order of 255 kgCO₂-e/m², over 50 years, but at an additional capital cost, due to the extra materials. What this means is strategies to reduce embodied carbon even late in the design stage can provide carbon savings comparable, and even greater than, more traditional strategies to reduce operational emissions over a building's effective life.

Online Access: Free

Resource Link

<http://www.lowcarbonlivingcrc.com.au/resources/crc-publications/crcicl-project-reports/rp1034-carbon-value-engineering-integrated-carbon>