Review

A primary focus on operational carbon emissions means that this book offers less for structural engineers than the title implies, concludes Paul Astle.

Designing zero carbon buildings: embodied and operational emissions in achieving true zero (3rd edn.)

Author: Ljubomir Jankovic
Publisher: Routledge
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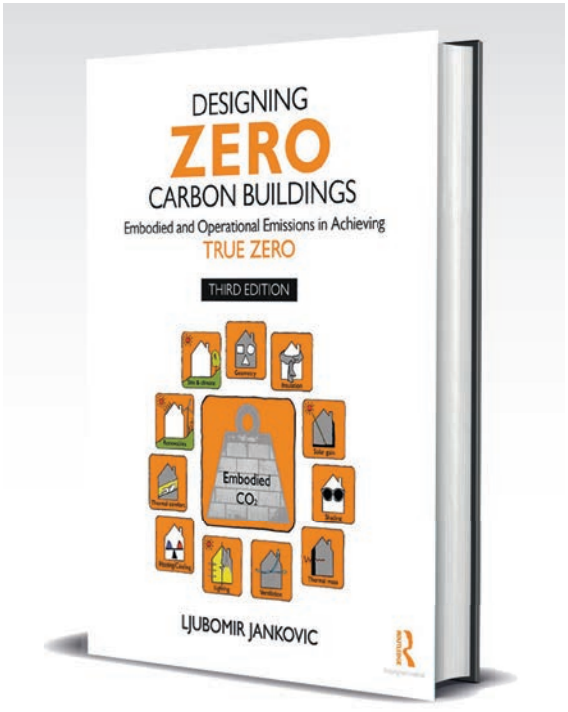
Designing zero carbon buildings: embodied and operational emissions in achieving true zero addresses a crucial and timely subject: designing buildings that achieve zero carbon emissions. However, while the title suggests a comprehensive approach, the content focuses mostly on the operational performance of buildings, offering limited guidance on embodied carbon emissions. This narrow focus may mislead readers looking for a balanced guide to achieving zero carbon in all stages of a building's life-cycle. It should be noted that previous versions of this book did not include embodied carbon; this is evident in the depth of detail and guidance provided.



The book introduces embodied carbon in construction materials at a basic level, providing a few illustrative examples. However, it lacks specific design strategies to reduce embodied carbon, such as minimising material use, a fundamental principle in lower-carbon design. Instead, the book emphasises using local materials and processes to lower construction emissions – an approach that, while helpful, does not tackle the largest source of upfront embodied carbon.

From an operational design perspective, the nearly 400-page text provides a detailed examination of numerous factors influencing a building's carbon performance. Chapters cover a range of topics – from building geometry and insulation to solar gain and electrical systems. Though dense and technical, these sections are valuable for those looking to better understand and optimise operational emissions. In particular, there is a section dedicated to advanced optimisation techniques which could be relevant in broader design practice.

The book's central framework, termed the 'Zero Equation', is an approach designed to combine operational performance and embodied carbon, theoretically determining the point at which a building achieves zero carbon. However, this method suffers from oversimplification. The 'jam jar' analogy, intended to simplify the concept, may actually introduce confusion – particularly with the idea that carbon (the 'jam') can be easily removed from the building (the 'jar').

The 'Zero Equation' also has critical compliance issues when compared with established best practices in whole-life carbon assessments. For instance, it emphasises 'negative' operational emissions from on-site renewables, which can offset carbon-intensive grid energy. While such benefits are considered in life-cycle assessment (LCA) methodologies, standard guidelines require these benefits to be reported separately from the boundaries of a whole-life carbon assessment. Additionally, the inclusion of biogenic carbon in timber and other materials does not conform to best practices, as biogenic carbon should be separately accounted for as part of a whole-life carbon assessment. These methodological flaws mean that the book's example calculations would not meet UK expected standards for a whole-life carbon assessment and undermine the premise of the 'Zero Equation'.

In summary, *Designing zero carbon buildings* may serve as a valuable resource for readers interested in operational energy efficiency and carbon performance, particularly those looking to optimise various systems for lower operational emissions. However, it falls short as a holistic guide to zero-carbon building design. Without a balanced focus on both operational and embodied carbon, and with compliance issues regarding whole-life carbon standards, this book does not fully address the requirements for achieving true zero-carbon buildings. Members seeking comprehensive strategies to reduce embodied carbon would benefit more from existing guidance from the Institution and other industry bodies, which offer clearer, more balanced advice.

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