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Reducing carbon: a review of some recently published industry guidance

In 2020, the Institution of Structural Engineers (IStructE) published its landmark guidance, *How to calculate embodied carbon*[1] (referred to as 'the guide' in this article). Following this, in March 2021, in collaboration with Elliot Woods, it published an open-source Excel calculator[2] (hereinafter referred to as 'the tool') to complement the guide.

The guide is excellent. It is simple to use, comprehensive in most aspects, can be used at the concept stage of a project right through to project completion, is aligned with BS EN 15978[3], BS EN 15804[4] and the RICS professional statement, *Whole life carbon assessment for the built environment*[5]. Crucially, it is freely available to all. The guide is an invaluable tool that the entire construction industry can make use of to calculate and, ultimately, reduce embodied carbon associated with its work.

An important question, however, is whether the guide goes far enough in its consideration of 'temporary works' (and construction activity in general)? Overall, it is considered not.

There is some consideration. Temporary works elements may be split broadly into three categories: use of virgin material, finite reusability material and proprietary products.

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1 How to calculate embodied carbon (IStructE) (https://www.istructe.org/resources/guidance/how-to-calculate-embodied-carbon/)
2 The Structural Carbon Tool (IStructE) (https://www.istructe.org/resources/guidance/the-structural-carbon-tool/)
3 BS EN 15978:2011, Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method (BSI), Under Review
4 BS EN 15804:2012+A1:2013, Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products
5 Whole life carbon assessment for the built environment, RICS professional statement, 1st edition, November, 2017 (https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf)

Proprietary products are recommended strongly over the use of virgin material. However, this concept is not considered in detail throughout the guide and feels more an afterthought than an integral part. The guide claims, "… for new builds, unless significant Temporary Works are required, their contribution to the total structural embodied carbon is likely to be relatively small …". The veracity of this statement is not substantiated and in reality the contribution varies from project to project (or temporary works element). Of more concern, it may lead those working in temporary works to consider not focusing on reducing the embodied carbon associated with their work; thinking they will affect little impact. In truth, it is felt that significant carbon may be saved.

The open-source Excel calculator, whilst excellent, does not align wholly with the guide when considering temporary works, as it does not allow for the classification of materials into the three categories, above, or calculate the A5w (Lifecycle) module.

Perhaps the largest grey area in the guide is the calculation of the A5 module for construction installation processes, as described in BS EN 15978. The guide claims that, "… Module A5 is likely to account for a small, but not insignificant, percentage of structural embodied carbon over the life cycle of a building project …"; granted there is an appended caveat that, "… For heavy civil works, A5 may be more significant …". Again, this statement appears to be based on anecdotal evidence only and seems to be written from the viewpoint of a permanent works designer. In reality, it's unclear what contribution the A5 module has to the project embodied carbon as little data for it exists.

The Lifecycle module A5 is split into two components: A5w for material wastage and A5a for site activities. The A5w calculation seems adequate for temporary works although specific guidance for temporary works is limited. The guide advocates the use of project-specific data for the A5a calculation but offers little guidance. There is a lack of consideration of the construction process, stating that on-site electricity consumption and fuel use are the only sources of embodied carbon relating to the construction process; which is clearly not the case.

The guide provides guidance in the absence of project-specific data to estimate the A5a module by applying a carbon factor to the construction cost – 1,400 $kgCO_2e$ per £100,000; the data for which is provided in the RICS guidance. However, the actual figure for the A5 module clearly varies enormously from this estimation and from project to project. It is considered that this has the potential to mask the major sources of carbon for a project, skewing carbon contributions towards the design and biasing project decisions in favour of optimising the design over the construction process.

There is a heavy reliance on the measurement of materials as the sole source of carbon for the project, whereas this may not necessarily be the case. Instead, a more holistic approach is recommended for project carbon calculation, where a better understanding of the construction process would improve the reliability of the carbon calculation during the planning/design phase compared with 'as built' carbon emissions.

Understandably, priority has been given to the design when producing the guide, but it's now the time to gain a better understanding of carbon related to the *construction process* and incorporate this into any calculations for a truer reflection of the holistic project embodied carbon. This would better inform decisions to reduce carbon across the board, and not just the permanent design.

Conclusion

In conclusion, the guide and tool are a good starting point; and one on which to build.

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