Putting the net-zero hierarchy into practice

Build clever

Emily Halliwell continues this series of notes signposting key climate resources for IStructE members around each level in the hierarchy of net-zero design by looking at how to 'build clever' to minimise material usage and reduce carbon emissions.

'Building clever' is about selecting appropriate structural configurations and design criteria. It is assumed at this stage that 'building nothing' and 'building less', including through reuse and refurbishment, have already been explored and implemented where possible. A key part of building clever is engaging with clients and design teams to refine the brief to enable the next step, which is to 'build efficiently'.

When considering efficiency, it is important to differentiate between building parameters such as column grid, imposed loading and fire rating, and element parameters such as material strength and member sizes. These are discussed in Ben Gholam's article on using efficient design to reduce embodied carbon[1] and it is generally the building parameters that are driven by client requirements and design team preferences.

The article highlights the importance of discussing these parameters early, when there is greater scope to make changes, such as reducing column spacing, and of understanding potential resulting interactions, such as shorter spans leading to more materials being used in columns and foundations. Jonathan Roynon's structural sensitivity study[2] provides clear graphics demonstrating the potential carbon savings that may be made through optimising both building and element parameters, and could be used to help communicate to clients and design teams the impact they can have.

Typically, decisions regarding column grids are led by the architect and influenced by a range of factors from use to location. David Treacy advocates a return to a 300mm planning grid and outlines the potential benefits of standardisation over the commonly used bespoke approach[3]. Wide adoption of a

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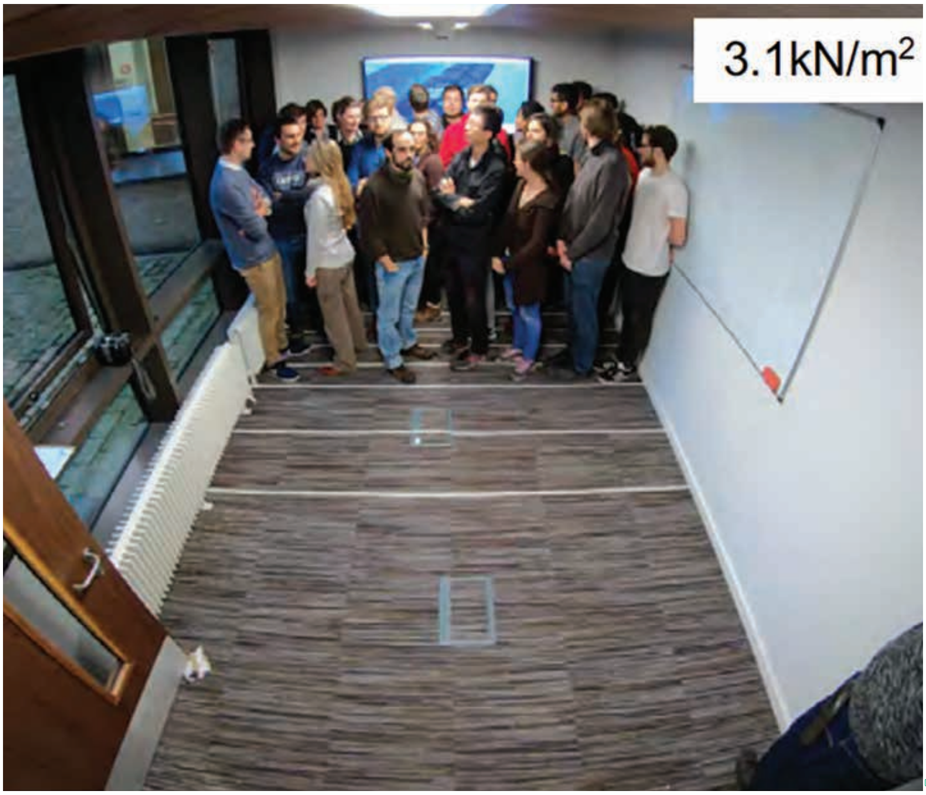
> **REDUCED FLOOR LOADINGS ARE QUICK AND SIMPLE FOR ENGINEERS TO IMPLEMENT**



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KEY REFERENCES

1) Gholam B. (2020) 'What do we mean by efficiency? A holistic approach to reducing embodied carbon', *The Structural Engineer*, 98 (10), pp. 14–17; https://doi.org/10.56330/KRTA2216

2) Roynon J. (2020) *Embodied carbon: structural sensitivity study* [Online] Available at: www.istructe.org/resources/case-study/embodied-carbon-structural-sensitivity-study/ (Accessed: February 2024)

3) Treacy D. (2020) 'Time for a structural change?', *The Structural Engineer*, 98 (8), pp. 18–19; https://doi.org/10.56330/QYLE 3989

4) Hawkins W., Peters A. and Mander T. (2021) 'A weight off your mind: floor loadings and the climate emergency', *The Structural Engineer*, 99 (5), pp. 18–20; https://doi.org/10.56330/YQWX1048

5) Norman J. (2022) 'What if carbon drives our design from the outset?', *The Structural Engineer*, 100 (2), pp. 18–21; https://doi.org/10.56330/LJJE5467

6) Moynihan M. (2022) 'How to achieve a SCORS A rating using current materials and technology', *The Structural Engineer*, 100 (5), pp. 14–15; https://doi.org/10.56330/FOKT1997

> **WHEN CONSIDERING EFFICIENCY, IT IS IMPORTANT TO DIFFERENTIATE BETWEEN BUILDING PARAMETERS AND ELEMENT PARAMETERS**

standard system would reduce the number of spans considered, with opportunities for optimised design and wider use of off-site manufacture. Even without a wider change in industry, many of the benefits of standardisation may be implemented directly by engineers within a project.

The floor loadings for a project are often set out by a client as part of their brief to the engineer and research has shown these often exceed what is required by design codes. Will Hawkins, Angus Peters and Tim Mander outline the findings of the MEICON study in their article on floor loadings and the climate emergency[4] and argue that while reducing floor loadings may not result in as significant carbon savings as, say, reducing spans, it is quick and simple for engineers to implement.

Many of the resources available on building clever, including those referenced here, discuss how to influence clients and design teams to refine the brief to enable a lower-carbon design.

However, an alternative approach to this is James Norman's proposal of setting an embodied carbon limit at the outset[5]. In this approach, instead of being part of the brief, the structural configuration, material choice and design loading are selected to ensure the carbon limit is met.

The SCORS system offers a framework for setting carbon targets and Muiris Moynihan showed in his article on achieving a SCORS A rating[6] how this is possible using current materials and technology, utilising the measures outlined above, along with efficient design, which will be covered in the next article in this series.

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SEE ALSO

→| **Halliwell E. (2024)** 'Putting the net-zero hierarchy into practice: Build nothing', *The Structural Engineer*, 102 (1), pp. 10–11; https://doi.org/10.56330/WSKW8501

→| **Hayes C. (2024)** 'Putting the net-zero hierarchy into practice: Build less', *The Structural Engineer*, 102 (2), pp. 18–19; https://doi.org/10.56330/MGEK3688