

Designing for a 3-d world

We live and work in a time of large-scale social and economic change with ethical and environmental issues gaining prominence in strategic decision-making. The building sector needs to become leaner, cheaper, faster and safer to proactively steer these changes and best benefit society.

As we engineers build 3-d structures for the 3-d world we occupy, wouldn't it make sense for us to also be designing them in 3-d? Effective use of 3-d design software could be one of the most useful tools to help the building industry shift towards a more efficient model. As with any tool, there is a time and place, and we must keep at the forefront of our minds that the role of an engineer is to make a judgement on what is appropriate, when.

3-d design tools empower us to increase the level of integration between different members of the design team, enabling holistic consideration of the entire problem rather than each discipline acting discretely. For example, modelling software allows shared ownership of drawing files, omitting the need for repetition of drawings and enabling simple coordination and checking between disciplines. This has the potential to greatly improve working efficiency and is something we really need to focus on driving forward as, at the moment, our industry seems stuck in prehistoric times.

A few years ago [Expedition](#) designed the Infinity Footbridge, Stockton. The bridge's shape was form found to maximise its structural efficiency and this led to some rather complex geometry. The complex problem was simplified by producing one data set which was used to both create an analysis model and generate the drawing geometry. This model was then handed directly to the steel manufacturers as construction information, from which they produced the steel sections. Whilst the software facilitated this simple exchange and eliminated potential for errors, it did not address an altogether different problem; the legalities of information status and ownership. This was solved by creating the digital version of a rubber stamp. A problem that couldn't be solved, however, was building control's requirement that their checking work was entirely independent. Hence, they refused to interrogate the design through the 3-d model. So, in the end, having theoretically designed and constructed the bridge without using paper, a set of drawings

did end up being produced – solely for the checker. This is clearly a shortcoming the industry needs to resolve.

A second useful capability of 3-d design software is as a drawing tool; 3-d sketching enables a number of complex geometric shapes to be rapidly realised, compared and rationalised, greatly simplifying the process design teams go through when developing complex structures. In the future we envisage parametric modelling to facilitate live design development between architects and engineers. This is, in fact, a process we are exploring on the [Thames Cable Car](#) project. As the cable car is intended to be inaugurated by the 2012 Olympics, manipulating 3-d design tools to speed up the design process will be greatly advantageous.

A parting thought – leaving the cinema having watched Avatar 3-d the man in front turned to his friends and said “that was great, I wish life could always be in 3-d!”

Quite.

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