CARBON WILL BE DIFFERENT

Dr Scott Steedman

During the Blitz the late Lord Baker, then Scientific Advisor to the Ministry of Home Security, recognised that there were fundamental flaws in the traditional elastic design approach for steel buildings that meant they were particularly vulnerable to collapse. His development of the theory of plastic design for building structures, introduced into British Standard 449 in 1948, was swift and effective. It was to become a step change in engineering design philosophy, a paradigm shift.

These days, we are unused to paradigm shifts in engineering. Advances have been dominated by incremental progress, a 'try harder' model. For each new performance requirement the engineering profession has reacted by bolting on another design determinant. Health and safety standards, energy efficiency, biodiversity or simply consumer choice are just a few of those added to the long list of design requirements in recent decades.

Today we face the global challenge of controlling and reducing our carbon emissions – and for the engineering profession this means adopting carbon as yet another design determinant. But simply adding carbon into the shopping basket will not be enough to secure the rapid and sustained reductions in our carbon emissions that the new Government targets require. As Keith Clarke, CEO of Atkins, has recently been arguing, carbon will come to dominate the design process for all engineered products.

Carbon will be different. Carbon needs to become a primary design determinant if we are serious about tackling carbon emissions. We need to understand what this will mean for UK society, industry and the entire engineering supply chain.

Carbon will become the key decider in every engineered solution – not cost, safety or environmental impact. So far we have dabbled with calculations of how much carbon is embodied in engineering designs, how much will be used in construction or manufacture, how much in use. We have talked about new houses with a zero carbon footprint. We are gradually seeing new, green products and technologies beginning to reach the market. But this is simply business as usual.

In many situations, the most effective route to reducing carbon emissions will be to reduce performance.

The engineering profession has considerable inertia. Paradigm shifts require analytical rigour and general acceptance. So what would a carbon determined design look like? We are very familiar with cost as a primary design determinant. But as pressure rises to control our emissions, the engineering profession must prepare to debate not just the cost of its solutions, but their performance and their outcome in carbon terms.

There are tough discussions to be had. New technologies can bring reductions in carbon and maintain or even increase performance – such as insulation, heating and lighting systems, lightweight materials and more efficient engines.

But in many situations, the most effective route to reducing carbon emissions will be to reduce performance. Why construct a flood protection system for a 1 in 100 year flood, when we could accept a higher risk of flooding and take the benefit in reduced carbon emissions? If that solution still provided adequate means of escape, could it become politically and socially acceptable?

The King Review of Low Carbon Cars is an excellent analysis of the scale of the challenge in road transport and clearly illustrates the tension between achieving de-carbonisation and maintaining present levels of vehicle performance. But is this radical enough? What would cars look like if carbon were rationed? Do we need to discuss what performance levels or environmental, health and even safety standards we should be reducing in order to guarantee we meet our carbon targets?

A public debate around carbon as a primary design determinant would change the nation's perspective of engineering in the UK. It would be a paradigm shift for the engineering profession. Our present Chief Scientific Advisors have a vital role in delivering the message. The quicker the Government realises that to meet its own targets carbon will have to be treated differently from all of our current design determinants, the faster the engineering profession can address the challenge.

Dr Scott Steedman FREng
Editor-in-Chief