



Scott Boote

The main barriers to delivering low-carbon design on residential projects are not the ones you might expect, according to **Scott Boote**. He talks to Helena Russell about what needs to change – both in engineers' perceptions about materials and process, and in the wider sector.

DESPITE THE WIDELY ACCEPTED

reality of the climate crisis, and the urgent need for action, effecting change in the construction sector can be like wading through treacle. To illustrate his frustration, Agnos Studio founder Scott Boote – a vocal advocate for low-carbon design in small projects – compares two recent schemes. Both involved the refurbishment of bungalows with similar structural forms, and in both cases the clients had aspirations to pursue a low-carbon solution.

In the first case, the existing walls and foundations of the timber-framed prefabricated bungalow in Twyford, Hampshire (**Figure 1**) were retained, the structure stiffened with additional timber, and the roof replaced. On the second project, the whole bungalow was demolished and rebuilt on the same footprint so that the client could benefit from zero-rated VAT for new-build house construction.

Boote is disappointed that such factors are holding back progress. 'We are rebuilding a structure that could have been reused; knocking down the walls to save money,' he sighs.

The tax landscape is just one of the unexpected obstacles he has found. 'When we first started thinking about the climate emergency, it was all about learning to design in timber, how to calculate carbon, use less materials or reuse them, and all the other technical aspects,' he says.

'We can figure the technical stuff out, but it's also about policy, attitude to risk, education and communication – sometimes about being comfortable to be the only person in the room raising it.' Boote has no qualms about being that person, his professional experience with low-carbon design and unconventional materials offering the necessary reassurance for clients.

Architecture's loss

Boote can't pinpoint how he gravitated towards structural engineering. 'I was brought up in Plymouth and we went to France every year on the ferry. I would stand with my dad, a telecoms engineer, watching the ship's doors close, because he found it so interesting to see the guys pull on the chains and the pistons operating and all that stuff. Maybe it rubbed off on me?' he ponders.

At school he showed promise in arts as well as sciences, but advice on options was lacking. 'My careers adviser was pretty rubbish; I said I was good at maths and physics, and they

said I should do engineering. But I said I was also good at art, and they said "yeah, well just do engineering",' Boote recalls. He took part in the Engineering Education Scheme at school; an initiative by the Engineering Development Trust that brings young adults into contact with professional engineers. His team worked on a project with a hydraulics engineer from Kawasaki, and Boote found himself producing the drawings, which he loved.

'I had one eye on doing architecture,' Boote admits. 'But I also went to open days for mechanical engineering and civil/structural, and the latter just seemed to grab my attention. In hindsight it was a perfect compromise between my interest in architecture and the technical curiosity I inherited from my dad.'

Ultimately, he hedged his bets, applying for the University of Bath's joint engineering/architecture degree. The first three years were a struggle; 'I bumbled through it,' he recalls, with hindsight concluding he would have

FIGURE 1: Refurbishment of timber-framed bungalow in Twyford shows that low-carbon solutions are achievable for small projects, despite tax challenges

CAREER MILESTONES

- 2004** Graduated from University of Bath, BEng (Hons) Civil Engineering
- 2004** Joined Mark Lovell Design Engineers as structural engineer
- 2011** Joined TCI (Service Stream) in Australia as design engineer
- 2011** Qualified as a chartered structural engineer (MIStructE)
- 2012** Joined Webb Yates Engineers as senior structural engineer
- 2013** Promoted to associate (structures) at Webb Yates Engineers
- 2020** Became a member of the IStructE Sustainability Panel
- 2022** Founded Agnos Studio, Bristol



benefited from taking some time out first. His ‘thin sandwich’ included two six-month placements in industry, and the first one, at the regional office of a large consultant, didn’t help. ‘I was bored and didn’t really get what they were doing.’

Happily, the penny dropped during his second placement at Mark Lovell Design Engineers (MDLE), a small practice where he was fully immersed. ‘They were doing interesting work but on a relatively small scale, and I worked directly with Mark [Lovell]. My final year at university was totally different – I just got it. Before that, everything seemed abstract and intangible.’

He acknowledges that Bath also gave him the opportunity to come into contact with individuals such as Tim Ibell, natural materials guru Pete Walker, thin shell specialist Mike Barnes and British Museum roof designer Chris Williams.

Stepping stones to success

On graduation Boote returned to MLDE, where he had been offered a job no matter what his grades. ‘Mark works from first principles to some extent, rather than just sticking to codes or accepted practice. We designed all sorts of different things – a wind turbine, green oak houses, buildings such as Straightway Farm (Figure 2) which

incorporate rammed earth, staircases and sculptures out of stainless steel and so on.’

While he benefited from being in a small practice, ultimately its size prompted Boote to move on to progress his career. At the tail end of the financial crash, and turning 30, he had ‘a bit of a wobble’ and decided to travel round Australia for a year.

Back in the UK he interviewed at half a dozen firms, settling on Webb Yates Engineers as a small practice – around 16 at the time – that was ‘enough like where I’d been before’. He knew he would have close contact with the founders, would be encouraged to innovate and work creatively, in a company with aspirations to grow. ‘I was working on bespoke houses, a large timber-concrete composite framed building for the Anna Freud Centre, and stone staircases almost straight away. Architects wanted more ambitious stone staircases, which forced us to figure out how to do that with reinforcing and post-tensioning techniques,’ he explains.

Boote’s involvement stepped up a notch when he was made sole point of contact for all the company’s stone projects. This enabled him to keep track of the portfolio and understand the factors that affected their progress,



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even when his direct involvement was minimal. As well as the ubiquitous staircases, such as the one at Lennox Gardens in Knightsbridge (Figure 3), there were extensions and cladding projects, and full loadbearing masonry structures, including the proof-of-concept Clerkenwell Close in London with Amin Taha Architects, a five-storey stone building that was famously issued a demolition order by Islington Council before being saved on appeal. ‘At Webb Yates, they continue to push the boundaries of what’s feasible and have several ambitious projects in the pipeline,’ he says.

‘The biggest obstacle is often people’s attitude to risk,’ Boote explains. ‘Both the RIBA stages and IStructE structural plan of work assume a linear process through a project, but with natural materials you often have to loop back because you find it isn’t as strong as you thought, or you can’t get as much of it as you hoped, or it doesn’t look the way you want it to. This means you may have to elongate some of those stages to allow for the loops. Developers hate those kinds of uncertainties.’

Yet there’s nothing to say that it should always be higher risk than other materials, he adds. ‘Sourcing a piece of local stone can be no riskier than sourcing something that’s being shipped through the Suez Canal, for example.’

Natural instincts

Boote has always had a strong interest in natural materials, as part of his low-carbon design philosophy, and both

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FIGURE 2: Working at MLDE gave Boote varied introduction to his career on buildings such as Straightway Farm



AGNESE SANMITO

MLDE and Webb Yates allowed him to gain plenty of experience not only in the use of stone, but also rammed earth and timber.

Rammed-earth construction needs a strong buy-in from the client right at the start, he says; it has particular foibles that mean it quickly gets designed out of a project if the client doesn't have the time or budget to pursue it to construction. He cites the rammed-earth house in Wiltshire (Figure 4) that he worked on while at Webb Yates with Tuckey Design Studio, which is just finishing construction. Around 70% of the mix used was sourced directly from the site.

Rammed-earth specialist Martin Rauch of Lehm Ton Erde in Austria was brought in to train the contractor's staff in the construction process. But the nature of the physical work drove labourers away and the unpredictability of the material and the supply chain fed into the challenges.

'We were on site and the contractor turned round and said it was going to take twice as long to build the house. On a commercial project that would have been suicidal – you can see why people are nervous of using it,' he says.

Rauch generally proposes using a 'recipe', buying in materials rather than relying on what is locally available to the site. This eliminates unpredictability and reduces the amount of testing that is necessary. 'The eco credentials start to

↑ **FIGURE 3:** Boote developed expertise in stone structures, such as this Knightsbridge staircase, while at Webb Yates

→ **FIGURE 4:** A supportive client is important for projects in natural materials, such as rammed earth



LOW-CARBON DESIGN FOR SMALL PROJECTS CAN BE CHALLENGING BECAUSE THERE'S NO DESIGN FEE BUDGET FOR CALCULATING CARBON OR COMPARING DIFFERENT OPTIONS

drop off when there's all the transport involved, but we shouldn't let perfect be the enemy of good,' Boote says.

Low-carbon small projects

In 2019, Boote relocated to Webb Yates' Bristol office, but found himself at a crossroads just a few years later when the company took the business decision to close the branch. Staff were offered the opportunity to move back to London, or to take redundancy.

'I wasn't daunted by the idea of setting up on my own. I'd always had it in the back of my mind to do that at some point,' Boote explains. Webb Yates also gave him the option to take over its local projects, giving him a workstream from the get-go, and a potential customer base.

'My focus at the moment is on low-carbon design for small projects, which can be challenging because there's no design fee budget for calculating carbon or comparing different options, and when you mention embodied carbon to an uneducated or uninterested client, they don't know what you're talking

about. But it can also be easier in some ways – e.g. if you swap a blockwork wall for a timber stud wall you save a whole load of carbon. It's good sometimes to sneak in these measures,' Boote smiles.

Swapping out materials can make a dent in embodied carbon but will only take you so far on a small project, Boote says; most of the savings come from efficient sizing of individual members or checking that design loads are calculated accurately, and that demands design time. 'We are talking about having a library of standard build-ups or details with embodied carbon calculated so that you're not actually having to start from scratch to work these things out.'

He questions the post-WWII drive to create maintenance-free buildings. 'In the context of the climate crisis, where we've got till 2030 to really change things, maybe going back and repointing some masonry in 40 years is OK if it means we save a lot of carbon now. True vernacular style is to build with local materials and then have the skills to continuously repair, reinstate or replace the parts that need to be maintained,' he says.

Testing advocate

Alongside his project work, Boote is collaborating with James Norman, co-author of *The regenerative structural engineer*, on a book with the grand working title 'The future of design'. The publication proposes a reliability-based approach to the design process; 'We're not exactly advocating that you throw your codes away, but that sometimes you should take a different approach, which is a tricky balance.'

Boote has contributed a section on what he considers to be the neglected art of testing. 'This goes right the way from messing about in your shed up to getting your concrete cubes tested by an accredited test house. I was really keen to get the first bit in because I think that's definitely something that has been lost since computer analysis has grown in popularity, and for me, interweaving analyses with the physical world is absolutely key.'



TUCKEY DESIGN STUDIO