



David Knight

David Knight has made his mark in the bridges sector through his involvement in some of the industry's smallest, yet most inspired, footbridge projects. He talks to Helena Russell about the power of collaboration, and what designers can learn from fabricators.

THE BENEFITS OF EARLY CONTRACTOR INVOLVEMENT

in improving constructability and pinning down costs are widely acknowledged, particularly in the bridges sector where there are many variables to consider. But David Knight believes even greater benefit can be gained from extending the practice further down the line, learning from the expertise of other supply chain specialists.

As Director of Design at Cake Industries, a modest London-based fabrication firm that punches well above its weight, Knight has managed to secure his company a high profile in the bridges sector. Despite being just 20 strong, the company has already built several award-winning bridges, including the 2023 Structural Award-winner Cody Dock Rolling Bridge (see page 24) and shortlisted Bracklinn Falls Bridge (Figure 1).

Knight sits on the design review panel for the Greater Cambridge Shared Planning Service; is on the industrial advisory board for the design trips at Cambridge University, feeding back on a new degree combining structural engineering, architecture and material science that will launch at the university this year; and has just taken over as chair of the British group of the International Association for Bridge & Structural Engineering (IABSE).

To achieve all this before reaching 40

surely marks him out as some kind of virtuoso. He offers a simpler explanation: 'I agree to lots of things, because you never know where these things will go, who you will meet, or what role these people will play in your life. My advice to young engineers is always to say yes; you get a reputation for doing so, and more doors will open for you.'

Engineering as a collaborative endeavour is Knight's mantra, and he has not been afraid to step away from a conventional career path to pursue it. Despite having worked with – and been mentored by – some of the biggest names in bridge engineering, he is driven to pursue true collaboration between designers and constructors, even disrupting his own trajectory to do so.

Pursuing an ambition

With a furniture maker for a father, Knight's formative years were spent in a home where making beautiful things was part of life. Engineering was suggested by a relative, and his fascination with bridges began during a family holiday which involved a road trip through Denmark. 'We went across the Storebaelt and Øresund bridges and I thought, "those are pretty amazing, I wonder how they work?"'

He acknowledges that he was not a conventional engineer; 'I had an aptitude for maths and physics but I always enjoyed drawing, and had a creative

bent for music in particular.' At his Cambridge entrance interview, Knight was clear about his ambition; 'I said I wanted to design bridges – and that's what I've ended up doing, with many of those people whose work I studied, read and talked about!'

After university, Knight joined the infrastructure and bridges team at Buro Happold in London, in a graduate intake of 120. But a year later, the financial crisis hit and his only option was to transfer to Hong Kong where there was still work. While he wouldn't have gone by choice, Knight acknowledges that it was a formative experience. 'I grew up a lot as a person and as an engineer – it removed some of the barriers I'd had about where I worked.'

He remained for a couple of years working on major projects such as West Kowloon Station, but knew it was time to move on when he found himself being steered towards the building sector. 'I applied to all the companies I knew of that worked in bridge engineering,' he recalls. Following an informal interview in a pub with Flint & Neill director, David

Career milestones

- 2007** MA(Hons) MEng in Engineering, Fitzwilliam College, University of Cambridge
Joined Buro Happold as bridge and structural engineer
- 2009** Moved to Hong Kong with Buro Happold
- 2011** Joined Flint & Neill as engineer
- 2014** Became Member of Institution of Civil Engineers and Chartered Engineer, Engineering Council
- 2015** Became Member of Institution of Structural Engineers
- 2017** Joined Cake Industries as director
- 2017–20** Guest lecturer on MSc structural engineering course at University College, London
- 2018–21** Associate lecturer in technical studies for undergraduate and postgraduate architecture students at Central St Martins, University of Arts, London
- 2020** Became Fellow of Royal Society for Arts, Manufactures and Commerce
- 2023** Awarded IABSE Early Career Prize
Appointed chair of British group of IABSE

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MacKenzie, he was offered a job, beginning a six-year immersion in the bridges sector, on a steep learning curve.

Getting into the swing

Knight's first job as site engineer for a project in Dover Harbour was technically demanding – it involved a footbridge that sat on top of two other bridge decks designed to rise and fall with the tide – and made more complex by the contractor going bust before the job was finished.

'It was my first time as a site engineer, taking my designs through to fabrication, and the first time seeing my own details being built, which was quite interesting,' he recalls. 'I spent a lot of time thinking about how this was going together because I was watching them doing this work.'

Knight flourished in the environment at Flint & Neill: 'These were the people who really knew about bridges, and half of them had already written a code or a standard. It led me to think about creativity and how we do a good job.'

Before too long, he was entrusted with his own project – the cable-stayed Greenwich Reach Swing Bridge (**Figure 2**) in southeast London – despite not yet being chartered. 'Ian Firth was brave enough to give me the opportunity to take it on, with his close oversight,' he says.

He had direct contact with all parties. 'We were doing the concept design through to planning and on to full detailed design, but working for the contractor who was going to build it. There was a lot to learn – it was a movable bridge – and I was working with Ian closely for the first time. It was fascinating seeing how he approached questions about design, and how the relationship with the architect [Moxon] was hugely collaborative, rather than the deferential or secondary role I'd experienced in the past. I had a hard time just keeping up!'

Subsequent projects ranged from complex movable bridges, such as the retractable 'kissing' Inderhavn Bridge in Copenhagen and Water Street Bridge in Canary Wharf, London to contributing to major schemes, such as tender design for the Mersey Gateway in northwest England and the interchanges on the Lower Thames Crossing. But as he became more senior, Knight found he was spending more time on the commercial side of projects and losing his connection to the design that he found so fulfilling.

A different vision

'I questioned why I was spending time



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managing potential conflict with a fabricator, when what I really wanted to do was to speak to them early in the process, reflect the discussion in my structural design, and go round a couple of loops to get the right outcome,' he explains.

'At the start of a project, you should all be going in the same direction, but the way the industry works and the contractual set-up can quickly generate conflict. Even if claims don't occur, everyone is fearful of them,' he says. 'People spend too much time trying to cover their backs rather than focusing on making the project better.'

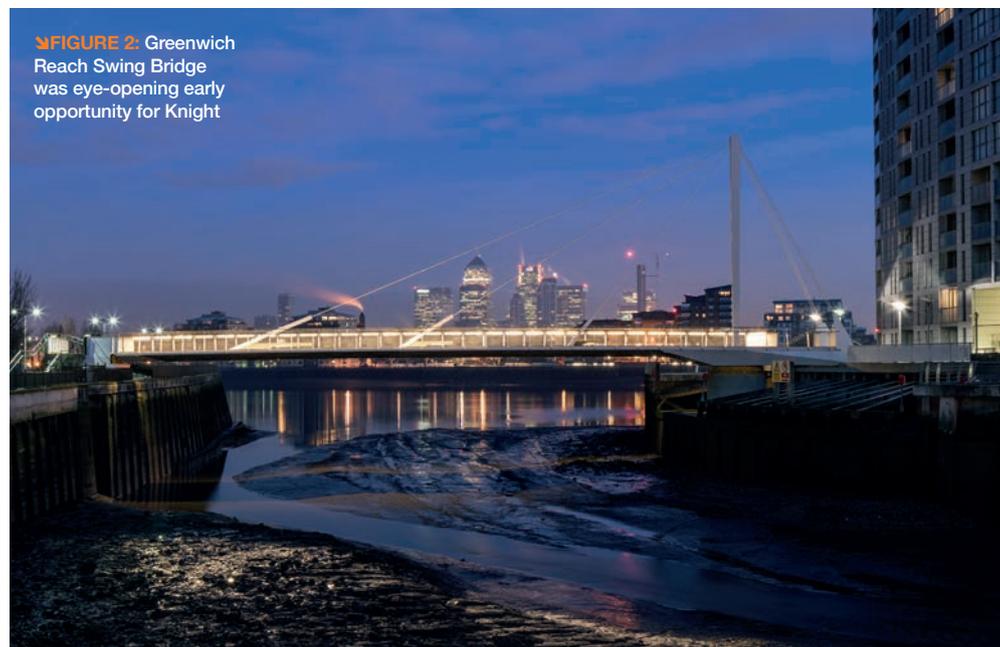
Knight's determination to try and change this was just one of the factors

↑FIGURE 1: Bracklinn Falls Footbridge, Scotland combines beauty with technical skill to meet challenges of remote site

that prompted him to jump ship in 2017. By now he was chartered and establishing a name in the sector, and sufficiently secure in his personal life to take a risk.

Five years earlier, he had worked with Cake Industries – at the time a fledgling fabricator comprising founders Keefer Erickson and Andy Creed – on the construction of a sculpture for the courtyard of the Royal Academy in London, designed by Chris Wilkinson.

'I spent a very intense six weeks with them, talking about the structure, looking at options, and considering how we might make it. We became friends and, over the years, had the usual conversations in the pub about how we



↑FIGURE 2: Greenwich Reach Swing Bridge was eye-opening early opportunity for Knight

COWI/PHOTOGRAPHY BY SIMON KENNEDY

would improve the industry. Eventually, Keefer got frustrated by me saying all this stuff and he threw down the gauntlet. They offered me a share in the business to help grow it!

Another steep learning curve awaited; while the number of staff had risen to five, the majority of work was building and installing staircases. 'In residential conversions, the staircase is usually the biggest outlay but often isn't properly budgeted,' Knight explains. 'The structural engineer on the project generally wouldn't have the understanding or the time to make sure that the staircase was beautiful. That was the obvious place to start, where we could add value immediately.'

'Our aim is to bring structural engineering into fabrication such that we can take an idea or a sketch from an architect or artist, and design and make it. To do that you need the structural engineering to be in house, as well as the design for fabrication. I was brought in to grow the design for fabrication and our engineering capabilities to achieve this,' he says.

Jurassic spark

Knight expected to have to play the long game: 'My plan was always to bring bridges into the business, but I knew it would take time and we had to put the building blocks in place first. We had no quality control system, or HR system; we were doing the payroll manually. A lot of my time in the first few years was spent putting these things in place; gaining our CE mark was a big step.'

Happily, he didn't have to wait too long. 'Our first big break was the swing bridge to the dinosaur island in Crystal Palace Park [south London]. I spotted it in the *Architects' Journal* and had enough contacts to email a few people and offer to help. The Friends of Crystal Palace Dinosaurs really liked the fact that we were based so close to the site.'

'It was a truly collaborative project with Tonkin Liu and Arup, and really suited our skills. It was a stretch for us to take on the role of main contractor; as well as making the bridge, we had to set up the site, drain the lake, install screw piles



CAKE INDUSTRIES

and crane it in. There was a real thread of responsibility throughout that I thrived off.'

The tiny, 8m long, movable span (**Figure 3**) was highly commended by the IStructE in its 2021 Structural Awards, giving Cake Industries a profile in the bridges sector and acting as the stepping stone to more. 'Suddenly, doors started to reopen,' Knight recalls. 'When you leave a big company, your network falls away. So rebuilding that was very important.'

The firm's reputation for one-off movable bridges was reinforced with completion of the Cody Dock Rolling Bridge in east London, but Knight highlights the Bracklinn Falls Footbridge in Scotland (**Fig. 1**) as the best example of what Cake Industries is capable of.

'We were directly appointed by the client, Loch Lomond & The Trossachs National Park, as main contractor, winning the tender based on our concept and the quality of our submission with BEAM Architects. There was no site access for big plant, and that drove the design, but while it was a technical response to the location, it also

↑FIGURE 3: Access bridge for Friends of Crystal Palace Dinosaurs became calling card for Knight's engineering business at Cake Industries

had to be beautiful.' The team designed a kit of parts consisting of 3m long panel sections which could be transported along the footpath on a small excavator, bolted together into a 22m long footbridge and slid over the gorge on a set of temporary rails.

As well as bringing bridge projects to the yard, Knight is passionate about exporting the firm's fabrication knowledge to improve designs by others or advise clients directly. Consulting arm Cake Engineering was established with this in mind, and already has a respectable portfolio of projects, including design of 11 new bridges for a walking trail in County Mayo, Ireland.

'We understand how a structure is going to be made, and that is an integral part of our design work,' he says. 'It offers clear benefits for the owner, starting with better cost certainty. Secondly, we understand where the connections will go, and can make them more efficient, better designed, and more beautiful, even in their structural form. It's an opportunity for us to show how we would do it, it fits how we work and it's better for the client.'

Further expansion is likely to demand relocation: 'We want to scale the business, but there's a limit to what we can achieve in this workshop and with just 20 staff,' he says. 'We are limited by head height in the workshop, so really we need a bigger space – but that requires a lot of investment and we need to grow the business sufficiently to make that possible.'



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