Profile

Engineer for the award-winning British Airways i360 observation tower in Brighton, Dr John Roberts, is 70 this year and has no plans to stop work. Jackie Whitelaw talked to a man who intends to be the oldest engineer at his employer, Jacobs, and still turning out ground-breaking designs.

There can't be many structural engineers who can say they have personally won the Institution's Supreme Award for Structural Engineering Excellence, but Dr John Roberts can.

At the end of last year, the work of the Jacobs Executive Director of Operations in the UK was awarded the prize for the British Airways i360 at Brighton (Figure 1) – a slender 162m high steel tower with an observation pod that rises 138m to give visitors views out to the Isle of Wight and Dover.

Previously, his endeavours at Allott & Lomax and Babtie won the award for the London Eye observation wheel (2001) and the UK's tallest and fastest rollercoaster – the Big One at Blackpool Pleasure Beach (1995) (Figure 2).

In a busy and long career that has included projects around the world, these three schemes are also the ones that have given him most professional satisfaction, he says.

Roberts, who was president of the Institution at the millennium in 1999–2000, worked closely on that most striking of millennium projects, the London Eye, and latterly the i360, with architects David Marks and Julia Barfield of Marks Barfield. Marks' untimely death last year aged 64 has been a heavy blow. 'David was an inspiration and his death is a great tragedy,' Roberts says. 'We spoke every week for the last 20 years.'

With Marks Barfield, Roberts was and is a director and chief engineer for the £48M i360, and he is also a minority shareholder in the company which owns the attraction. With Marks he had been promoting the moving observation tower to other cities and there are several locations where planning for one is under way, he reports. 'If you've got something that works well, then build it again!'

Still going strong

Roberts had originally planned to retire a decade ago. But he is still enjoying his engineering and will continue to work three days a week with a new ambition to be the oldest engineer in the UK for Jacobs. 'There are a lot of engineers older than me in the USA, so there's some way to go there. While I am still capable and still enjoying the work, I will go on.'

He is aware that he is now a useful role model for young and mid-career engineers in a modern UK where pensions are not ever again going to be gold plated and people are likely to be working well into later life.

Roberts spent much of his career with Allott & Lomax in Manchester, which was taken over by Babtie in 2000, staying when Babtie in turn was acquired by Jacobs in 2004. 'All my fellow directors retired at 60. I wanted to carry on and, with the Jacobs takeover, took the view that it gave me a chance to step back from running a business to focus on high-level engineering where in effect I could choose which projects I wanted to do.

'I had that luxury because throughout my career I'd kept on being a structural engineer. Even when I was a director and the company secretary at Allott & Lomax, I continued doing projects. So, my advice would be: don't give up doing the technical work. There was a phase when engineers wanted to be project managers and moved off into that too soon, before they had real technological knowhow and skill. I kept on top of being a structural engineer and that is the reason I can carry on working.'

Early inspiration

Roberts decided to be a structural engineer during some work experience as a teenager in the 1960s on the Severn Bridge approach roads, measuring the density of fill under the road surface. 'One day we were told to stop and clean the entire site, repaint the buildings, wash the Land Rovers and so on, because "the Engineer" was visiting the site. The engineer in question was Dr Oleg Kerensky from Freeman Fox and he arrived in a chauffeur-driven car, with everyone bowing and scraping in front of him as he was barking orders. I thought, "that's what I want" and promptly pursued a career in structural engineering. I matched his

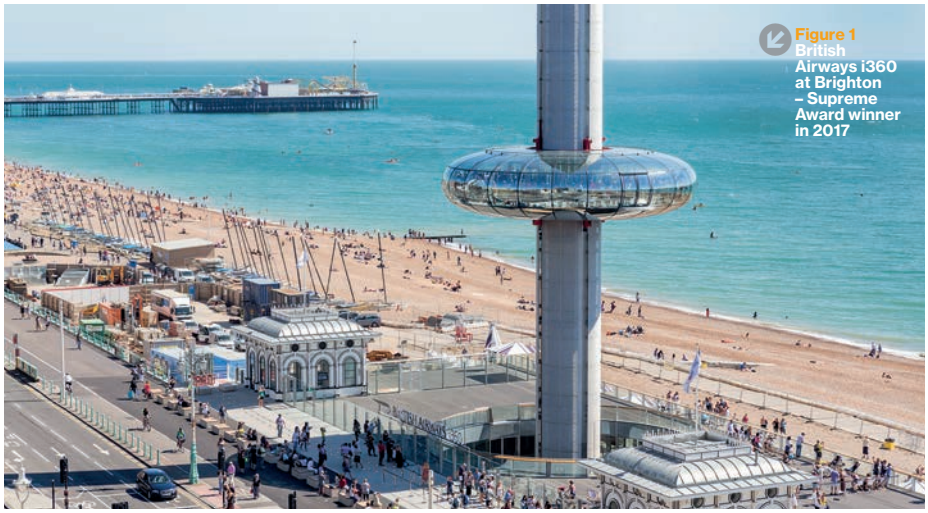

Figure 1 British Airways i360 at Brighton – Supreme Award winner in 2017

Figure 2
Big One at Blackpool Pleasure Beach – Special Award winner in 1995

achievement of becoming Institution president. However, I have never yet had that sort of reaction when I go on site. I keep telling the contractors I work with that story, and so far there's been no Kerensky-style response.'

Roberts' structural engineering was learned at Sheffield University, where he was so enthused he stayed on to study for a PhD in the dynamic overload of steel structures. 'But after three years of that I was aware my contemporaries were already out working in industry and, as I wanted to be a designer, I thought I should get on and complete the then-necessary site experience and make a career for myself.'

He spent two years on site with Alfred McAlpine before making the jump into design, first with Bertram Done & Partners in 1974 and then, soon afterwards, with Allott & Lomax, which at the time was concentrating heavily on nuclear power stations.

Fun and fairgrounds

However, the energy sector was not to be his future. 'One of my partners had met by chance a director of Blackpool Pleasure Beach while on holiday – though not in Blackpool, I believe. The Pleasure Beach needed engineering advice and, though we had no knowledge of rides, we were hired. Soon afterwards I started to design for them and, almost at the same time, Alton Towers.' The apogee was the Big One in 1992, but Roberts can also lay claim to a joyful toboggan ride called the Avalanche at Blackpool and the Monorail at Alton Towers among many others, as well as an adventure into understanding the 1930s engineering of timber rides for a European record-breaking timber coaster at Tusenfryd in Oslo, Norway.

By this time, Roberts was an acknowledged expert in the engineering of fun and fairgrounds, so when he read a story in *The Times* in 1996 about the Marks Barfield plan for a giant wheel in London to mark the millennium, he couldn't resist.

'They had already started working with Arup on scheme design, but I found their phone number from directory enquiries, rang and asked to speak to David and he took the call. I explained I worked on theme park rides and understood the safety issues, passenger flows and so on and asked if I could come and talk to him. I met him at his office and after 15 minutes he said, I want you to join as our specialist engineer. A twist of fate then left the wheel without Arup when initial contractor Mitsubishi, to whom Arup had been novated, pulled out. I stayed on.'

The London Eye was a phenomenal success and cities around the world wanted their own. Marks and Roberts set off travelling the globe to find new clients, but none could afford the near £90M price tag.

'Then David had a brainwave of a cheaper alternative and came up with the idea of the i360 tower. I did some rapid hand calculations – deciding the diameter of the tube and thickness of the steel in two pages, and the foundation sizing on one further sheet of A4. Jacobs did enough detailed design to cost it and we found a site on the beach at Brighton.

'We were ready to start construction in 2008, just as the financial crisis hit and our funding was withdrawn. It took another six years to sort out the money,' he says. In the end Brighton City Council provided a £40M loan obtained from the government's Public Works Loan Board and the i360 shareholders contributed the other £8M.

What impressed the Structural Awards judges with the project was the erection method devised by Roberts to jack the tower in 17 'can' units, avoiding the use of unfeasibly large cranes, and meaning all construction could be carried out safely at ground level. The strategy to deal with vibration was also a remarkable feat of engineering.

'My philosophy was that the only thing that mattered was wind. So, we either had to make the tower as stiff as possible, which meant the diameter would be bigger, or say "make it as slender as possible and deal with the inevitable vibration risk". We used perforated aluminium Expamet cladding, with the perforations designed to stop vortex shedding, but we couldn't assume that would do the work on its own and so added "sloshing liquid dampers". They were designed and manufactured by Australian engineering Professor Max Irvine and they arrived filled with Australian water because he joked "he wasn't having Pommy water in his dampers".'

Roberts is excited about the next versions of the i360 and recognises he has been very fortunate in his career. 'I'm a visiting professor at Manchester University and think now I would have liked to have had time to be a teacher of structural engineering. But I accept my future holds relaxing with my family on the balcony of our house, combined with designing a few more exciting rides.'

VOICE OF EXPERIENCE

Dr John Roberts has been contributing to the Royal Academy of Engineering workshops with Dame Judith Hackitt, who is leading the UK government committee looking at whether the Fire and Building Regulations are fit for purpose following the Grenfell Tower tragedy last year.

'The interim report has implied that there will have to be change,' Roberts says. 'In my view many existing buildings wouldn't show Building Regulations compliance if they were checked now because so much will have been altered since they were built, the significance of which has not been realised or even known by the building control authorities.

'The interim report also highlights the issue of competence of those involved in all aspects of the building process. What I think is needed is the requirement that all designs, both for new builds and for alterations, be signed off by an individual, qualified engineer. Britain is probably the most lax of the equivalent economies in dealing with approvals under Building Regulations. People can submit designs without stating who they are, and there is no statutory control over who can design structures and buildings. I am sure change will be imposed post Grenfell.'

HAVE YOUR SAY

To comment on this article:
►email Verulam at tse@istructe.org
►tweet @IStructE #TheStructuralEngineer