Editorial

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I think that many of us chose a career in engineering because we like solving technical problems, and we like solving technical problems by experimenting and finding solutions that are better than the ones we have used before. ‘Better’, in this context, could mean many things; longer, taller, slenderer, stronger, more durable, less disruptive, better looking, more economical, safer, more sustainable. This intrinsic drive to innovate is of course not just a self-serving demonstration of engineering prowess and flair. The demand for improved infrastructure and the ever-increasing expectations from society require engineers to remain innovative, challenge traditional thinking and go beyond established practices.

This issue of *Bridge Engineering* contains five interesting papers. They cover newly built and existing bridges and general asset management but innovation is a common element to all. They demonstrate how innovative thinking can enhance our solutions and lead ultimately to delivering better value to our clients and society; be that producing a more efficient design, finding hidden reserves of strength in an aging bridge or optimising the maintenance spend across a network of structures. The five papers are from Sweden, the UK, Ireland, Japan and China. It is welcome to see papers from different countries. This is testament to the wide international appeal of *Bridge Engineering* and the standing of the journal among practising and research engineers worldwide.

In the first paper, Häggström *et al.* (2017) describe the full-scale testing of an old steel truss railway bridge to failure. It is not often that bridge engineers have the opportunity to test a real bridge to destruction and witness its behaviour near and at failure. Besides the obvious thrill from the exercise, such tests can provide valuable insight into the behaviour of a real structure, its actual ultimate capacity and failure mechanisms. The findings can then be applied in the assessment of similar bridges. When the Åby Bridge in northern Sweden was replaced by a new bridge, it was placed on temporary supports alongside its original position and loaded to failure by two hydraulic jacks with cables anchored in bedrock. The authors describe the test and the accompanying numerical analysis, including comparison of the findings with a previous assessment to the Swedish assessment standard.

Hendy *et al.* (2017) describe the design of Walton Bridge, a new arch road bridge over the River Thames. The two inclined

steel arch ribs have a hexagonal cross-section and support the ladder deck on steel bar hangers. The paper provides a general overview of the design, followed by a more detailed account of two particular challenges that the designers had to tackle in order to produce a design that is both safe and efficient. The first issue relates to the section classification and resistance of the hexagonal shaped arch ribs that are made up of curved plates. The second issue relates to the fatigue and toughness properties of the steel bar hangers. The paper describes the detailed analytical investigation and testing, in the case of the hangers, that the designers had to undertake in the absence of appropriate codified guidance.

O'Donnell *et al.* (2017) present an interesting paper explaining how a series of static and dynamic tests were used to develop and refine a numerical model of a historic steel suspension footbridge in Ireland. Daly's Bridge is a historic footbridge over the River Lee in Cork and is known locally for its lively behaviour under pedestrian loading. Developing a reliable model was made difficult by the lack of accurate information on the structure. The authors conducted a series of static and dynamic tests on the bridge, deploying various technologies and used the findings to improve and validate their numerical model. We can even learn how an ordinary smartphone, one that almost all of us carry around these days, can be used as an instrument to measure the natural frequency of structures.

A new procedure adopted to capture bridge condition data in Japan is described by Tamakoshi *et al.* (2017). Japan, like other developed countries, has an extensive infrastructure. The ability to allocate resources optimally in the maintenance of the country's vast bridge stock and to make informed decisions both for design and maintenance relies on the understanding of the deterioration mechanisms of the various bridge components, materials and technical solutions. The new procedure, based on so-called ‘segmental data-recording’, organises bridge inspection findings into a detailed and consistent data structure. The assembled data are then used to analyse deterioration trends, including the interaction of two or more deterioration mechanisms. The authors describe the procedure and demonstrate its application on steel girder and concrete deck composite highways bridges.

Finally, but not least, Simeng and Chen (2017) describes a method that allows the passage of a heavy vehicle over

a long-span arch bridge that would otherwise fail under the heavy load. The matching load technique uses supplementary loading to control the thrust line (i.e. reduce its eccentricity from the centre line under the combined effects of the heavy vehicle and the supplementary loading). The authors demonstrate the technique on a 130 m-long concrete arch bridge, using two trucks as supplementary loading to validate the structure for the passage of a 400-tonne heavy vehicle. A computer algorithm has been developed to find the required position of the supplementary trucks, while keeping their path continuous, for each position of the heavy vehicle.

I would like to thank the authors for their papers. I hope that our readers will find them informative and a valuable source of guidance, ideas or perhaps inspiration. I would also like to remind our readers that the papers are open for discussion. Details on how to send comments to the journal can be found at the end of each paper.

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