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Editorial
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Editorial

Marcos Sanchez

Welcome to the second themed issue of *Bridge Engineering* on the subject of assessing the capacity of existing bridges. As a result of the number of papers received after our initial call on this subject, we have been able to publish two separate issues. This fact shows the importance and attention that this subject currently has in our industry. Another significant factor for this success is related to the variety and wide range of applications and cases to which capacity assessment of existing bridges can be extended.

This second themed issue of *Bridge Engineering* includes seven very interesting papers that cover a wide range of phenomena and scale; spanning in time from the capacity loading assessment of a nineteenth century iron arch, the assessment of an iconic reinforced concrete box built in the 1940s, passing through post-tensioned decks completed in the 1970s, and finishing with the evaluation of the arching effect in twenty-first century segmental concrete bridges.

Physical scale models are not very common as part of bridge assessment strategies, primarily due to their cost; however, in a very interesting paper, D.P. Cousins (2017) combines full-scale laboratory testing of concrete hinges with the more traditional approach of using analytical tools along with inspection to evaluate the accurate behaviour and fatigue assessment of this element as a main feature of a multi-span reinforced concrete deck. This type of hinge, also known as a Freyssinet hinge when working primarily in compression, was also used extensively in deck structures in the UK in the 1960s. Its conclusions, backed up by detailed modelling and an independent check on top of the full-scale experimental results, clearly shows the benefit of this effort when compared with the general approach of BA/09 (HA, 2009), which is understandably conservative.

Zaid and Collings (2017) also take advantage of full-scale tests in segmental box girder strips, carried out by Choi and Oh (2013), to develop a sophisticated analysis to evaluate the different contributions of frame action, compressive membrane action and geometric arching action that govern the accurate transversal behaviour of the top slab of concrete boxes under traffic loading. Their approach shows the benefit not only in the assessment of existing concrete box decks under, for example, abnormal traffic loading but also the potential savings in materials that can be introduced in new design with the appropriate consideration of the phenomena.

On a different subject, Kashani, Crewe and Alexander (2017) develop a numerical method that simulates the behaviour of concrete columns with corroded reinforcement. To calibrate their model and verify the approach they relied on an extensive experimental programme (Kashani *et al.*, 2013a, 2013b, 2013c, 2014, 2015a, 2015b, 2015c) and also on testing a 2·5 m-high column specimen under cyclical loading after inducing corrosion in the reinforcement. Their analytical method, validated by experimentation, provides an accurate simulation of corroded columns under seismic scenarios, with an extensive application in structural assessment beyond bridge structures.

Pimentel and Figueiras (2017) report on their successful modelling and explanation of the cracking patterns that developed within the box in a 1970s multi-span, 250 m-long post-tensioned box girder. Combining refined 2D modelling along with bridge inspection methods such as gamma ray imaging, the potential cable corrosion is discarded, and detailed 3D methods provide a reasonable explanation of the cracking patterns observed.

David Astin (2017) presents a comprehensive assessment of an iconic 1940s reinforced concrete structure, the Waterloo Bridge in London, a multi-span continuous girder with slender columns and a central suspended section on roller bearings. Given its specific structural arrangement, particular attention is paid to the horizontal movements of the structure, combining full structural modelling with monitoring over extended periods. It is also interesting to learn of the concerns with regard to vibrations considered by the original designers, mitigated by placing steel dampers at mid span. With a combination of global and local detailed models along with bridge inspections, this paper covers every aspect of this iconic structure.

Also in the field of historic bridges, Okorie, Clapham and Ndlovu (2017) address the capacity assessment of a nineteenth-century iron-arch bridge over river Aire in Leeds carried out to evaluate the adequacy of this structure to carry a planned trolleybus system over it. Combining relatively simple repair techniques in critical areas and areas vulnerable to corrosion, identified after a detailed inspection programme, with a full analysis combining 3D finite-element analysis and space frame models, the authors prove the adequacy of the iron arches and the minimum intervention required, by replacing the mass concrete fill with a reinforced concrete slab, in order to support the future loading planned for this structure.

Finally, Bentz and Hoult (2017), address the response assessment of a two span reinforced concrete bridge by the use of sensor data acquired during load testing of the bridge. While the bridge was originally designed as simply supported the compression induced by the earth pressure against the abutments resulted in a different structural behaviour. Using the information gathered from fibre optic strain sensors and digital image correlation analysis, the authors were able to calibrate a detailed numerical model, implementing the real boundary conditions and stiffness of the structure and predict accurately the behaviour of the structure against other loading conditions verified with the measurement system implemented.

In summary, with these two themed issues on assessing the capacity of existing bridges, a total of 12 papers covering a wide range of subjects and applications on this area have been presented. This represents a good sample of the 'state of the art' on bridge capacity assessment. As an integral part of this publication, readers are encouraged and welcome to comment and discuss the content of the papers. You may send a response to the journal; details on the procedure can be found at the end of each paper.

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