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Editorial

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Editorial

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Welcome to this June 2021 issue of the Institution of Civil Engineers' journal *Bridge Engineering*. In this journal we aim to publish a mix of practice and research papers, which we hope will be of interest to all bridge engineers.

Currently there is active debate in both the technical and general media on the actions that society needs to take to address the climate emergency. The Institution of Civil Engineers and other construction industry bodies are considering how net zero carbon construction should be achieved. Bridge engineers have a responsibility to contribute to this discussion and propose innovative new designs and construction methods. Bridge engineers are encouraged to use the pages of technical journals such as *Bridge Engineering* to share improvements in the field of bridge engineering. One area where we could learn from building structures is in off-site construction. The many advantages of off-site construction (over traditional on-site construction) are reasonably well known, and these include improved economy, programme and quality. These result in improved health and safety, staff welfare, fewer deliveries, reduced waste and reduced congestion/pollution. These advantages are further realised by the increased use of new technologies such as digital design (i.e. digital twins). 15 years ago this journal published a paper by Collings (2006), in which he described how to count the equivalent embodied carbon in bridges. This proved to be well ahead of its time and bridge engineers should now be assessing the embodied carbon content of their designs when comparing options. The methods described by Collings (2006) have recently been formalised by Gibbons and Orr (2020) and are now expected to be widely used in the design of building structures. This journal is keen to continue to contribute to the zero carbon debate and we would welcome papers describing case studies of any innovations in reducing the environmental impact of bridge structures.

This issue of *Bridge Engineering* includes four technical papers that cover a range of topics from the advanced design of new steel bridges to the reporting of experimental studies on concrete support structures.

In the first paper, Hendy *et al.* (2021) present a comprehensive study of the additional load effects that exist in steel–concrete composite multi-girder decks with plan curvature. They use the results of an extensive finite element parametric study to propose new design rules for such bridges based on modifications to the existing Eurocode rules for straight girders. This provides a rational and relatively easy-to-apply solution to a long-standing problem for designers. This is a practical paper that will be of direct use to designers and will also help to create a consistent approach that will be expedient in the independent check of curved plate girders.

The issues associated with excessive lateral vibrations of the London Millennium Footbridge in the year 2000 generated a considerable amount of research interest in dynamic pedestrian loading. Ramos-Moreno *et al.* (2021) now review much of this research and present a novel pedestrian load model they have developed. The proposed load model takes account of realistic vertical and lateral pedestrian loads including effects such as gait, the physical characteristics of individual pedestrians and crowd flow interactions. This paper advances the understanding of crowd loading and will inform the future designs of footbridges to help prevent the reoccurrence of those vibration problems.

The next paper considers the behaviour of bridge piers adjacent to shipping channels subject to vessel- bridge collisions. Zhou *et al.* (2021) describe a range of numerical analysis studies considering different constitutive concrete material models, both elastic and non-linear. These models are applied to two idealised situations of first, a ball impacting with a rigid concrete wall, and then a hammer hitting a reinforced concrete beam. They then extend the study to include a detailed 3D model of the bow of a 1000 DWT cargo vessel impacting a solid RC bridge pier model. As well as realistic materials models including concrete reinforcement ratios, the effects of impact velocity are also included. Finally, these results are compared with existing load models recommended for these types of impacts by three of the major international design standards.

The final paper by Khan *et al.* (2021) describes an experimental and numerical study of the behaviour of concrete bridge piers subjected to earthquake loading. The focus of the study is piers constructed from low-strength concrete and previously damaged piers that have been repaired with CFRP wrapping. The paper concludes that CFRP retrofitting of damaged piers is a very effective repair method.

I hope you find these papers interesting and useful. Comments on the content of any of the papers are always welcome. Details on how to contribute your comments can be found at the end of each paper. Also, there are many fascinating bridge-related projects being constructed around the world, so if you are involved with one of these projects then maybe you would consider submitting a paper to this journal.

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