Editorial

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While in the older, developed world the focus now is on the maintenance of the existing infrastructure (Proske, 2020) with few new megaprojects being built, China is boosting the construction of infrastructure. Many iconic and world-record-breaking bridges have been built in China in recent years; for example, the Hong Kong–Zhuhai–Macau Bridge, the Pinnan Bridge rail-cum-road sea-crossing, the Yangsigang Yangtze River suspension bridge with a main span of 1700 m, and the Hutong (cable-stayed) and Wufengshan (suspension) Yangtze River bridges carrying a high-speed railway running on main spans of up to 1092 m. This is just to mention some, which were completed and opened to traffic in the past two years. (The Institution of Civil Engineers (ICE) intends to progressively present these projects to our readers in this and subsequent issues of the journal.)

The demands of a modern society mean that bridges not only have to be longer, taller and wider, but also safer, more durable, more environmentally friendly and visually more impressive. This special issue of *Bridge Engineering* introduces some Chinese projects by gathering together recent, state-of-the-art technical papers of practical significance that address research, design and construction.

The first paper (Fang *et al.*, 2021) gives some insight into one of the most iconic, large and complex infrastructure projects of modern times: the Hong Kong–Zhuhai–Macao Bridge, which was officially opened to traffic in 2018. This sea crossing consists of an eastern artificial island, an undersea immersed tunnel, a western artificial island and a 23 km-long main bridge section. A key aspect of the bridge section is the embedded pile-cap design for the main bridge piers, which meant that prefabricated pier shafts and pile caps had to be installed under water. This posed many construction-related challenges, which are reviewed by the authors.

A very striking structural form, from an aesthetic point of view, is the spatial arch bridge, which is also a very challenging structural system, as the loads are not applied in the plane of the arch and anti-funicularity cannot be always achieved. Sun *et al.* (2021) show us the beauty and complexity of such structures by analysing the structural behavior of Jiusha Bridge in Hangzhou City, China.

Prestressed concrete decks with corrugated steel webs (Figure 1) are one of the most promising developments of steel–concrete hybrid structures that can be applied to highway and railway bridges, owing to their excellent mechanical properties and efficient material utilisation. Corrugated steel webs reduce the weight of the bridge, while also increasing the plate buckling resistance of the webs and decreasing their axial stiffness due to the folded plates. The application of this system in China is reviewed in a state-of-the art paper by He *et al.* (2021), which includes more than 50 references to greatly assist any engineer wishing to apply this solution.

In major projects, improvement and innovation of construction methods has to be a significant goal. In many cases, this implies mechanisation of construction. Wang *et al.* (2021) present the construction method for Yushan Bridge, where mechanisation achieved a shortened construction period and improved construction quality. In the same vein, Dong *et al.* (2021) present the application of mechanised methods in the fabrication of the deck for the Yuxi River cable-stayed bridge, showing how engineers were able to reduce the construction schedule without compromising quality or safety.

In the next paper, Ascaso Til and Sancho Santamaría (2021) describe how ancillary equipment, such as erection gantries, has to be carefully designed and operated as it is a key factor for the success of a project. Moreover, this paper also illustrates the involvement of UK companies in the Chinese bridge industry, giving as an example their contribution to the Nizhou Bridge, a suspension bridge with a 1688 m main span.

Finally, Chinese construction management methods are adapting to international standards. Decision making is becoming more and more complex, and sophisticated tools are in vogue to help engineers (Castillo *et al.*, 2015). As everywhere in the world, construction safety risks have to be carefully taken into account in any big construction project. In their paper, Zeng *et al.* (2021) describe the application of cutting-edge methods based on analytic hierarchy processes, cloud theory and back-propagation-neural networks to assess the safety risks for construction of a cast-in-situ box girder for a viaduct with high piers in a mountainous region.

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Figure 1. A corrugated steel web bridge (He *et al.*, 2021)

We would like to sincerely thank all the contributors for their efforts and for sharing with us the fruit of their endeavors. This will certainly help to present Chinese technology and achievements to ICE journal readers. This current issue also gives us, as bridge engineers, the opportunity to increase our competence in and knowledge of practical applications of the state-of-the-art construction methods, and again shows the wide range of topics *Bridge Engineering* covers in order to do justice to the many different aspects of modern bridge engineering.

Moreover, in this ever-changing world, our commitment is to make all the relevant information available as soon as possible. In order to do so, the journal publishes papers online ahead of print. These are available to subscribers on the ICE Virtual Library website at <http://www.icevirtuallibrary.com/toc/jbren/0/0>.

Any bridge engineer is welcome to participate in the journal, either by sending original papers that address any aspect of the

bridge engineering discipline, or by commenting on and discussing the content of the published papers. In this case, a response may be sent to the journal; details on the procedure can be found at the end of each paper.

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