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Editorial

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Innovation in structural engineering is vital to the continued progress of the industry and it is always encouraging to see papers that present research into the performance of new materials, and even more encouraging when it provides tangible environmental benefits. The first paper in the July 2018 issue of the journal provides a detailed look at the behaviour of basalt fibre polymer bars as an alternative to steel for the flexural reinforcement of concrete beams. Li *et al.* (2018) describe the testing of basalt reinforced concrete beams using a standard 4-point bending test to determine the performance of the beams under loading in terms of strength, deflection and cracking. Expressions for the flexural behaviour are presented and then compared against both the test results and international standards for fibre reinforced concrete. It is concluded that basalt bars provide a durable alternative to steel reinforcement and potentially mitigate the use of precious river sand supplies by facilitating the use of sea-sand concrete.

The next paper in this issue by Liao *et al.* (2018) look at the reliability of critical infrastructure using probabilistic methods. Practicing design engineers, often working to prescriptive international standards, will rarely give thought to the probabilistic nature of structural behaviour and how achieving an adequate level of performance is related to fundamental uncertainties in factors such as loading, underlying geology, local topology, environmental exposure, materials and construction accuracy. The paper provides an intriguing study into the probabilistic safety evaluation of a river bridge substructure and describes a process for analyzing uncertainty in water surface elevation, water velocity, local scour depth, wind load and soil property data using Baysian inference and applying a Monte Carlo simulation to estimate reliability for five selected limit state functions. The paper concludes that the reliability analysis for the case study presented is compatible with international performance requirements and that a reliability analysis should consider multiple limit state functions to ensure that the critical limit state is identified in all conditions.

The performance of non-engineered structures under seismic loading is of critical performance in developing countries where a large proportion of domestic buildings are built using traditional construction methods. An appreciation of the behaviour of such structures leads to a better understanding of how they can be strengthened and improved economically to save lives and limit economic impact. Rafi *et al.* (2018) describe the testing of reduced scale masonry building using a shaking table to understand the seismic response of a traditional form of building construction in Pakistan. The paper describes the meticulous approach taken to construct a representative model, test the constitutive materials and instrument the model structure to obtain key information on its behaviour under seismic excitation. Acceleration response, floor displacement, dynamic amplification factor, base shear and hysteretic characteristics are all presented for scaled time histories corresponding to 75%, 100%, 125% and 150% of the design spectra.

Mazer *et al.* (2018) present a study on the use of fuzzy logic to predict chloride diffusion in concrete. The paper describes the basic concepts of fuzzy logic and its application to the practical problem of predicting the apparent chloride diffusion coefficient. The method described uses data from 20 different studies to determine fuzzy set membership functions for water-cement ratio, concrete compressive strength and pouring temperature and then applies fuzzy inference on chloride diffusion data to determine the output in terms of an apparent chloride diffusion coefficient. The paper provides an example of the application and demonstrates how fuzzy logic can be practically applied to concrete technology.

Finally Akbari and Maalek (2018) provide a detailed state of the art review on the seismic behaviour of irregular bridges. Their thorough review starts by looking at the definition of irregularity in bridge design and a discussion of proposed regularity indices with reference to standardised bridge configurations. The paper then summarises experimental investigations documented in available literature before examining the differences between force-based and displacement-based design approaches. Other aspects reviewed include the effects of higher modes and analysis methods on predicted behaviour,

seismic isolation, reliability and risk assessment and soil-structure interaction. The paper concludes with key recommendations regarding methods of analysis, the importance of design in reducing non-uniform demand in short or stiff piers of irregular bridges, and the need to include soil-structure interaction for bridges located on sensitive soils. An extensive list of recommended further research is also presented.

I trust you find the papers in the July 2018 issue of interest and hope that they may be of practical benefit. Looking ahead, the journal will be publishing one themed issue on fibre-reinforced polymer composites and one on wind energy structures.

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