Editorial

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The first issue of *Structures and Buildings* in 2016 contains six papers and one book review. The first two papers investigate the fire resistance of cold-formed steel and reinforced-concrete frames, while the other four articles cover different topics in reinforced concrete. The six papers originate from various research institutions in Malaysia, Australia, India, China, Poland and the UK, demonstrating the international reach of the journal.

The first paper by Johnston *et al.* (2016) describes a full-scale site fire test performed on a cold-formed steel portal frame building with semi-rigid joints, complemented with finite-element modelling. The total length of the building was 10 m, comprising five frames spaced at 2.5 m. Each frame had a span of 8 m, height to eaves of 2.2 m and pitch of 10°. The fire test was carried out by several international experts from four research institutions, namely Queen's University Belfast, Curtin University, University of Strathclyde and Ecosteel, benefitting from unique fire testing facilities at Curtin University, Malaysia. In the full-scale fire test, the building collapsed asymmetrically at a temperature of 714°C. The paper also presents the development of a non-linear elasto-plastic finite-element shell model for the building in fire. After model validation against the results of the full-scale fire test, a comprehensive parametric study is conducted, highlighting the importance of in-plane restraint from the side rails in preventing an outwards sway failure for both a single portal and full building geometry model. The study also demonstrates the importance of modelling the semi-rigidity of various joints in design.

In the second paper, Behnam and Ronagh (2016) investigate the post-earthquake fire resistance of a two-bay reinforced-concrete portal frame. Following a post-earthquake firewall break down, the paper computationally assesses three fire exposure scenarios: only the left part of the frame exposed, only the right part of the frame exposed and the entire frame exposed. Two action scenarios are also considered; the frame is first pushed to displacement corresponding to the life safety level of performance based on FEMA356 code, followed by a natural fire curve, whereas the second assumes a fire-alone analysis to provide a point of reference. The finite-element simulation shows that no failure occurs in any of the fire-alone scenarios, or when exposing the smaller part of the building to the post-earthquake fire, but exposing the larger part and the entire frame to post-earthquake fire causes frame collapse at around 50 min and 25 min, respectively. The investigation shows the importance of firewalls to reduce

vulnerability of reinforced-concrete buildings in case of post-earthquake fire.

The third paper by Cairns and Goodchild (2016) reports on an experimental investigation into the performance of lapped steel joints in structural concrete. The paper considers the effect of three different parameters, namely concrete cover, proportion of bars lapped at a section and relative size of bars within a lapped pair. However, the main focus of the paper is to evaluate the reduction in lap strength where minimum concrete cover, as specified by Eurocode 2, is reduced below one bar diameter. The authors conclude that lap strength is decreased by approximately 12% when the bottom cover is reduced from 1.2 to 0.6 times bar diameter. It is also found that lap strength is barely changed when laps are staggered, raising questions over the validity of the coefficient in Eurocode 2 related to the proportion of bars lapped at a section. Results also demonstrate that, where lapped bars differ in diameter, lap length may safely be based on the diameter and covers to the smaller diameter bar.

Corrosion of steel reinforcement is a primary cause of deterioration of structural reinforced-concrete members. The fourth paper by Zhuang *et al.* (2016) reports an experimental investigation on reinforced-concrete slabs strengthened with carbon-fibre-reinforced polymer (CFRP) sheets and exposed to a corrosive environment. The nine slabs tested are designed with different clear concrete covers and main longitudinal bar diameters. The slabs are then subjected to accelerated corrosion for periods of time ranging from 0 to 84 days to achieve various corrosion degrees of 0 to 15% mass loss based on Faraday's law. The paper provides a good analysis of the effect of CFRP confinement on the crack width due to corrosion of internal steel reinforcement. The authors observe that the average width of cracks directly under CFRP sheets is approximately 30% lower than that of other cracks in the slab specimens. The nine slabs are then loaded to failure under a four-point bending system and it is concluded that all slabs failed by CFRP laminate debonding followed by concrete crushing.

The addition of short and discontinuous steel fibres to concrete may improve the tensile strength and decrease the brittle failure characteristics of concrete. The fifth paper by Singh (2016) presents an analytical model for the determination of the ultimate flexural capacity of steel-fibre-reinforced concrete (SFRC) rectangular sections based on strain compatibility and force equilibrium. The post-cracking response of concrete in

tension implemented in the analytical model considers the random distribution and orientation of steel fibres at the cracked section. The analytical model predictions reasonably compare with the flexural capacity of SFRC beams tested elsewhere. The paper also presents a parametric study to assess the effect of fibre parameters, conventional reinforcing bars and concrete strength on the ultimate flexural capacity of SFRC beams. Design charts are also produced to simplify the flexural design procedure of SFRC members, and to aid the selection of fibre and quantity of reinforcing steel.

In the last paper of this issue, Halicka and Jabłonski (2016) present an experimental investigation of T-shaped composite concrete beams. The investigation aims to study the influence of interface location on the behaviour of beams tested; the interface is located between the flange and the web, at the mid-height and at a distance of one-quarter of the height from the bottom edge. It is concluded that the presence of the interface has a major influence on the crack pattern in beams tested but not the failure load.

This issue also presents a brief review by Baniotopoulos (2016) of the third edition of the well-established book: *Wind Loading of Structures* by John Holmes. The book provides a useful reference to practising structural engineers as well as for students and researchers working with analogous wind-engineering themes in advanced university courses and research.

I hope you find these papers stimulating and informative. As always, comments and discussions from readers on the papers in this issue are most welcome through the submission of discussion articles.

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