**Cite this article**
Fu F (2020)
Editorial.
*Proceedings of the Institution of Civil Engineers – Structures and Buildings* **173(11)**: 781–782,
https://doi.org/10.1680/jstbu.2020.173.11.781





**Structures and Buildings**

ice Publishing

# Editorial

**Feng Fu** PhD, MBA, MSc, CEng, FIStructE, FICE, FASCE, FHEA
Senior Lecturer, School of Mathematics, Computer Science and Engineering, City, University of London

Incidents such as the collapse of the Twin Towers due to fire, demolitions of large percentages of buildings in the Tianjin Harbor due to explosions, collapse of buildings due to severe earthquake, have all accelerated research on structures under extreme loading conditions such as blast, accidental impact loads, severe earthquakes and fire. It has also become an important task for civil engineers to provide cost effective designs to minimize injuries and improve the probability of survival. However, due to the unconventional features of these extreme loadings, the accurate responses of the structures is difficult to capture; advanced analysis and theories need to be further developed. Improvement in performance-based design guidance must also be made. This themed issue 'Research and design for structure under extreme loading conditions' of the ICE's *Structures and Buildings* journal is intended to represent the state of the art in these topics through presenting the latest research outcomes of both experimental and numerical studies.

This issue contains eight papers.

In the first paper, Aboutorabian *et al*. (2020) introduce numerical study of in-span hinges and their effects on the seismic response of irregular multi-frame reinforced concrete bridges. Four classes of single- and multi-frame bridges with low to high regularity indices were considered. The results showed that the beneficial or damaging effects of in-span hinges on the seismic behaviour of a bridge depend on its level of irregularity. They recommend that in-span hinges are located such that the adjacent frame lateral stiffness ratio approaches unity so as to avoid out-of-phase vibration of adjacent frames and unseating issues.

In the second paper, Dua *et al*. (2020) present an experimental and numerical investigation on contact explosion response of reinforeced concrete (RC) columns. Quantitative and qualitative assessments of damage profiles and the residual axial load capacity of the columns are presented. LS-Dyna models were used for parametric studies to establish the influence of various design parameters on the response. The results of the parametric studies showed that the demolition charge mass for an RC column is considerably lower than the breaching charge mass for an RC slab of the same depth and material properties.

In the third paper, Behnam (2020) made an investigation on three steel moment-resisting structures (four storeys, seven storeys and ten storeys). Their life-cycle costs (LCCs) were determined based on different earthquake loads. The results revealed that none of the structures designed based on the design earthquake provided a minimum LCC. The LCCs were minimized when a 60%, 50%, 40% increase was applied to the design earthquake, respectively. The proposed methodology can be used as a case-independent tool for different structures.

In the fourth paper, Lim *et al*. (2020) used a non-linear finite-element method to evaluate the effect of the shape and spacing of shear studs on the behaviour of steel-plate–concrete walls subject to blast loads. The behaviour of a wall subject to blast loading was analysed for various stud spacings and shapes.

In the fifth paper, Abdalla *et al*. (2020) provide a non-linear finite element analysis (FEA) of 21 models of concrete-filled tubular (CFT) circular steel columns wrapped with several carbon-fibre-reinforced polymer (CFRP) composite layers at the end region. The non-linear FEA models were properly calibrated and validated with experimental results. A parametric study was then conducted to assess the influence of the number of CFRP layers and axial load level on CFT circular steel column performance. Also, it was found that the column axial load level significantly affects the CFT circular steel column behaviour under lateral loading.

In the sixth paper, Dahmardeh *et al*. (2020) investigate the effect of torsional component of earthquakes on response of symmetric/asymmetric buildings. The results indicated that the effect of the torsional component on the non-linear responses of the building was considerable. The maximum growth of the displacement of torsionally stiff and torsionally flexible buildings was 51% and 155%, respectively. The diaphragm rotation can be increased to 154% in the asymmetric systems.

In the seventh paper Del Gobbo *et al*. (2020) made an assessment of damper placement methods considering upfront damper cost. Six damper placement methods were assessed based on structural and non-structural repair costs. The iterative methods were found to provide a greater total damping coefficient to the structures than the simple methods. This resulted in a higher supplemental damping ratio and lower repair costs.

In the eighth paper Cai *et al*. (2020) developed a new reliability analysis approach for the flexural capacity of post-fire reinforced concrete beams retrofitted with carbon-fibre-reinforced polymers/plastics (CFRPs). In this approach, the thermal parameters of RC beams are first determined to enable heat transfer analysis in Abaqus. Based on the thermal response obtained from the heat transfer analysis, a section method is used to calculate the post-fire residual flexural capacity of RC beams. Reliability analysis of the beams retrofitted with CFRPs is subsequently performed using the Monte Carlo method. The effects of fire exposure time, concrete cover thickness and CFRP usage on the reliability of the flexural capacity of RC beams after fire exposure were studied. This new approach provides an effective reliable model for the evaluation of the mechanical properties of post-fire RC beams strengthened with CFRPs.

## Note from ICE Publishing

This year has seen great disruption to normal life and work due to Covid-19 pandemic. In April, delivery of printed copies of the journal was halted due to reduced Airmail and delays at Customs. Readers can be reassured that purchased 2020 printed journal issues will be posted to them before Christmas. In January, we will see another change as the journal moves to solely online-only format. PDF is now the most common format in which to read the journal, reflecting the preference of institutional libraries and the desktop convenience for readers of finding, receiving and sharing articles in PDF. We expect this trend to continue, with fewer subscribers opting to pay extra for issues to be printed and posted to them. If you are one of our readers who does like to receive a hardcopy, these will be available to purchase on a per issue and per volume basis. Prices will be announced in the New Year. Readers who require a printed copy for accessibility reasons should contact journals@ice.org.uk.

### REFERENCES

Abdalla KM, Al-Rousan R, Alhassan MA and Lagaros ND (2020) Finite-element modelling of concrete-filled steel tube columns wrapped with CFRP. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **173(11)**: 844–857, https://doi.org/10.1680/jstbu.19.00011.

Aboutorabian E and Raissi Dehkordi M (2020) Numerical study of seismic response of irregular multi-frame reinforced concrete bridges. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **173(11)**: 783–798, https://doi.org/10.1680/jstbu.18.00222.

Behnam B (2020) Seismic design of steel moment-resisting structures based on life-cycle cost. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **173(11)**: 821–833, https://doi.org/10.1680/jstbu.18.00228.

Cai B, Zhang B and Fu F (2020) Post-fire reliability analysis of concrete beams retrofitted with CFRPs: a new approach. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **173(11)**: 888–902, https://doi.org/10.1680/jstbu.19.00037.

Dahmardeh SR, Motamedi M and Aziminejad A (2020) Effect of torsional component of earthquakes on response of symmetric/asymmetric buildings. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **173(11)**: 858–878, https://doi.org/10.1680/jstbu.19.00013.

Del Gobbo GM, Williams MS and Blakeborough A (2020) An assessment of damper placement methods considering upfront damper cost. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **173(11)**: 879–887. https://doi.org/10.1680/jstbu.19.00023.

Dua A, Braimah A and Kumar M (2020) Contact explosion response of RC columns: experimental and numerical investigation. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **173(11)**: 799–820. https://doi.org/10.1680/jstbu.18.00223.

Lim JS, Jeong YD and Yi ST (2020) Improved stud layouts for steel-plate–concrete walls subject to blast load. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **173(11)**: 834–843, https://doi.org/10.1680/jstbu.18.00229.