Editorial

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This issue of *Structures and Buildings* offers six papers on experimental studies, advanced numerical simulations and analytical studies of different types of structures, from the experimental investigation of strengthened pre-damaged concrete cylinders, to numerical analyses of the seismic retrofitted unanchored steel tanks and replaceable steel coupling beams in box-type buildings, investigations of buckling load of inclined slender reinforced concrete columns and moment-rotation behaviour of segmental tunnel, and finally, the development of a new design approach for halving joints. These studies can provide new insights into innovative retrofitting methods and effective design approaches.

In the first paper by Ma *et al.* (2019), post-tensioned steel straps were adopted to strengthen the pre-damaged concrete cylinders. A series of loading tests were conducted for undamaged and damaged cylinders with different strap spacings and number of confining layers of straps. The test results revealed that providing additional confinement to the pre-damaged cylinders can effectively enhance their axial strength and axial deformability. Furthermore, it is more effective to increase the amount of confinement by adding more layers of straps than by reducing the strap spacing. This study can contribute to the development of simple and effective strengthening solutions for damaged concrete structures.

In the second paper by Tavakoli Joorabi and Razzaghi (2019), the effectiveness of providing anchors for seismic retrofitting of unanchored steel tanks was thoroughly examined by using Ansys software (Ansys, 2004). In this study, a non-linear response history analysis was conducted using appropriate earthquake records. The effects of uniform steel corrosion, material non-linearity, large deformations and contained liquid on the seismic performance of pre-code and retrofitted steel cylindrical tanks were investigated. The models developed are capable of simulating inelastic buckling and shell uplift of the steel tank. The seismic fragility analysis demonstrates that providing anchors can effectively improve the seismic uplift resistance of steel tanks for moderate and major earthquake scenarios. Furthermore, the effects of steel corrosion cannot be neglected in the fragility analysis.

The third paper by Mohsenian and Mortezaei (2019) presents a comprehensive numerical investigation of the seismic performance of box-type buildings with steel and concrete coupling beams. A time history analysis of these two types of buildings was performed under design-based and maximum credible earthquakes. The computed strain distributions demonstrate that many walls experienced damage prior to the concrete coupling beams which is inappropriate as coupling beams cannot effectively dissipate seismic energy. Furthermore, through a pushover analysis, the lateral stiffness and strength of the buildings are found to be significantly affected by the types of coupling beams. An incremental dynamic analysis was then performed to evaluate the seismic reliability of these two types of coupling beams and the response modification factors of buildings. The results show that the use of steel coupling beams is appropriate as they can achieve the desirable energy dissipation ability and be easily replaced after damage. Finally, appropriate design response modification factor for box-type buildings with steel coupling beams is recommended.

The fourth paper by Allouzi (2019) presents a numerical analysis of inclined slender reinforced concrete columns by using Abaqus 6.13. In this study, the inclined columns have the transverse reinforcements in the horizontal direction and the main reinforcements in the tilted direction and are subjected to vertical loads. Non-linear finite element analysis was conducted to calibrate the effective flexural rigidity and effective length factor in the Euler buckling equation. The proposed equation can be used to calculate the first buckling load of inclined reinforced concrete columns with various slenderness ratios, inclination angles and boundary conditions.

It is well-recognised that the mechanical behaviour of a segmental tunnel lining depends on the opening and closure of the segment joints. The induced axial load in the joint often varies throughout the analysis and iterations are usually required in the solution process. The fifth paper by Peña *et al.* (2019) proposes a simplified moment-rotation bi-linear relationship for typical planar joints which is governed by the initial stiffness and the maximum moment resistance but not the axial load. The initial stiffness can be obtained from the

geometrical properties of the joint, the mechanical properties of the material and eccentricity of the load. The maximum moment resistance is determined from the crushing load of concrete. The proposed equation has been validated by the test results. The proposed model can significantly enhance the computational efficiency of segmental tunnel linings.

Half-joint beams have been widely used in precast concrete construction. Since the collapse of concrete bridges in Canada and Italy, engineers raise a matter of concern on the structural safety of half-joint details. The sixth paper by Kotsovos and Cotsovos (2019) postulated that the inherent vulnerabilities in half-joint structures were attributed to shortcomings of the strut-and-tie load transfer mechanism underlying the specified reinforcement layout. Furthermore, the forces in half-joint beams were transferred by beam action rather than the well-known strut-and-tie mechanism. Under such action, tensile stresses were induced in the transverse direction of the compressive load path. Compressive force-path theory was adopted to design transverse reinforcement aiming at strengthening the compression force path of half-joint beams. The accuracy of the proposed design method was verified through comparisons of the predicted failure mode and load-carrying capacity with the results from a non-linear finite element analysis. This study provides a new perspective for the design of halving joints.

The issue concludes with a book review by Sheth (2019) on a recent monograph presenting fundamental structural concepts and architectural considerations on building design.

I trust that you will find this issue interesting and relevant to retrofitting of existing structures and design of new structures. Please also bear in mind that comments on these papers

can be submitted in the form of Discussion articles. As well, the most recent articles ahead of print which are available on the ICE Virtual Library of the journal at: <http://www.icevirtuallibrary.com/toc/jstbu/0/0> are fully citable using the DOI system.

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