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Editorial

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This is the second part of a two-part themed issue 'Composite (steel and concrete) structures – new developments and trends'. The aim of themed issue is to capture the state-of-the-art in the design of composite structures made from steel and concrete as there has been a boost in the use of composite structures (steel and concrete) worldwide. This second part features seven papers contributed by authors from different countries including Brazil, China, Greece, Iran, Hong Kong, Portugal, and United Kingdom. Authors shared their latest technical assessment on the next Eurocode 4, composite columns, composite connections, steel truss reinforced composite joints, shear connection by adhesion and interlocking & friction, sandwich panel infilled steel frames and composite steel frames with reinforced concrete infill.

The first paper by Johnson (2018) presents an overview of the challenges faced in developing the next Eurocode 4 for composite structures. The paper initially describes the nature of comments received and recent information from research followed by a discussion of the priorities for inclusion in Eurocode 4. The main requests are centred on the needs to make it easier to use, to shorten it and to include much new material. This paper also presents examples of where removal of uncertainty and a few deletions would make EC4 more user-friendly. As for the new material, it indicates that priority should be given to the inclusion of provisions which fills gaps in current recommendations. Some requests for extension of scope have also been listed, with reasons given why some of them should not be accepted.

The second paper by Zhu and Chan (2018) is a contribution in the field of the novel trend in composite structures, that is the association of steel or high strength steel with high strength concrete (around 100 MPa). The study experimentally and numerically evaluates the axial behaviour of concrete-filled steel tubes (CFST) with triangular, hexagonal and octagonal cross-sections and using high-strength concrete. The paper discusses the impact of cross-section shape on the load capacity and ductility of these CFST sections. The outcome of the experimental studies were also used in the assessment of existing design provisions in European, American and Chinese standards. The paper also presents finite-element models incorporating three existing concrete constitutive models and compares these results to the previously performed experiments. Finally, design approaches for CFST were also reviewed and assessed.

The third paper by Rodrigues *et al.* (2018) evaluates the structural response of composite joints situated in hogging moment regions. An experimental program was proposed and was centred on the development of an alternative for the standard push out tests. In hogging moment regions the concrete slab is not under compression forces and it can lead to an extensive concrete cracking that may affect the actual structural joint response. An alternative setup (i.e. pull out tests) was developed and described to represent the composite joints where tension forces act in the concrete slab. The paper focuses on the results of these pull out tests that presented failure modes associated with a tensile reinforcing bar rupture or anchorage capacity. The results enabled a better understanding of these failures modes and their relevance over the global beam-to-column joints structural response.

The fourth paper (Deng *et al.*, 2018) evaluates the structural response of composite joints connecting steel truss beams encased in concrete and traditional composite columns. The paper describes low-cyclic reversed loading experiments performed on eight interior joints to simulate earthquake load conditions. The results are presented regarding load-deflection hysteresis loops and skeleton curves of joint specimens aiming to evaluate their ductility, hysteresis behaviour and seismic-resistant performance. The influence of axial compression ratio and steel ratio on the seismic performance was also assessed indicating that a significant steel ratio will increase the bearing

capacity. Alternatively, the results also indicated that a relatively high axial compression ratio would improve the joints bearing capacity but also leads to adverse effects on their cyclic response.

The fifth paper (Diógenes *et al.*, 2018) presents and discuss full–scale flexural tests of composite beams using a novel shear connection interfaces based on adhesion, interlocking and friction. Two beams with conventional cast-in-place slabs were also tested for comparison purposes. The authors claim that the proposed shear connection allowed all the tested beam specimens to achieve a composite section with a high degree of interaction and high strength. Numerical simulation was also performed and calibrated against the performed experiments indicating that the specimens with cast-in-place slabs reached full interaction at the composite section until the maximum load. This response was not observed in the specimens with precast slabs where the complete interaction was not reached.

The sixth paper (Hashemi *et al.*, 2018) describes an investigation of the use of concrete sandwich panel as an infill wall on the steel frames in-plane structural response. Three large-scale, single-storey and single-bay steel frame specimens with an aspect ratio of 1·0 (two infilled frames with and without separation at the frame-to-panel interface and one bare frame) were tested under in-plane cyclic lateral loading. The results indicated that the response of the infilled frame with the full connection between the infill and frame (IFM) was not similar to the behaviour of the specimen with a discrete interface connection (FSI). The FSI specimen behaved almost like a bare frame regarding lateral stiffness and strength. Alternatively, the interaction between the concrete sandwich panel and the steel frame in specimen IFM led to a considerable increase in the initial stiffness, lateral strength, energy dissipation and the equivalent viscous damping ratio of the system compared with the bare frame, clearly showing the importance of a proper connection in the interface of the two materials.

Finally, the last paper of this particular issue (Vogiatzis and Avdelas, 2018) also focuses on the concrete infill of steel frames and presents the development of a three-dimensional, non-linear finite-element model to assess the structural behaviour of steel frames with reinforced-concrete infill walls subjected to a combination of gravity and in-plane lateral loading. Sensitivity studies, taking into account both material characteristics and geometrical non-linearities were made to study parameters like the shear retention factors, Coulomb's coefficient for steel–concrete contacts and different load–slip relationships for modelling the shear behaviour of headed studs. Experimental data present in the literature was used to calibrate the proposed numerical model. Parametric studies followed to evaluate the influence of transverse and longitudinal confinement reinforcement, reinforcing bar diameter and steel strength. The finite-element model results predicted the force–drift response of the system and revealed that the presence of shear connectors had a critical effect on the overall system response.

In this two-part themed issue 'Composite (steel and concrete) structures – new developments and trends' there are contributions from different parts of the globe. We sincerely hope you benefit from reading this themed issue and share our thoughts in congratulating the authors for their achievements and contributions to date.

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