Editorial

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This is the first part of a two-part themed issue “Composite (steel and concrete) structures – new developments and trends”. The aim of the themed issue is to capture the state-of-the-art in 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 first part features seven papers contributed by authors from different countries including Australia, Belgium, Brazil, China, Germany, Luxemburg, South Korea and United Kingdom. Authors shared their latest technical assessment on shear connections, composite beams, composite slabs, composite columns and composite walls.

The first paper by Rehman *et al.* (2018) presents an experimental investigation on an innovative composite floor system that can be demounted and deconstructed through adopting demountable shear connectors. A companion test which adopted conventional welded shear connectors was also conducted. Results indicated the two specimens shared similar structural behavior. The ultimate moment capacity of the demountable floor was well predicted by plastic theory and its deflection was well predicted by BS 5950-3-1. The investigation also successfully demonstrated the proposed composite floor system that allows demounting of a composite slab from a steel section even after loaded up to ultimate capacity.

The second paper by Nellinger *et al.* (2018) experimentally evaluates short-span composite beams with small degrees of shear connection between 13 and 39% [less than currently permitted in EN 1994-1-1 (2004)]. Ten composite beams with conventional headed studs and some modern forms of profiled steel sheeting were tested. Results indicated the moment capacity of the composite beam was well predicted by plastic theory. However, results suggested that there is a need to revise the design provisions in EN 1994-1-1 (2004) for the target parameters in their test programme.

Design proposals by Konrad (2011) and Nellinger (2015) that complement the design rules in Eurocode 4 can improve design accuracy.

The third paper by Chen and Limazie (2018) numerically examines composite slim floor beams with innovative shear connections. In this slim floor system, a cellular floor beam was used and embedded within the concrete floor. The shear connections were formed by combining tie-bar elements with infill concrete passing through the steel web openings. The web-openings were shaped in two different configurations – circular and clothoidal. Both analytical models and design guidance were proposed.

Moving from design resistance of composite beam/shear connections to performance of composite floors in service, the subsequent two papers focuses on deflection and vibration. The fourth paper (Ranzi, 2018) proposes a new design approach to predict long-term deflections of composite and post-tensioned composite slabs. The proposed model takes into account of the shrinkage gradients through the slab thickness. Proposed formulations were compared with existing experimental results and yielded satisfactory predictions. The fifth paper (Chen *et al.*, 2018) numerically examines human-induced vibration behavior of steel-concrete composite floors under human walking and rhythmic activities. Numerical results indicated the influential parameters include load model, natural frequency, effective weight and damping ratio. Comfort index through determination of peak accelerations of composite floors could be used to evaluate human perception to the vibration of steel-concrete composite floors.

Finally, the last two papers focus on the structural behavior of composite columns and walls. The sixth paper (Castanhiera *et al.*, 2018) presents an experimental investigation on concrete-filled seam-welded rectangular hollow columns in which the

design approach in Eurocode 4 was examined. A comparison of the experimental results with the predicted results based on Eurocode 4 indicated that different buckling curve can be adopted to yield efficient design for concrete-filled seam-welded rectangular hollow columns. The seventh paper (Lim and Yi, 2018) presents a numerical investigation on the behavior of steel-plate-concrete shear walls under combined loads. The effect of the shape and spacing on the proposed inclined studs was examined. Numerical results were compared with the Korean design codes and critical parameters were discussed.

In this first part of the themed issue “Composite (steel and concrete) structures – new developments and trends”, we sincerely hope you benefit from reading these papers and share our thoughts in congratulating the authors for their achievements and contributions to date.

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