Editorial

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The current issue of *Structures and Buildings* comprises five papers reporting research findings in different themes in the domain of structural engineering (the content of which can be found at www.icevirtuallibrary.com/content/issue/stbu/166/6). Themes range from an experimental study of the behavior of steel elements subjected to long-duration blast load, carried out using a state-of-the-art test facility, to an experimental study of the structural behaviour of drystone Iron Age brochs (prehistoric circular towers in northern Scotland) carried out using a simple plywood platform and three hydraulic jacks. All the five papers may be considered as good contributions in their respective areas of research.

In the first paper, Clubleby explores the effects of dynamic pressure generated by a long-duration blast load on small-diameter circular and angular structural steel members for a Mach stem region where a shock wave travels at near the speed of sound. It may be mentioned that comparatively long-duration shocks give rise to a significant *drag or translational load effect* based upon dynamic pressure, or what is commonly termed the *blast wind*, unlike a conventional relatively short-duration event. The variability in drag coefficient for members of the same shape can differ greatly, owing to stagnation of the flow and the level of flow field obstruction. This paper investigates this effect using a simplified experimental study in the world's most powerful blast tunnel, the US large-blast thermal simulator at White Sands Missile Range, New Mexico. Four assemblies were examined based upon hollow steel sections mounted at different angles and positions. The experiment indicated a drop in drag coefficient for shielded circular members in close proximity of approximately 40%. The drag force on unshielded sections was lower in magnitude owing to the possible absence of flow stagnation and reduced boundary layer effects. Comparative square and angled sections displayed approximately 50% higher values than circular members. This study would be useful for the validation of analytical models to simulate the behavior of elements subjected to blast wind.

Elastic analysis is commonly used by designers throughout the world for the seismic design of ordinary structures and inelastic response history analysis is generally carried out for the design of special structures. The second paper (Mwafy) proposes a simple and theoretically based design approach that utilises reserve strength and inelastic response in the design process keeping in mind better acceptability among the designers. It is observed that inelastic analysis procedures are a more dependable means to predict actual seismic response compared to elastic analysis

methods. This proposed approach utilises inelastic structural response in design. To describe the approach, the correlation of seismic demands obtained from inelastic and elastic analysis procedures carried out using a wide range of reinforced concrete buildings of different characteristics, ranging from 8 to 60 storeys, was investigated. Fibre element models and input ground motions of different characteristics were employed in the inelastic simulations. Mwafy concludes that this new approach would enable designers to arrive at a realistic and cost-effective design without compromising safety. However, it is well established that inelastic analysis are very sensitive to small variations in modelling parameters and this necessitates experimental validation of material model.

Extensive research findings since 1970 have established that framing systems consisting of concrete-filled steel tube columns have advantages compared to reinforced concrete or steel columns. The third paper (Guler and Lale) investigates the behaviour of circular steel fibre reinforced concrete-filled steel tube columns based on experimental and numerical studies. Seven model circular steel fibre reinforced concrete-filled steel tube columns were tested under axial load. The experimental results were compared with finite-element analysis results. The plastic-damage concrete model was employed to represent the behaviour of concrete. The results showed good agreement between the finite-element model and the test results. The largest difference in axial load capacity between the test results and the finite-element analysis was 8%. Furthermore, the experimental load carrying capacity of the test model was also compared to that predicted by different codes. It is observed that EC4 gives better results for columns with thicker steel tube walls than those with thinner walls since it takes into account the confining effect. For specimens with thinner steel tube walls the ACI or Australian design codes can be used since they provide reliable margins. However, it may be noted that these observations are based on results of an experiment carried out using small test models.

The fourth paper (Che and Ge) presents a study on structural damage detection in ancient Chinese heritage wooden buildings. The purpose of structural damage detection is to identify the location and extent of structural damage based on the variation in dynamic characteristics of the structure. The elements were evaluated thoroughly based on microtremor measurements and finite-element analysis. Multi-domain microtremor measurements were taken to detect the tilting and twisting of the structure. Comparison of the natural frequencies and natural modes obtained from microtremor measurements with those computed

from three-dimensional numerical analysis, the location and characterisation of the damage was made. It is important to note that setting rehabilitation strategies for such heritage structures are even more challenging.

A simple experimental investigation to understand the structural behaviour and collapse mechanism of dry-stone Iron Age brochs, prehistoric roundhouse buildings in northern Scotland, is presented in the last paper (Thew *et al.*). The response of brochs to structural action was simulated by building two scale models and

testing them in settlement, a possible source of failure. With the key features carefully reproduced and overall identical dimensions, the effect of variation of basal style between ground-galleried and solid-based, the two main types, was examined. The tests indicated that solid-based brochs can withstand a horizontal displacement at the wall head of twice that of ground-galleried types. Finally, it was observed that a large settlement was required to cause the failure of a scale model, suggesting that structural actions alone cannot cause collapse. This study will assist restoration and conservation of this architectural heritage.