Editorial

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This issue of *Structures and Buildings* consists of six technical papers. The papers have investigated lime-silica fume pastes modified with nano-metakaolin, use of artificial neural network to predict the compressive strength of masonry assemblies, use of multi-wall carbon nanotubes and nanosilica in hybrid-fibre-reinforced concrete, residual concrete properties at elevated temperatures, ultimate load and behaviour of beam-to-beam cold-formed steel channels connected with clip angles, and concrete sleepers performance strengthened with steel and polypropylene fibres.

The first paper, by Al-Jabri *et al.*, (2020), investigated the impact of nano-metakaolin on the compressive strength, capillary water absorption, pore structure, phase composition, and microstructure characteristics of lime-silica fume pastes. Silica fume was replaced by nano-metakaolin at five different percentages to enhance the mechanical properties of the paste. Nano-metakaolin was used as a cost-effective and locally available nanoscale additive. The phase composition and microstructural analysis of the developed mixes were evaluated based on differential scanning calorimetry, X-ray diffraction and scanning electron microscopy. The authors concluded that the replacement of silica fume by nano-metakaolin in the paste increased compressive strength and reduces water absorption due to the pozzolanic reaction of nano-metakaolin and its filler effects. The addition of nano-metakaolin reduced the size of pores in the paste and produced more compact and dense structures comparing to control paste due to additional calcium-silicate hydrate formation. It was also concluded that this product could be used where high compressive strength is not required, such as plastering and restoration of structures.

In the second paper (Carozza and Cimmino, 2020), the study aimed to develop an artificial neural network (ANN) model as an alternative approach to evaluate the compressive strength of masonry assemblies based on little input information. The object-oriented software artificial neural network design was developed in Java language to create the network and learning process. The compressive strengths of the elements and the mortar, the wythe number, the element type and the mortar

base were used as preliminary information. Afterwards, 30 experimental studies on the compressive strength masonry of assemblies were chosen to train and evaluate the approach. The study showed a lower mean sum of square errors used as the indicator of the ANN for the approach presented in this study than that of empirical formulations available in the literature. The model is claimed to be particularly useful even when little information is available as it only needs laboratory tests on brick or stone units and the mortar.

In the third paper, by Sadeghi and Esmaeili (2020), a hybrid-fibre-reinforced concrete (FRC) containing different amounts of steel fibres, nanosilica and multi-wall carbon nanotubes (MWCNTs) was developed in this study. The aim was to enhance post-fracture and crack-bridging behaviour of FRC. To this end, the flexural strength, toughness and compressive strength of FRC specimens with different amounts of macro and micro steel fibres, nanosilica, as well as MWCNTs were studied to achieve an optimum mix design. Then, concrete slab specimens with three different dimensions were prepared for the impact test using projectiles. It was found that the addition of nanosilica, MWCNTs, and the combination of fibres led to a significant increase in toughness and impact strength. Nanosilica at 8 wt% resulted in a significant increase in the compressive strength of concrete. However, it increased the brittleness of concrete, which can be overcome by fibres. Also, it was concluded that the toughness and mechanical strengths of the FRC was enhanced by adding steel fibres and nanosilica, and that the use of sufficient thickness increased the impact strength of concrete and maintained its integrity.

The fourth paper, by Rafi *et al.*, (2020), cylindrical concrete specimens were used to analyse compressive stress-strain behaviour, modulus of elasticity, Poisson ratio, and tensile strength of concrete after heat treatment. An unstressed residual property test approach was used in the study, in which concrete specimens are heat treated and are allowed to cool down before testing at ambient temperature. It was reported that the concrete's colour changed after 300°C, whereas hairline cracks propagated on the surface of specimens at 400°C. Also,

explosive spalling of concrete was reported at temperatures of 400–600°C which might be due to the pressure applied by steam and carbon dioxide in the concrete pores. A sharp reduction in concrete strength was reported after 600°C, which increased to 93% by increasing the temperature to 1000°C. The obtained results were also compared with the suggested analytical models in some of the international codes and the available experimental studies.

The subsequent paper by Natesan and Madhavan (2020) investigated the load-deflection behaviour and ultimate load-carrying capacity of bolted connections between two cold-formed steel channels with clip angles at different configurations. The main aim was to study the induced eccentricity as a result of offset loading. The parameters studied were the aspect ratios of the loaded leg, anchored leg for two- and three-bolt configurations, as well as the thickness of the clip angle. In general, four different clip angle failure modes were observed: distortional buckling, local buckling, the shear failure and tearing of the clip angle. The thicker clip angle resulted in higher stiffness and higher load-carrying capacity. The three-bolt configurations were prone to distortional buckling for connections with thin clip angles, whereas it could increase the ultimate load-carrying capacity in the case of thick clip angles. The specimens with a thinner clip angle were more prone to distortional buckling failure in comparison to the specimens with thick clip angle.

In the final paper, Pachideh and Gholhaki (2020), concrete sleeper specimens incorporating of steel and polypropylene (PP) fibres were tested to evaluate their compressive, tensile and flexural strengths. Eight mix designs with constant water to cement ratio and various contents of each type of fibre were prepared with a total fibre content of 1% by volume. Ansys software was also used in this study to investigate concrete sleepers with real dimensions. It was observed that the compressive strength of sleepers improved up to 84% when the content of steel fibres increased in the mixes with a total fibre content of 1% (steel + PP fibres). The use of steel fibres could also enhance the flexural strength of specimens. It was also

concluded that the amount of steel fibre should outweigh the PP fibre content to attain maximum strengths. More specifically, the mix with 1% steel fibres and no PP fibres showed the best performance in terms of compressive and tensile strengths, and the highest flexural strength was reported for the mix with 0.6% steel fibres and 0.4% PP fibres. Also, the amount of pre-stressed reinforcing bars could be reduced by 40% thanks to the use of fibres.

I trust that the readers of *Structures and Buildings* will find this issue interesting and useful. Comments and discussions on any of the papers are welcomed and the procedure is detailed on the last page of this editorial. On behalf of the editorial board I would like to thank all the authors for agreeing to publish their papers in this journal.

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