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Structures and Buildings

Editorial

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This issue of *Structures and Buildings* consists of six technical papers. Research investigations concerning reinforced concrete (RC) slabs, RC columns, timber joints, RC beams, structures under seismic loads and damage detection in structures are covered.

The first paper, by Sharbatdar *et al*. (2026), discusses the use of ultra-fibre-reinforced concrete (UFRC) layers to strengthen two-way concrete slabs and their stiffness under monotonic four-point bending based on 15 experimental tests separated into three groups with low, medium and high reinforcement ratios (groups W, M and S, respectively). One slab was not strengthened, while the rest were reinforced using UFRC layers containing 1% or 2% polypropylene fibres. The maximum load ratios of the strengthened specimens compared with the control specimens were 1.23 and 1.16 in group W, 1.01 and 1.11 in group M, and 1.08 and 1.25 in group S. The results showed that the cast-in-place UFRC layers significantly improved the yield load, ultimate load and stiffness, while also reducing the final deflection. They also enhanced the ductility, energy absorption capacity and cracking strength of the slabs.

In the second paper, Xiao *et al*. (2026) investigated the synergistic action of hybrid fibres (steel and polyvinyl alcohol (PVA) fibres) in concrete columns reinforced with glass-fibre-reinforced polymer (GFRP) and developed a reliable prediction model for axial compressive capacity. Axial compression tests were carried out on nine specimens: eight hybrid-fibre-reinforced GFRP concrete columns with varying fibre dosages and one conventional steel-reinforced control column. Compared with conventional steel-reinforced columns, the fibre-free GFRP-reinforced columns showed a 6.3% reduction in ultimate capacity and a distinctly brittle response. The addition of steel fibres alone increased capacity but offered only modest ductility gains, whereas PVA fibres alone had little effect on capacity while markedly improving the failure pattern, producing a more uniform crack distribution, more pronounced pre-failure warning signs and higher displacement ductility.

The following paper, by Guo *et al*. (2026), describes an experimental analysis of bolted timber joints with slotted-in steel plates (CSJs) comparing flat plates with innovative corrugated plates (FSJs), both with and without carbon-fibre-reinforced polymer (CFRP) reinforcement. The authors carried out tests on 32 specimens (16 corrugated and 16 flat) under monotonic loading parallel to the grain using an orthogonal test method. Compared with the FSJs, the CSJs showed more obvious pre-failure signs (shear damage, transverse–longitudinal (TL) cleavage, CFRP cleavage, acoustic changes) and diverse timber failure modes (grain shear/compression failure, TL cleavage), indicating better utilisation of timber properties under proper corrugation. Finally, the authors highlighted that improved joint design requires careful consideration of dimensions to mitigate timber shear brittleness, with CFRP reinforcement recommended for enhanced performance.

In the fourth paper, Abdullah (2026) investigated the adoption of discarded heavy-duty metal straps bolted onto the face of concrete beams as a strengthening approach. The method is claimed to be fast, cost effective and time saving, and thus provides a practical solution for strengthening beams regardless of their casting methods or locations within a building. A set of 12 RC beams was constructed to fail under bending moment. It was found that bolting metal straps on the beams enhanced the load-carrying capacity of the beams by up to 70%. Finally, the author pointed out that, to achieve optimal strength, it is essential to ensure that the holes are precisely at the centre of the strap and the straps are aligned with the provided steel reinforcement of the beam.

In the fifth paper, Nouri Rahimabadi and Farajpoor (2026) investigated the hypothesis of the existence of a force due to acceleration changes in structures. The existence of a jerk force was first mathematically proven in the presence of initial acceleration conditions. By defining a third-order equation that can consider the jerk force, its solution was derived. The solution of this differential equation was performed both directly with initial conditions and through generalisation of Duhamel's integral. Comparison of the solutions of second- and third-order equations with experimental results using the proportional jerk coefficient showed good

agreement. Based on the authors' statements, the effect of earthquakes as loads on structures, considering the ground jerk effect, showed that, in the third-order equation, the acceleration of tall or damaged structures with a small natural frequency and high damping was greater than in the second-order equation.

The last paper by Soo Lon Wah and Xia (2026) looks at damage detection in civil engineering structures using a vibration-based approach regarding environmental and operational conditions and outlier effects. The proposed method was based on a regression model of a database of vibration properties obtained from a structure for damage detection. The authors noted that the regression coefficients were sensitive to the presence of abnormalities in the database, which could be due to damage and outliers. To assess the performance of the proposed method, an experimental timber bridge was analysed. The results confirmed that the method can reliably detect damage under varying environmental and operational conditions, while remaining robust to outlier effects.

The Editor would like to thank all the authors, reviewers and readers. Discussions on any of these papers are welcome.

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