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Editorial

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This is the second part of the themed issue on 'Research and design for structures under extreme loading conditions' of the ICE's *Structures and Buildings* journal. The first issue was published in November 2020. This April issue continues to introduce the state of the art in extreme loading on structures through presenting the latest research outcomes of both experimental and numerical studies.

This issue contains five papers and one discussion:

In the first paper, Fattah *et al*. (2021) made a series of laboratory tests to measure the vertical and horizontal displacement responses of pile foundations when subjected to dynamic loads. Eight tests were conducted on a single pile and 66 tests on groups of piles They discovered that an increase in shaking frequency led to a reduction in the oscillation of wave propagation values recorded due to densification of the soil during shaking. The pile spacing was found to be an important parameter that affects the time–frequency characteristics of displacement at the pile top. With an increase in the pile spacing ratio, the internal forces were slightly reduced.

In the second paper, Ganji *et al*. (2021) present transient analysis of concrete gravity dams by Wavenumber-TD method for general excitation. In this study, the existing wavenumber approach is modified, so it can handle vertical as well as horizontal ground motions. the performance of the new approach is compared to the Sommerfeld truncation boundary, especially for vertical ground motions. Pine Flat dam in the USA is used as a typical example. Several models are considered with different values of normalised reservoir length. The dynamic loading considered is the local Taft earthquake record of 1952. Furthermore, two types of reservoir base condition – full reflective and absorptive – are adopted. Thus, a thorough examination and evaluation of the effectiveness of the wavenumber-TD approach for seismic analysis of concrete gravity dams is made.

In the third paper, Cao *et al*. (2021) made an experimental investigation on shear capacity of reactive powder concrete beams using high-strength steel reinforcement. For this new type of concrete beam, little research is made, neither are there design guidelines for this type of structure. 32 full-scale shear tests of RPC beams containing high strength steel reinforcement were performed. The parameters affecting the shear capacity of this type of structure were studied and the major failure modes due to shear were identified.

In the fourth paper, Sumathi *et al*. (2021) performed experimental and numerical investigations on seismic performance of concrete joints strengthened with hybrid-fibre-reinforced polymers. Nine one-third scaled exterior beam–column joints were investigated. They were first damaged in a displacement-controlled manner with constant column axial load and reverse cyclic load at the tip of the beams. The damaged joints were then repaired with new concrete and strengthened with hybrid-fibre-reinforced polymer laminates. It was observed that specimens with hybrid fibre mat laminations and glass-fibre wrapping exhibited a better performance in terms of ductility, with up to 81% increase.

In the fifth paper, Prakhya *et al*. (2021) made the assessment of existing concrete structures that support large oil platforms in the North Sea when subjected to internal explosion loads. Explosion at base, mid height and close to the deck support of the column were studied following a gas leak at different zones of pipe networks in the shafts. Fluid structure interaction (FSI) modelling was performed. The study revealed that the occurrence of a shift in magnitude and time of pressure from explosion following gas leak along the height of the column not only excited the modes of vibration involving breathing (axial), bending and squashing (radial) modes but also magnified the forces in the shaft.

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