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Editorial

Progressive Collapse of Buildings

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The progressive collapse of buildings is an important ongoing research topic in civil engineering. Devastating past incidents, some recent, have revealed the severity and complexity of this problem and the urgent need for a more resilient structural design. The purpose of this Special Issue was to highlight recent developments in the field that could make more robust structures feasible.

Progressive collapse is highly associated with accidental loads. Half of the published material in this Special Issue is devoted to the assessment of blast-load effects on structures. In addition to structural elements, non-structural ones can also significantly affect the overall response of the structure. In their research, Ioannou et al. [1] show that cladding membrane action can adversely affect its supporting structure, as it does not allow for extensive plastic dissipation and leads to higher support reactions. Thus, cladding characteristics are a paramount design parameter for blast mitigation. Along the same lines, the experimental work by Hadjioannou et al. [2] demonstrates the great impact that façade properties can have on the lateral resisting system. Their consideration in the design of the structure is very important if undesirable and unexpected structural failures are to be avoided.

The Tying Force and Alternate Load Path methods are two of the most commonly used methods for the assessment of structures' robustness to progressive collapse. These methods are hazard-independent, which means that they do not differentiate between the various causes that can lead to progressive collapse. One assessment methodology that is hazard-specific (blast loads) and relates the blast-hazard event with RC frame buildings' residual strength against collapse for a prespecified explosion location, through blast-scenario-dependent robustness curves, is provided by Francioli et al. [3].

Although seismic loads are treated separately by design codes such as Eurocodes, they can trigger progressive collapse in the event of critical (non-dissipative) member loss. To avoid this, capacity design rules are traditionally used; however, alternate methods such as the base isolation technique could be promising for a resilient design [4]. The development of simplified analysis and design methods can significantly help with the design of such structures and widen the scope of their use [5].

Glass—in contrast to other structural materials such as steel and concrete, which were considered in the aforementioned studies—possesses unique characteristics and behavior. Vibration frequency analysis for the identification of the damage levels of pedestrian bridge systems with laminated glass modular units, studied by Bedon et al [6], is a very useful research and design method for damage detection, post-breakage performance assessment, and health monitoring purposes.

The research material published in this Special Issue is remarkable. The editors would like to thank all the authors for their contributions, and Vibration Journal for making the publication of this Special Issue possible in the first place. Hopefully, it will inspire researchers and designers and aid their progress in the field of the progressive collapse of structures.

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