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Editorial
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Editorial

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I write this editorial from San Francisco. In recent months, a magnitude 6·1 earthquake hit Napa County, around 70 km from here. The earthquake woke my family and I, but we suffered no loss. Within the immediate zone of the earthquake, one person died and many more were injured, hundreds and millions of dollars of damage was caused. Most of the damage was in unreinforced masonry buildings. While these are no longer built in California and other areas of high seismicity, they continue to be built in areas of low to moderate seismicity. Due to this poor performance, compared with other forms of construction, there has been relatively little study into the behaviour and performance of masonry structures. Our first paper (Dutta *et al.*, 2014), while certainly not the only study of masonry buildings, provides more data in this area. First, the researchers have compared analytical techniques for calculating natural periods with the methods described in various international seismic design codes. This shows reasonable agreement when soil structure interaction is considered in the analytical method. Second, an assessment of vulnerability of masonry buildings is made, using differing layouts and sizes. Their results indicate that there is limited capacity of these buildings in smaller earthquakes, although single-storey buildings have more resistance. I would view these results with some caution – the computer analysis looks at the global response of a building. It only takes a small section of a wall to fail to cause a major hazard. However, the authors do make a good point at the beginning. There are many reasons why masonry buildings are the right choice in certain environments.

Figure 1. This brick-and-timber building sustained significant damage despite the out-of-plane anchors seen along the top of the wall. Copyright Arup (2014)

We follow with a series of papers on the modelling and construction of concrete. First, Oehlers *et al.* (2014a) discuss a mechanics-based method of simulating the partial interaction of materials within reinforced concrete sections. The researchers identify a concept of 'pseudo' properties of a material. The pseudo property not only considers the performance of a material itself, but also the interaction with other materials. Part 1, in this issue, describes how these properties can be measured and predicted. Part 2, which will feature in Issue 12 and is currently available online, shows how they can be applied (Oehlers *et al.*, 2014b).

Next, Orr *et al.* (2014) discuss the use of flexible fabric formwork in the construction of concrete beams. The paper describes not only the process, but also the design considerations that must be made as part of this type of construction. Flexible formwork not only allows for interesting architectural forms, it also has the potential to have optimally shaped beams to maximise strength and minimise materials. An interesting idea and a paper that is very worthy of publication.

Flat concrete slabs are often favoured by architects and contractors over beam and slab systems as they allow mechanical services to be run directly underneath the slab without considering the additional depth of supporting beams. This not only allows a simpler construction technique, but also reduces the floor-to-floor height, by eliminating dead space within the ceiling void. A potential problem with a concrete flat slab is the possibility of punching shear at the interface of the slab and the column. A number of different solutions for this have been developed over many years, including the use of column capitols, and addition of more shear reinforcement. These systems can be time consuming to build, and hence there has been an interest in various pre-fabricated systems which simplify construction. Yan and Wang (2014) discuss the use of a shear-head system used at the top of columns to allow a thinner concrete flat slab system. This is applied to steel tubes, so that the speed of construction of steel columns is combined with the flexibility and suitability of flat concrete slab as a flooring system.

Finally, Costa-Neves *et al.* (2014) present a paper showing the optimum design of various components of a building with a steel–concrete composite system. A number of different composite flooring systems are available that allow a building to be constructed with the right balance of speed, cost and structural depth. The focus of the paper is to present a number of viable designs for different combinations of bay size and steel strength. The authors have calculated optimum steel member sizes and reported the variation of steel weight with bay size. Another potential problem with composite flooring systems is their potential to vibrate under live loading, such as occupants walking, running or even dancing. While this paper does not discuss in detail methodologies for predicting peak accelerations, the authors indicate that this has been considered in the designs presented. This provides some useful benchmarks for both academics and practicing engineers alike.

As always, comments on any of these papers are welcome through the submission of discussion texts. Details of how to submit are at the end of each paper.

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