

## Editorial

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When we look at the present state of structures and buildings we should not forget the past; magnificent structures were erected with a rudimentary knowledge of engineering sciences. Only locally available materials, such as stone, soil fibres, bamboo, trees, quicklime among others, were used in civil construction, with an immense effort and sacrifice of human lives, to build monuments in honour of a king or a god.

The Choga Mish in western Iran incorporated private houses, public buildings and palaces made of soil composites built more than 5500 years ago (Rezaeian, 2007). The Persians and later Greeks and Romans were the first to build considering natural light and space inside buildings with reduced numbers of roof-bearing columns. They introduced arched cupolas and man-made stone (the first concrete), and built roads, criss-crossing Asia and central Europe.

In the ninth century modern palaces were built in Mesopotamia and in the Middle Ages huge cathedrals were built under the direction of a single individual, who was engineer, architect and builder all in one, in a trial-and-error method. The structure was successful when it performed well for the desired purpose, withstood natural and man-made hazards. And many are still standing today, some over a thousand years later.

The last 150 years have seen amazing developments, mainly concerning the application of industrialised materials, such as steel and reinforced concrete, at the expense of the use of locally available materials and technologies used in the past. Since industrialisation new technologies and materials have been introduced in a never-ending succession and velocity.

To deal with all innovations, norms and regulations were introduced to make steel and reinforced concrete structures and buildings durable and safe. To overcome barriers of weight and height, new materials and structural elements have been introduced. There is an on-going competition: to build the highest in the most desolate environments overcoming extreme temperatures, high winds, earthquakes, tsunamis and seasonal flooding. Structures no longer serve their purpose after a relatively short time. New concepts arise that cannot be implemented using existing structures, so they need to be replaced.

Above all we are concerned with safety – and more than ever. If something goes wrong it will affect more and more people. If a skyscraper catches fire or collapses, the number of victims will

be in the thousands. We must also now consider the materials, which should be non-polluting during their production, use and disposal. This has increased the focus on using local materials and natural materials, such as bamboo, palm trees, soil–fibre composites and so on as appropriate and sound standards do not yet exist. These are sometimes referred to as non-conventional materials and technologies (Nocmat), which will allow the creation of structures and building with minimum lifetime energy.

This issue contains four contributions which will help us to continue moving forward in the design of safer and more sustainable structures and buildings (the content of which can be found at [www.icevirtuallibrary.com/content/issue/stbu/166/7](http://www.icevirtuallibrary.com/content/issue/stbu/166/7)). Wang presents a finite-element and experimental investigation into the behaviour of components of composite connections subjected to fire. The developed models offer tools for the analysis and design of composite end plate connections. They can be extended to study the structural behaviour of semi-continuous beams and floors under various fire scenarios.

Li and Wang propose a simulation approach for generating sample functions of multivariate stationary non-Gaussian processes with regards to wind pressure acting on high-rise buildings and roof structures. The proposed cubic polynomial represents the translation of a Gaussian process to a non-Gaussian wind pressure process. A derived set of non-linear equations determines the parameters of the polynomial. The numerical results prove accurate and efficient in the simulation of a non-Gaussian wind pressure field acting on a large-span stadium roof.

Andrade treats the effect of epoxy resin type on the durability of reinforced concrete beams strengthened with carbon-fibre-reinforced polymer. The specimens were evaluated with regards to flexural capacity and load–deflection relationships of the beam after being exposed to different environmental conditions for a period of time. Based on the beam rupture test results the influence of the exposure conditions and the epoxy resin type in the beam rupture tests were then assessed.

Guo *et al.* present experimental studies on composite steel plate shear walls and steel plate shear walls connected with frame beams. The test results illustrated a good ductility and excellent energy dissipation capacity of composite steel plate walls. They show an increased load capacity and energy dissipation capacity when compared with steel plate shear walls. The experimental results were compared with the results of a finite-element model.

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Based on those results a simplified model of steel plate shear walls was proposed which may be used analysing shear wall systems in high-rise buildings.

**REFERENCE**

Rezaeian F (2007) *Iran: Seven Faces of Civilization*. Sunrise Visual Innovations, Toronto, Canada.