

Introduction

Welcome to this special issue of *Civil Engineering* on tall buildings.

Despite the recent global construction downturn, tall buildings are still erected in city centres because they provide economical, prestigious, comfortable, safe and sustainable solutions to urbanisation and urban regeneration. Increasingly clients' demands for taller buildings with enhanced performance requirements can only be met by engineering innovations in materials, design, construction and operation. It is not surprising therefore that the subject of tall buildings attracts the interest of civil and structural engineers, both in academia and industry.

Tall buildings are defined by the Council on Tall Buildings and Urban Habitat (CTBUH) as buildings that exhibit some element of 'tallness' in one or more of three categories, namely height relative to context, proportion and tall buildings technologies. For example, in terms of context, a building of 14 storeys or 50 m height would not be considered a tall building in Hong Kong but would be in Paris.

The papers in this special issue have been selected to cover a wide range of topics, with the first four papers being generally applicable to all tall buildings and the following four being case studies of tall buildings around the world.

The first paper examines the relationship between tall buildings and urbanism. Stefan Krummeck (2010) concludes that today's tall buildings are not only signifiers or beacons but also three-dimensional urban hubs incorporating contemporary aesthetics with modern, sustainable, technologically advanced building forms.

Edmund Choi (2010) then explains how tall buildings, as they become taller and more closely spaced can modify wind flow and sometimes lead to poor ground-level air conditions. To improve pedestrian-level air ventilation, measures such as permeable podiums and careful planning of the geometry and layout of tall buildings are proposed.

Fire fighting in a towering inferno is the theme of the third paper based on the experiences of the Hong Kong Fire Services Department. Shane Siu-hang Lo (2010) presents the way in which fire risk in tall buildings can be mitigated by safer building design, fire protection provisions, unrelenting enforcement efforts to improve fire safety of existing buildings, effective fire installations and quick response to fire calls.

Conventional methods for assessing the stability of structures tend to focus primarily on foundation resistance under vertical loading but, for tall buildings, the resistance to combined vertical, lateral and moment loadings must be considered. To achieve the latter, Harry Poulos (2010) proposes a limit-state design approach for computer-based design of piled and piled-raft foundation systems of tall buildings involving three sets of analyses.

The fifth paper presents the structural design of a 360 m high office tower in Dubai. Ranjith Chandunni and Farshad Berahman (2010) describe a number of significant challenges encountered including choice of structural system, finite-element modelling, wind-tunnel testing, seismic design, foundation system, vertical asymmetry and long-term axial deformation and differential shortening.

The fast-track techniques used for the construction of the 258 m tall Grand Lisboa hotel in Macau is the subject of the sixth paper. David Lee *et al.* (2010) describe the innovative contractual and technical solutions adopted such as choosing a management contract, site constraints and planning, top-down construction and choice of materials and structural systems for the foundations, podium and tower.

Heron Tower is a new 232 m tall landmark building in the City of London. Mark Richards and Nick Gillespie (2010) present the conceptual design of the building from the controversial planning application for the development of a historic site to significant design and construction challenges. These included below- and above-ground site constraints and obstructions, convergence of architectural and structural logic about the final form of the building and optimum construction phasing.

The final paper is about Strata SE1, a 148 m tall sustainable regeneration tower in London. Daniel Cowan (2010) gives an account of the design and construction, focusing on its sustainability credentials such as the three 9 m diameter wind turbines at the top of the building which provide 8% of its energy demands. Other special features include the use of post-tensioned flat slabs, a system of 'walking columns' and welded headed reinforcing bars for ties.

We are grateful to all the authors and referees who have made this publication possible and hope that it becomes a useful reference for the civil engineering profession.



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References

- Chandunni R and Berahman F (2010) The structural design of Almas Tower, Dubai, UAE. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **163(6)**: 33–39.
- Choi E (2010) Air ventilation in cities with dense high-rise developments. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **163(6)**: 12–19.
- Cowan D (2010) Strata SE1, London – propelling sustainable regeneration. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **163(6)**: 56–63.
- Krummeck S (2010) A new urbanity: the relationship between towers and urbanism. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **163(6)**: 4–11.
- Lee D, Lee H and Chan C (2010) Grand Lisboa hotel and casino, Macau: a fast-track high-rise. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **163(6)**: 40–47.
- Lo SS (2010) Fire fighting in high-rise buildings: the role for engineers. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **163(6)**: 20–26.
- Poulos H (2010) The design of foundations for high-rise buildings. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **163(6)**: 27–32.
- Richards M and Gillespie N (2010) Heron Tower, London – the strategy for construction. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **163(6)**: 48–55.