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Editorial

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Editorial: Themed issue on underground and foundation engineering

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Rapid and large-scale infrastructure construction and urban development result in increasing demand of complex buildings, transportation and other civil engineering systems. Engineers are continuously challenged by the height of the buildings and the depth of foundations, as well as the geometry and scale of underground constructions. Lessons learned from failures and database of major projects will leave a valuable legacy of new knowledge, innovation and practical experience, with a variety of new projects poised to benefit from this legacy. The legacy is beneficial to engineers across the world as well to prevent design and construction flaws, and to improve the risk management of future underground and foundation engineering. The present themed issue of *Forensic Engineering* aims to provide a venue for engineers and researchers to present their investigations or research progress on the subject of underground and foundation engineering in terms of well-documented case history, application and development of investigation technique, statistical analysis and simulation.

A total of 6 papers were recruited for the themed issue on Underground and Foundation Engineering. Following the standard of *Forensic Engineering* review process, four papers have been selected for publication in this themed issue, while one other will appear in future general *Forensic Engineering* issue due to space limitations, one last paper is still under peer review process. The four papers in this issue cover a wide range of problems and approaches, from forensic investigation of a building collapse to analysis of typhoon effect on foundation design, from statistical study on characteristics of more than 160 bridges to application of investigation technique- piezocone penetration test (CPTU).

The first paper in this issue, by Wang *et al.* (2020), presents a comprehensive field investigation on collapse of a 13-storey building founded on pretensioned spun high-strength concrete (PHC) piles. To identify the principal cause of the collapse, they carried out an extensive field investigation immediately after the accident to collect physical evidences of damages to PHC pipe piles and induced pile movements. Three possible causes, namely, geotechnical pile failure, effect of excavation and influence of surcharge loading, were explored

by using a full-scale static pile loading test, centrifuge test and 3D finite-element analysis. Combining all the investigation results, they propose a likely collapse process and recommendations to avoid such a similar collapse.

Two papers in this themed issue are concerned with the topic of bridges. Gong *et al.* (2020), summarize characteristics of more than 160 bridges that have been constructed on the Yangtze River in China. They carried out statistical analysis in detail on the aspects of bridge type, span and foundation type. Among these bridges, cable-stayed bridges and suspension bridges accounts for 81%. They find that pier foundation of Yangtze River bridges currently is generally categorized into six types: pile foundation, caisson foundation, colonnade foundation, caisson-colonnade composite foundation, caisson-pile composite foundation and spread foundation, among which the pile foundation is the most widely used. The post-grouting technique can improve the bearing capacity of pile foundation in a convenient and economical way. Continuing on the topic of bridges but moving to application of investigation technique, the paper by Liu *et al.* (2020) tackles the challenge of reliable attainment of soil parameter in engineering design. They introduce a case study on the comprehensive application of CPTU in the Chongming-Qidong Bridge site, China – for soil classification, soil property evaluation and pile capacity assessment. The technique is beneficial to facilitate the transition of geotechnical design from a deterministic approach to a more objective probabilistic way, as it can conveniently describe site conditions from various aspects at a relatively low cost. It is reminded by the authors as well that caution shall be exercised during its application, as local calibration of empirical correlations is necessary to ensure the reliability.

The last paper of this issue addresses typhoon effects on foundation design of offshore wind turbines. Chi *et al.* (2020) investigate foundation design of wind turbine generators under varied conditions, namely, tow return periods (50 and 100 years), three water depths (from 27.5 m to 45 m) and three foundation types (i.e. monopole, three-leg jacket and four-leg jacket). They compare the results on the weight of structure, overturning moment and pile length, which can be used

as a preliminary reference for the development of offshore wind farms in Taiwan and could provide developers with a better understanding of typhoon impacts and countermeasures.

We would like to thank all of the authors and reviewers for their contributions and prompt responses throughout the tight submission and review process, which made it possible to complete this themed issue by the end of this year. Moreover, we are highly grateful to Dr Wei F. Lee for his valuable advice and Dr. Qing Li's kind assistance in handling the administration works during the process. While limited in coverage, we hope this themed issue stimulates more innovative ideas that promote further advancement in the area of underground and foundation engineering. Finally, more engineers and research groups working on this area are encouraged to present their high-quality work in *Forensic Engineering* in the future.

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