Editorial

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The original focus of this issue was the optimal and future use of numerical methods within the framework of Eurocodes, as these, together with the national annexes and published documents, were being reviewed and updated with revised editions planned from 2020 onwards. We were fortunate in that professionals ranging from forward-looking researchers to practical designers responded with their experiences. This issue presents three papers on this topic together with one further paper and a discussion, both of broader relevance to design.

When Eurocodes were introduced in 2010, it was believed that their use could be facilitated by using numerical methods. However, the codes need to span both conventional non-computer-based and numerical methods, which can lead to challenges where a conventional approach might make implicit assumptions that are not easily translated into a numerical analysis or does not fully exploit the capabilities of a numerical approach. Furthermore, there is also significant scope to utilise numerical analysis to inform and update established design rules.

In the first paper, Walker *et al.* (2017) describe a practical design approach that is able to leverage the full benefits of an explicit non-linear numerical model of reinforced concrete, going beyond a conventional linear-hybrid analysis approach, while remaining in accordance with the requirements of Eurocode 2 (BS EN 1992 (BSI, 2004)). This allows robust computation of serviceability limit state and ultimate limit state demand, including explicit modelling of material and geometric non-linearities and construction imperfections. The approach is illustrated through the engineering design of a concrete gravity substructure for the White Rose Extension Project off the coast of Newfoundland, Canada.

The second paper, by Lees (2017), addresses the pros and cons of different factoring approaches to verifying ultimate limit

states (ULS) of geotechnical structures when using numerical methods. While the resistance factoring approach may be used to verify adequate safety against a particular failure form occurring in relatively simple cases, the material factoring approach (MFA) is considered more suited to numerical methods and complex scenarios. The action effect factoring approach (EFA) is similarly suited to numerical methods but there are some situations where lower than expected ground strength has a significant effect on structural forces and EFA would not provide adequate reliability. The author therefore recommends a dual factoring approach (MFA and EFA) where the most onerous structural forces obtained from each are used in the verification of structural ULS.

In the third paper, Šmak *et al.* (2017) utilised a combination of numerical analysis and experimental work to evaluate the design rules for pinned joints given in BS EN 1993-1-8 (BSI, 2005), which are based on design rules/recommendations set out in the latter half of the nineteenth century. While the design rules were shown to provide conservative results in all analysed cases for static loads, other loading scenarios or geometrical issues may require more detailed consideration through numerical modelling and/or experimental work.

The final two contributions in this issue address issues in plate analysis and offshore monopile foundations, respectively. Lim (2017) established shear correction factors for simply supported thick plates of regular polygonal shapes that are uniformly loaded by considering theory and shear deformation models. The results show that the correction factors are functions of the dimensionless plate thickness, Poisson's ratio of the plate material and the number of plate sides. Cui *et al.* (2017) discuss observations from their extensive research on lateral cyclic loading of short rigid monopiles for offshore wind turbines, demonstrating the effects of loading pattern on accumulated rotations of a monopile foundation.

REFERENCES

- BSI (2004) BS EN 1992-1-1:2004, B: Eurocode 2: Design of concrete structures. Part 1-1: general rules and rules for buildings. BSI, London, UK.
- BSI (2005) BS EN 1993-1-8:2005: Eurocode 3: Design of steel structures. Part 1-8: design of joints. BSI, London, UK.
- Cui L, Bhattacharya S and O'Kelly BC (2017) Discussion: Soil–monopile interactions for offshore wind turbines. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **170(4)**: 174–176, <https://doi.org/10.1680/jencm.17.00001>.
- Lees AS (2017) Use of geotechnical numerical methods with Eurocode 7. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **170(4)**: 146–153, <https://doi.org/10.1680/jencm.17.00004>.
- Lim TC (2017) Refined shear correction of polygonal plates with static loads. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **170(4)**: 167–173, <https://doi.org/10.1680/jencm.17.00005>.
- Šmak M, Kala J and Hokeš F (2017) Pinned joints – their design and real behaviour. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **170(4)**: 154–166, <https://doi.org/10.1680/jencm.17.00003>.
- Walker G, Abhyankar S and Gratton D (2017) Non-linear analysis of concrete structures: a practical design approach to Eurocode. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **170(4)**: 135–145, <https://doi.org/10.1680/jencm.17.00002>.