Editorial

Georgios E. Stavroulakis Dr.-Ing, Habil, Prof. h.c.
Member of the Editorial Advisory Panel; Professor, School of Production
Engineering and Management, Technical University of Crete, Greece

This issue of *Structures and Buildings* contains an investigation relevant to the usage of recycled aggregates in concrete structures and their influence on shrinkage, a finite-element (FE) analysis for the calculation of confinement stresses in reinforced-concrete (RC) columns of arbitrary cross-section, a method for accurate calculation of effective flexural rigidity in slender RC elements, and a study on the design of timber-framed walls using current Eurocodes. All results are relevant to civil engineers working with classical RC buildings or industrial, timber structures. The presented papers continue the tradition of this journal to provide results useful for the professional development of its readers.

This issue contains papers that have passed the usual rigorous peer review procedure adopted by the journal and contribute to the following areas of knowledge.

This first paper presents an investigation of the shrinkage of concrete made with recycled aggregates and is based on a thorough database of published data from English literature since 1978 (Lye *et al.*, 2016). In comparison to natural aggregates, concrete shrinkage was found to increase at a decreasing rate with coarse recycled concrete aggregate content, giving an average increase of 33% at 100% natural aggregate replacement. This difference between the performance of the two concretes decreases with increasing ambient humidity and concrete strength. Increase in concrete shrinkage with fine and all-in recycled concrete aggregate and other recycled aggregates was found to be too high and variable to make them suitable for use in structural concrete. The assessment of Eurocode 2, ACI 209-2R and Bažant-Baweja B3 models showed that the shrinkage of concrete containing coarse recycled concrete aggregate is generally underestimated. Methods are proposed for determining the shrinkage of concrete made with coarse recycled concrete aggregate together with using Eurocode 2, as well as for minimising its effect on the shrinkage of concrete for a given strength and workability by reducing its cement paste content. This investigation may help the recycling of aggregates and contribute to the enhancement of life-cycle considerations in the building industry.

The second paper presents a new FE method for the calculation of confining stresses in a concrete column confined with fibre-reinforced polymer (FRP) (Ouyang *et al.*, 2016). This approach is particularly useful for columns under eccentric loading or non-circular shapes, where the confining stresses become non-uniform and anisotropic and makes

possible the prediction of the structural behaviour of confined concrete. By applying this approach on circular concrete columns confined by FRP under eccentric loading, it was found that the confining stresses are generally smaller at larger eccentricity, which compares well with published experimental data. In theory, the FE method can be applied to concrete columns of any shape and even those provided with lateral reinforcement.

The third paper of this issue addresses the calculation of effective flexural rigidity in RC elements in order to take into account excessive cracking or deflection, particularly for slender sections such as slabs (Visintin *et al.*, 2016). In particular, a new partial-interaction approach for quantifying the flexural rigidity of a cracked section based on a recently developed segmental analysis procedure is presented. It is shown that the partial-interaction cracked flexural rigidity is independent of the applied moment after the onset of cracking. Hence, for a given cross-section, the effective flexural rigidity only varies with the proportion of the member that is cracked. The results contribute to a more accurate calculation of effective flexural rigidity, which is typically based on empirical calibrations.

The last paper deals with the design procedure for calculating the racking strength of timber-framed walls and describes an extensive experimental programme investigating the compatibility and suitability of the test method in BS EN 594:2011 with the racking design method in BS 5268-6-1:1996 (Coste *et al.*, 2016). The need of this investigation is explained if one considers that the Eurocode 5 rules currently used in the UK—given in PD 6693-1—do not include a procedure for calculating racking strength using the results from wall panel racking tests to BS EN 594. Under the Building Regulations (England and Wales), BS 5268-6-1:1996, which was superseded by Eurocode 5, can still be used and this standard includes a calculation method using test results from BS EN 594:1996. As BS EN 594:2011 uses a revised test procedure, it has been found that the results are no longer compatible with the BS 5268-6-1 design procedure. The test results have been analysed and compared and appropriate recommendations are made. The results facilitate the usage of limit states Eurocodes for structural timber design, which in the UK has been following an empirical method largely based on test results to derive the wall panel racking resistance.

I hope that you will find these articles informative and useful to your work and I invite you to contribute to the discussion

by sending your comments to the journal. Furthermore, beyond the classical printed and electronic version, *Structures and Buildings* publishes the most recent articles online Ahead of Print on the Virtual Library homepage of the journal: <http://www.icevirtuallibrary.com/toc/jstbu/current>.

REFERENCES

- Coste G, Kermani A, Porteous J, Murray D and Dhonju R (2016) Influence of test procedure on timber wall racking performance. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **169(12)**: 925–934, <http://dx.doi.org/10.1680/jstbu.15.00142>.
- Lye C-Q, Dhir RK and Ghataora GS (2016) Shrinkage of recycled aggregate concrete. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **169(12)**: 867–891, <http://dx.doi.org/10.1680/jstbu.15.00138>.
- Ouyang Y, Lo SH, Kwan AKH and Ho JCM (2016) A new analysis method for polymer-confined concrete columns. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **169(12)**: 892–911, <http://dx.doi.org/10.1680/jstbu.15.00140>.
- Visintin P, Oehlers DJ and Sturm AB (2016) Mechanics solutions for deflection and cracking in concrete. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **169(12)**: 912–924, <http://dx.doi.org/10.1680/jstbu.16.00009>.