Editorial

Charalampos Baniotopoulos

Chair of Sustainable Energy Systems, School of Engineering,
University of Birmingham, Birmingham, UK

The present issue, being the second themed issue on structural glass, aims to complete the broad picture of the current research and development in relevant topics as presented by Overend (2015). To this end, this issue contains seven articles written by authors who present results on structural glass behavior, glass panel quality control and the design of glass curtain-walls and glass-covered frames from their research activity in Germany, Belgium, UK, Greece and USA. Numerical and analytical modeling is considered in all of these studies and the respective results are compared in most cases with experimental test data. It is noteworthy that these two themed issues of *Structures and Buildings* are of significant importance due to the fact that the Eurocode on the design of glass structures is planned to be officially published in the near future.

The first article by Maniatis *et al.* (2016) presents two testing methods for the determination of the bending strength of less than 3 mm thick glass (usually called thin glass) when the geometrical non-linearity is taken into consideration. The experimental and numerical investigations performed led to the conclusion that both the proposed methods are appropriate for the determination of the bending strength of thin glass members, with the modified four-point bending test being preferable because the test setup and the execution are simpler. The studies showed that small variations of the glass thickness, Young's modulus and Poisson's ratio do have an influence on the tensile bending stress in thin glass specimens.

The next paper by Langosch and Feldmann (2016) discusses the design of pane-like laminated glass columns and, in particular, with laminated sections of heat-strengthened and toughened glass. Within a limit state design framework, using a second order theory and considering the elastic shear bond between the glass layers, load-deflection curves of laminated glass sections under axial compression have been developed. Then, introducing an appropriate limit state function, an equation to mathematically describe the European buckling curves is proposed, where the validity of the aforementioned analytical equations is shown by experimental investigation.

The third paper by Schneider and Schula (2016) shows that the dynamics of a soft body impact on glass plates of different types can be simulated by applying transient, implicit and explicit finite-element methods; the latter results are in very good agreement with the respective experimentally measured data. In addition, a quick engineering approach is proposed to

be applied for the verification of the numerical simulations using equivalent static loads derived from a two-degrees-of-freedom model.

The fourth paper by Belis *et al.* (2016) presents an extensive study of a friction-grip connection that is used in laminated glass. In particular, the results of various experimental tests recently performed on laminated glass plates bolted to steel skew plates with preloaded bolts to study the time-dependent behavior and the slip resistance of an existing connection are among the details presented. The study demonstrates both the importance of the meticulous design of the gasket and the negative effect of interlayer creep on the structural performance of the analysed friction-grip connection.

The following article by Kasper *et al.* (2016) presents a non-destructive screening method based on the known basics of photoelasticity to check the quality of tempered glass panels. This method, using polarising filters and appropriate evaluation criteria by means of a screening of the entire surface of the panels, gives full information about the homogeneity of the prestressing. Besides simplicity, the presented quality control method has the advantage that any possible glass geometry can be easily checked in a non-destructive way.

The sixth paper by Baniotopoulos *et al.* (2016) proposes a systematic methodology to optimally design glass curtain-wall systems. Applying advanced finite-element analysis and taking into account structural design criteria, an optimal design method is proposed to achieve cost minimisation once structural integrity and serviceability requirements are fulfilled. This way, the method leads to significant conclusions that can be used by the designers for the selection of mullions, transoms, anchors and panels in curtain-wall systems.

The last paper by Lauriks *et al.* (2016) aims to give an answer to the question of how to preserve built heritage while fulfilling modern standards on safety and structural integrity during glass structures rehabilitation by presenting the Saint-Hubertus Galleries project. The study takes into account the contribution of the glass plates while assessing historical glass coverings to the overall structural behavior of the previously mentioned iron and glass roof by means of a parametric finite-element analysis. The structural response of the original historic structure, the influence of the application of modern adhesives and sealants and the replacement of single glass panes by laminated glass plates are among the details investigated.

I hope you will find these articles stimulating and informative. It should be reminded that related comments and discussion are as usually welcome, and that *Structures and Buildings* publishes its most recent articles online Ahead of Print on the Virtual Library homepage of the journal: <http://www.icevirtuallibrary.com/toc/jstbu/current>.

REFERENCES

- Baniotopoulos CC, Nikolaidis NN and Moutsanidis G (2016) Optimal structural design of glass curtain-wall systems. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **169(6)**: 450–457, <http://dx.doi.org/10.1680/jstbu.13.00088>.
- Belis J and D'haese D and Sonck D (2016) Investigation of a friction-grip connection in laminated glass. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **169(6)**: 432–441, <http://dx.doi.org/10.1680/jstbu.13.00011>.
- Kasper R, Di Biase Pietro and Feldmann M (2016) Quality control of tempered glass panels with photoelasticity. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **169(6)**: 442–449, <http://dx.doi.org/10.1680/stbu.14.00001>.
- Langosch K and Feldmann M (2016) Design of pane-like laminated glass columns. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **169(6)**: 403–415, <http://dx.doi.org/10.1680/jstbu.13.00117>.
- Lauriks L, Belis J, Sonck D and Wouters I (2016) Structural contribution of glass in Saint-Hubertus Galleries. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **169(6)**: 458–468, <http://dx.doi.org/10.1680/jstbu.14.00025>.
- Maniatis I, Nehring G and Siebert G (2016) Studies on determining the bending strength of thin glass. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **169(6)**: 393–402, <http://dx.doi.org/10.1680/jstbu.14.00003>.
- Overend M (2015) Editorial. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **168(7)**: 455–456, <http://dx.doi.org/10.1680/stbu.2015.168.7.455>.
- Schneider J and Schula S (2016) Simulating soft body impact on glass structures. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **169(6)**: 416–431, <http://dx.doi.org/10.1680/jstbu.13.00112>.