Spotlight on Structures

Research Journal of The Institution of Structural Engineers

In this section we shine a spotlight on papers recently published in *Structures* – the Research Journal of The Institution of Structural Engineers.

Structures is a collaboration between the Institution and Elsevier, publishing internationally-leading research across the full breadth of structural engineering which will benefit from wide readership by academics and practitioners.

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Special issue: Advanced manufacturing and materials

The latest issue of *Structures* (Volume 18, April 2019) is a special issue on 'Advanced Manufacturing and Materials for Innovative Structural Design'. The issue is based on papers presented at a symposium of the 29th annual International Association for Shell and Spatial Structures (IASS) symposium in Boston, USA (16–20 July 2018).

Guest Editors Dr John Orr, Professor Arno Pronk and Professor Tim Ibell have selected an article on seismically stabilised tile vaults for the Rwanda Cricket Stadium as their featured article from the issue. Featured articles are made available free of charge to all for a period of six months following publication.

The full issue contains the following articles:

Article title	Authors	Available at:
Precast Slab Structures Made of Carbon Reinforced Concrete	Sebastian May, Oliver Steinbock, Harald Michler and Manfred Curbach	https://doi.org/10.1016/j.istruc.2018.11.005
Case Studies in Topological Design and Optimization of Additively Manufactured Cable-nets	Daniel Tish, Wes McGee, Tim Schork, Geoffrey Thün and Kathy Velikov	https://doi.org/10.1016/j.istruc.2018.11.002
Design, Construction and Testing of a Low Carbon Thin-Shell Concrete Flooring System	Will Hawkins, John Orr, Paul Shepherd and Tim Ibell	https://doi.org/10.1016/j.istruc.2018.10.006
A Cable-Net and Fabric Formwork System for the Construction of Concrete Shells: Design, Fabrication and Construction of a Full Scale Prototype	Tomás Méndez Echenagucia, Dave Pigram, Andrew Liew, Tom Van Mele and Philippe Block	https://doi.org/10.1016/j.istruc.2018.10.004
Sharanam: Case Study of a 15 Meter Span Earthen Conical Vault	Lara K. Davis, Mahesh Varma and Satprem Maïni	https://doi.org/10.1016/j.istruc.2018.11.014
Ice Formwork for High-Performance Concrete: A Model of Lean Production for Prefabricated Concrete Industry	V. Sitnikov	https://doi.org/10.1016/j.istruc.2018.11.004
Structural design of a lattice composite cantilever	James Solly, Nikolas Früh, Saman Saffarian, Lotte Aldinger, Georgia Margariti and Jan Knippers	https://doi.org/10.1016/j.istruc.2018.11.019
Structural Optimization of Cross-laminated Timber Panels in One-way Bending	Paul Mayencourt and Caitlin Mueller	https://doi.org/10.1016/j.istruc.2018.12.009
Rosenstein Pavilion: Design and structural analysis of a functionally graded concrete shell	Daria Kovaleva, Oliver Gericke, Jonas Kappes, Ivan Tomovic and Werner Sobek	https://doi.org/10.1016/j.istruc.2018.11.007
Rwanda Cricket Stadium: Seismically stabilised tile vaults	Michael Ramage, Timothy J. Hall, Ana Gatóo and M. Wesam Al Asali	https://doi.org/10.1016/j.istruc.2019.02.004
Design of Truss Structures Through Reuse	Jan Brütting, Joseph Desruelle, Gennaro Senatore and Corentin Fivet	https://doi.org/10.1016/j.istruc.2018.11.006

Design and production of an arch built of precast stackable components	Lluís Enrique and Joseph Schwartz	https://doi.org/10.1016/j.istruc.2018.12.005
Space Truss Masonry Walls With Robotic Mortar Extrusion	R. Duballet, O. Baverel and J. Dirrenberger	https://doi.org/10.1016/j.istruc.2018.11.003
The 2017–18 design and construction of ice composite structures in Harbin	Arno Pronk, Mark Mistur, Qingpeng Li, Xiuming Liu, Rijk Blok, Rui Liu, Yue Wu, Peng Luo and Yu Dong	https://doi.org/10.1016/j.istruc.2019.01.020

Special issue: Editors' Featured Article

Rwanda Cricket Stadium: Seismically stabilised tile vaults

Michael Ramage[a,b], Timothy J. Hall[a,b], Ana Gatóo[a,b] and M. Wesam Al Asali[b]
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The Rwanda Cricket Stadium, completed in 2017, uses compressed soil-cement tiles, thin-tile vaulting, and geogrid reinforcement for seismic stabilisation in Kigali's moderate risk earthquake zone. The vaults follow the natural resolution of forces toward the ground, closely mimicking the parabolic geometry of a bouncing ball and evoking the cherished hilly topography of Rwanda. The masonry vaults in compression allow the use of geogrid embedded within the mortar layers, adding global ductile behaviour to the thin shell composite of low strength tiles. Structural analysis is based on thrust lines, with additional envelope for the thrust lines to leave the profile of the masonry computed from the tensile capacity added by the geogrid. Construction follows traditional thin-tile techniques adapted for new environments and uses compressed earth tiles as pioneered at the Mapungubwe Interpretive Centre in South Africa. Here, the two approaches are combined in a permanent structure, with the largest vault spanning 16m with a rise of 8m. The Rwanda Cricket Stadium is a fusion of advanced structural analysis and architectural design with labour-intensive, locally sourced material production offering a much-needed solution to building sustainably in the developing world. Employing air-dried, hand-pressed soil tiles, produced using local labour, this method of construction has proved to be innovative, cost-effective and beautiful.

The full paper is available at https://doi.org/10.1016/j.istruc.2019.02.004.

New impact statement

Design of composite cold-formed steel flooring systems

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The benefits of using composite action in steel-concrete construction are well accepted and widely used; the potential benefits of using composite action between cold-formed steel beams and wood-based boards in flooring systems were, until the present study, neither understood nor utilised. In the investigation presented, the authors' own experimental and numerical data have been used to underpin the development of design rules to harness composite action in such systems.

The developed design rules, the theoretical background of which is fully described, follow the fundamental principles of current structural design standards for steel-concrete composite construction. Thus, they can be easily adopted by designers and are suitable for incorporation into future revisions of the Eurocodes. They allow practitioners to incorporate the beneficial influence of composite action in their designs, which is shown to lead to up to 100% increases in capacity and 40% increases in stiffness.

The full paper is available at https://doi.org/10.1016/j.istruc.2017.09.006.