Spotlight on Structures

Research Journal of The Institution of Structural Engineers

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

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Special Issue

Steel Structures: Mechanics, Simulation and Testing

Guest Editors: Nuno Silvestre and Leroy Gardner

This Special Issue of *Structures* contains updated and extended versions of a selected collection of papers presented at the Mini-Symposium on 'Steel Structures: Mechanics, Simulation and Testing', held within the 9th European Solid Mechanics Conference (ESMC), Madrid, 6–10 July 2015.

The papers cover a wealth of topics concerning the behaviour and design of steel (hot-rolled, cold-formed and stainless) and composite structural systems. Without claiming to be exhaustive, one can find two papers dealing with theoretical formulations, including computational implementations and experimental validations, to analyse the effect of cross-section in-plane deformation on the linear, buckling, post-buckling and interactive buckling of steel columns (Liu and Wadee) and composite girders (Taig *et al.*).

Then, two papers are dedicated to the analysis of cold-formed steel structures experiencing local and distortional buckling. Martins *et al.* investigate the influence of interaction between local and distortional buckling modes in the strength of lipped channel columns, while Zhang *et al.* propose and calibrate shell and beam finite element models to analyse pitched-roof portal frames, taking into account both local and distortional buckling.

The fifth and sixth papers emphasise the need for improved design rules for stainless steel structures. Arrayago and Real present an experimental study on ferritic stainless steel stub columns and show that the continuous strength method provides more accurate predictions than EN 1993-1-4. Theofanous *et al.* present an experimental study on the flexural response of stainless steel channels bent about their minor axis and angles bent about their stronger geometric axis and show that design provisions of EN 1993-1-4 are unduly conservative.

The seventh paper of the special issue, by Taras and Huemer, is dedicated to the structural reliability of steel members and frames. This paper shows the influence of different load sequences on the reliability of three design rules or procedures (the resistance of plastic cross-sections, of beam-columns and of portal frame structures).

The last three papers are focused on the application of new materials and components to improve the behaviour (stiffness, strength and ductility) of steel structures. Espinos *et al.* provide new combinations of materials (high-strength steel, fire-resistant steel, geopolymer concrete, shape memory alloys) to enhance the fire behaviour of CFST columns and connections. Wang *et al.* show that beam-column connections integrated with shape memory alloy and steel tendons have excellent recentring capability and moderate energy dissipative ability, while Becque presents a new approach to the modal decomposition of buckled shapes in thin-walled structural elements.

Interactively Induced Localization in Thin-walled I-section Struts Buckling About the Strong Axis

Elizabeth L. Liu and M. Ahmer Wadee

A GBT Model for the Analysis of Composite Steel–Concrete Beams with Partial Shear Interaction

Gerard Taig, Gianluca Ranzi, Daniel Dias-da-Costa, Giuseppe Piccardo and Angelo Luongo

Local–Distortional Interaction in Cold-formed Steel Columns: Mechanics, Testing, Numerical Simulation and Design

André Dias Martins, Dinar Camotim, Pedro Borges Dinis and Ben Young

Structural modeling of cold-formed steel portal frames

Xi Zhang, Kim J.R. Rasmussen and Hao Zhang

Experimental Study on Ferritic Stainless Steel RHS and SHS Cross-sectional Resistance Under Combined Loading

I. Arrayago and E. Real

Experimental study of stainless steel angles and channels in bending

M. Theofanous, A. Liew and L. Gardner

On the influence of the load sequence on the structural reliability of steel members and frames

Andreas Taras and Stefan Huemer

Advanced materials for concrete-filled tubular columns and connections

Ana Espinos, Manuel L. Romero, Antonio Hospitaler, Ana M. Pascual and Vicente Albero

Numerical investigation on I-beam to CHS column connections equipped with NiTi shape memory alloy and steel tendons under cyclic loads

Wei Wang, Tak-Ming Chan and Hongliang Shao

A new approach to modal decomposition of buckled shapes

Jurgen Becque