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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New issue available

A new issue of *Structures* (Volume 14, June 2018) is now available at www.structuresjournal.org.

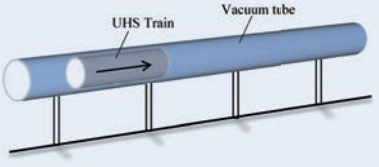
Editor-in-Chief, Professor Leroy Gardner, has selected a paper on 'Exploring Bridge Dynamics for Ultra-high-speed, Hyperloop, Trains' as his featured article. This will be available free of charge online for the next six months.

Further highlights discuss the 'Resistance of Axially Loaded T- and X-Joints of Elliptical Hollow Sections at Elevated Temperatures' and 'Ultimate Strength Analysis of Laminated Composite Sandwich Plates'.

Editor-in-Chief's Featured Article

Exploring Bridge Dynamics for Ultra-high-speed, Hyperloop, Trains

Nicholas A. Alexander[a] and Mohammad M. Kashani[a,b]
[a] University of Bristol, UK
[b] University of Southampton, UK



In this paper the dynamics of a set of ultra-high-speed (UHS) moving masses/loads traversing a continuous beam are explored. The proposed model is intended to simulate the dynamic response of continues bridges under the new Hyperloop/Transpod trains, which are proposed to travel at up to 1200 km/h. This speed introduces a range of dynamic responses that have hitherto not been observed in generic high-speed trains. The analytical results show that the dynamic amplification factors, due to train passage, are significantly larger than current trains. This is due to the combination of ultra-high-speed and continuous beam construction, which is necessary to maintain a partial vacuum in the enclosed tube. Therefore, current design recommendations are not sufficient for these UHS trains.

The full paper is available at https://doi.org/10.1016/j.istruc.2018.02.006.

Editor's Highlights

Resistance of Axially Loaded T- and X-Joints of Elliptical Hollow Sections at Elevated Temperatures – A Finite Element Study

E. Ozyurt[a] and Y.C. Wang[b]
[a] Department of Civil Engineering, Gumushane University, Gumushane, Turkey
[b] School of Mechanical, Aerospace and Civil Engineering, University of Manchester, UK

This study presents the results of a numerical study to develop a method to calculate the static strength of welded Elliptical Hollow Section (EHS) joints at elevated temperatures. Extensive numerical simulations using the non-linear finite element package, ABAQUS v6.14–1 on EHS T- and X-joints under brace axial compression or tension and pre-stress in chord member with different type of joint orientations at elevated temperatures over a wide range of diameter ratio have been conducted. The adjustments required to be made to the equations of joint resistance under ambient temperature conditions for estimating joint resistance at elevated temperature conditions are investigated in this study. The FE simulation results have been compared with the calculation results of a number of existing methods at ambient temperature. It has been found that the method proposed by Packer et al. gives the best agreement with the authors' simulation results at ambient temperature. At elevated temperatures, for T- and X- joints with braces in compression welded to the wide sides of chords, replacing the ambient temperature yield strength of steel by the elevated temperature value in the current design method overestimates the ultimate load carrying capacity of axially loaded EHS T- and X-joints due to inability of the ambient temperature calculation equations to take into consideration EHS flattening at high temperatures. For these cases, it is recommended to calculate the joint strength reduction factor at elevated temperatures according to the Young's modulus of steel.

The full paper is available at https://doi.org/10.1016/j.istruc.2018.01.004.

Ultimate Strength Analysis of Laminated Composite Sandwich Plates

Anish Ajay Kumar
Department of Civil Engineering, National Institute of Technology Patna, Patna, India

The ultimate strength analysis of laminated composite sandwich plates is presented via ultimate failure load prediction along with modes of failure for laminated composite sandwich plates using mathematical model based on improved higher order shear deformation theory (IHSDT). The proposed IHSDT mathematical model satisfies the inter-laminar shear stress continuity at each layer interface and also ensures zero transverse shear stress conditions at the plate top and bottom. The piecewise parabolic shear stress variation across the thickness of each layer is considered. No shear correction factors are required. The suitable C_0 FE formulation of IHSDT model is developed by authors.

The full paper is available at https://doi.org/10.1016/j.istruc.2018.02.004.