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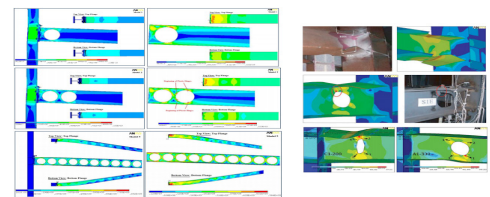
ADVANCED STEEL STRUCTURES

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Perforated steel beams and their use for seismic-resistant design of connections

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Today, it is estimated that more than 35% of steel-framed buildings incorporate long spans in excess of 12 m. In the 1990s the cellular beam, which replaced the castellated beam, gained prominence. Cellular beams are now estimated to have increased from 40% to 92% share of the steel beams in the UK market according to the new steel construction (NSC) magazine. There has been a lot of research on perforated beam webs with the geometry of the perforation ranging from circular, elongated, to non-standard shapes. However, very limited research has been found with regards the design limitations of seismic resistant connections when such perforated beams are used. Studies were conducted by FEMA and the SAC Joint Venture with reports ranging from FEMA-350 to 355F aim to develop reliable, practical and cost-effective design guidelines and specifications of reduced web opening (RBS) connections while do not include substantial reference to connections with the use of lightweight perforated beams (the so-called Reduced Web Section – RWS connections) with closely or widely spaced web openings. However, increased demand using lightweight structural members from seismic active regions has been recently recorded and the use of perforated beams in such areas deems further research. The presentation will discuss the up-to-date research work and propose design recommendations for RWS connections. The use of large isolated and periodically spaced perforations will be presented as an effective way of improving the seismic behavior of connections enhancing their ductility, rotational capacity and energy dissipation capacity.



Recent Publications

1. Tsavdaridis K D and Pilbin C (2017) FE Parametric Study of RWS/WUF-B Moment Connections with Elliptically-Based Beam Web Openings under Monotonic and Cyclic Loading. *International Journal of Steel Structures*; 17: 677-694.
2. Tsavdaridis K D and Papadopoulos T (2016) A FE Parametric Study of RWS Beam-to-Column Bolted Connections with Cellular Beams. *Journal of Constructional Steel Research*; 116: 92-113.

Biography

Konstantinos Daniel Tsavdaridis is an Associate Professor and the Director of the research group focuses on steel and steel-concrete composite structures in the School of Civil Engineering at the University of Leeds, UK. He holds MEng degree from City, University of London and an MSc (DIC) from Imperial College London. His research expertise is in structural product development that embraces resilience and sustainability; particularly the development of innovative seismic-resistant structural members and systems, and testing large and full scale specimens. He has published some 100 scientific articles, journal publications, technical reports and international conference papers. He is also an inventor and he has filed a few patents on resilient, lightweight and sustainable structural systems.

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