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Seismic resistant design of connections with the use of perforated beams

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The 1994 Northridge and 1995 Kobe earthquakes had destructive effects and proved that welded steel moment frames were generally prone to premature brittle failure. Studies were conducted by FEMA and the SAC Joint Venture with reports ranging from FEMA 350 to 355F with main aim to develop reliable, practical and cost-effective design guidelines and specifications. Alternative solutions were considered (FEMA 350, EC8: Part 3) by reinforcing connections or utilizing a reduced beam section (RBS). Today, it is estimated that around 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 an 80% share of the long span beams in the UK market. There has been a lot of research on perforated beam webs with the geometry of the perforation ranging from circular, elongated, to elliptically-based shapes. However, very limited research has been found up to date regarding the design limitations of seismic resistant connections when such perforated beams are used. Recent research has come up with the development of a new technique, which is consisted by the engagement of the RBS and the use of perforated beams. It is concluded that the design of reduced web section (RWS) connections should be based on the articulate decision of the first opening's distance as well as the use of large isolated perforations as an effective way of improving the behavior of connections enhancing their ductility, rotational capacity and energy dissipation capacity.

Biography

Konstantinos Daniel Tsavdaridis is the Director of the research group who focuses on steel and steel-concrete composite structures at the University of Leeds. He holds a MEng from City University 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 structural systems and members, and testing large-full scale structures. He has published more than 60 scientific articles, journal publications, technical reports and international conference papers. He is a member of ASCE, Professional Chartered Civil Engineer and registered at the European Federation of National Engineering Associations.

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