Plenary Talk Title

Advances in steel-concrete composite structures in civil engineering

Abstract

Steel-concrete composite structures have been used in civil engineering for well over a century, with their rather serendipitous discovery during the development of the Skyscraper in Chicago and New York in the late 1880's. The initial steel-concrete composite developments for column and floor systems of buildings were rather empirical, however following World War II, significant investment in the USA and Europe saw major infrastructure developments applying scientific principles to understand their structural behaviour. Since then there has been major and ongoing developments internationally to develop design procedures for their efficient and safe use. This paper will outline the American, Australian, European and Chinese developments in the area of codification of steel-concrete composite structures which allow for the efficient and safe design of bridges and buildings. The paper will then look to the future and outline ongoing advances and research into the behaviour of steel-concrete composite structures. The current trend in tall building structures is to use steel-concrete composite frames, with more than 50 % of all tall buildings over 200 m worldwide using steel-concrete composite frames. The major challenges lie in the deployment of materials which can provide efficient, robust and safe designs. Ongoing research particularly in Australia looking into high performance steel and concrete for this purposes will be summarised in this paper.

Brrief CV

Brian Uy was appointed as Professor of Structural Engineering and Director of the Centre for Infrastructure Engineering and Safety (CIES) in the School of Civil and Environmental Engineering at The University of New South Wales in 2013. Brian also holds an Adjunct Professor role within the School of Engineering and Information Technology at UNSW, Canberra (Australian Defence Force Academy (ADFA)).

Brian has delivered over 250 conference papers in 35 countries, including over 60 keynote/invited lectures in 15 countries and has been involved in research in steel and composite structures for over 20 years. He has co-authored some 600 publications including over 170 journal articles with over 80% of these appearing in A* & A journals (Based on ERA 2010 ranking of the Australian Research Council). Much of this research has been underpinned by competitive grant funding from the Australian Research Council granting schemes and from industry totalling over $55 million Australian dollars with a success rate of over 75%. Brian was a member of the Australian Research Council (ARC) College of Experts for Engineering and Environmental Sciences from 2007-2009 (serving as Deputy Chair in 2009). He was also a member of the Selection Advisory Committee for the ARC Australian Laureate Fellowships from 2011-2013 and in 2015 was appointed to the Engineering & Environmental Sciences Research Evaluation Committee for ERA 2015. Brian has been selected as a member of the ARC College of Experts for Engineering, Information and Computing Sciences for the period 2016-2018.

Brian is Chairman of the Standards Australia Committee BD32 on Composite Structures and a member of BD90 on Bridge Structures which are developing standards on Steel and Composite Structures for buildings and bridges respectively.

He also serves on BD01 and BD02 for Steel and Concrete Structures respectively. He has been the Chairman of the Australia Regional Group of the Institution of Structural Engineers since 2012 and he serves on its Council, International Interest Group , Sustainable Construction and Building Information Modelling Panel. In 2015 he was elected Chair for the Australian Group of the International Association of Bridge and Structural Engineering (IABSE). Brian regularly provides higher level consulting advice and certification for major national manufacturing and infrastructure companies and for forensic/expert witness purposes for many of Australia's leading legal practices. Brian serves on the editorial boards of fourteen international journals for structural engineering and is Chief Editor (Asia-Pacific) for Steel and Composite Structures. He is also a significant contributor to international codes of practice in steel and composite construction and currently serves on the American Institute of Steel Construction (AISC) Task Committee 5 on Composite Construction and the American Society of Civil Engineers (ASCE) - Structural Engineering Institute (SEI), Technical Committee on Composite Construction.

Brian graduated with a Bachelor of Civil Engineering (Honours Class 1) and Doctor of Philosophy from The University of New South Wales. He was installed as a Fellow of the Institution of Civil Engineers (FICE) in 2014 and is a chartered member of Engineers Australia, American Society of Civil Engineers, Institution of Civil Engineers and Institution of Structural Engineers. He is also a member of the Australian Institute of Company Directors, International Association of Bridge and Structural Engineers and the Council of Tall Buildings and Urban Habitat.