

Challenges in Accurately Predicting the Ultimate Behaviour of Steel Structures

Professor Sritawat Kitipornchai
School of Civil Engineering, University of Queensland, Australia

3 November 2017 (Friday) • 9:30 AM – 11:00 AM
NTU, Lecture Theatre 4 (LT 4), North Spine 2nd Level, NS4-02-34

Abstract

Following 9/11, an accurate prediction of the ultimate behaviour of structures under accidental loads and extreme loads is of paramount importance. In particular, research on progressive collapses has gained worldwide attention, notably the good work under the direction of Professor Tan Kang Hai of NTU/CEE is a prime example. In this talk, the speaker will elaborate the challenges of predicting the ultimate behaviour of steel structures by discussing the analysis of complex transmission tower structures for their ultimate loading capacity and failure modes. The method of analysis has been validated by full-scale tests because it considers both the geometric and material nonlinear effects and treats angle members in the tower as general asymmetrical thin-walled beam-column elements. Modelling of material nonlinearity for angle members is based on the assumption of lumped plasticity coupled with the concept of a yield surface in a force space. A novel technique of strengthening existing tower structures using tension diaphragms will also be presented. This technique has been successfully applied to strengthen aging towers with little cost.

The speaker will also present a structural analysis software that was developed for teaching in the City University of Hong Kong and the University of Queensland. It is an easy-to-use software that can provide a handy tool for students to learn about structural behaviour and design. It gives instant graphical results that accurately simulate structural response, thereby promoting self-learning and creativity. Academics and engineers will likewise find the software useful in their structural analysis work.



Speaker

Professor Sritawat Kitipornchai is from the School of Civil Engineering at the University of Queensland, Australia. He is a Fellow of the Australian Academy of Technological Sciences and Engineering (ATSE) and a Fellow of the European Academy of Sciences and Arts (EASA). He has been awarded Honorary Professor at Tongji University, Tsinghua University and Beijing Jiaotong University. He is the Regional Editor of *Engineering Structures* since 1993. His research interests are in the areas of structural stability, steel structures, transmission towers, computational mechanics, advanced composite and smart materials. He has published over 330 journal papers and 8 books, with a Web of Science h-index of 49 and over 10,000 citations.

Professor Kitipornchai has been with the University of Queensland since 1976. From 2001 to 2012, he worked at the City University of Hong Kong and was the Head of Department for 6 years, during which time he established the discipline of Civil Engineering and the Department of Architecture and Civil Engineering for City University of Hong Kong.

Professor Kitipornchai has won many awards that include the Tileman Prize, the James Hardies Award, the Munro Prize, the University of Queensland Teaching Excellence Award, and the Monash Civil Engineering Alumnus of the Year Award. More recently, he has been awarded the Nishino Medal from East Asia-Pacific Conference on Structural Engineering and Construction (EASEC) for being one of the most accomplished structural engineering researchers in the Asia-Pacific region.