THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

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第 16 届东亚及太平洋结构工程及施工国际会议
2019.12.03-06

2019 年 12 月 3 日 至 6 日，第 16 届东亚及太平洋结构工程及施工国际会议（EASEC15）在澳大利亚布里斯班顺利召开。香港分中心的代表钟国辉教授，何浩祥博士，胡亦非博士，学生肖蒙和郭亦彬受邀参加并举办了一场题为“高性能 S690 钢材在建筑结构中的有效应用”的专题会议，并汇报了香港分中心最近的研究成果。

东亚及太平洋结构工程及施工国际会议最初于 1986 年 1 月 15 日至 17 日在泰国曼谷举行。此后，这项会议在很多不同国家和地区进行。此次会议的多学科主题为专业的结构和施工工程师们以及学者们提供一个展示学术成果，汇报先进技术的论坛，同事也为学者们叙旧交流，建立新的合作关系提供了良好的平台。

下列国际知名的专家受邀在 EASEC 16 会议上进行了专题演讲：

- J. N. Reddy 教授
  德州农工大学，美国
- Robert E. Melchers 教授
  纽卡斯尔大学，澳大利亚
- Jose L. Torero 教授
  伦敦大学学院，英国
- Yozo Fujino
  东京大学，日本
- Ser Tong Quek 教授
  新加坡国立大学
- 丁洁民教授
  同济大学，中国
- Prof. D. A. Nethercot 教授
  帝国理工学院，英国
- Mark Bradford 教授
  新南威尔士大学，澳大利亚

杨永斌教授和 C. M. Wang 教授在开幕式上致欢迎辞

EASEC16 与会者合影

J. N. Reddy 教授

Y. Fujino 教授

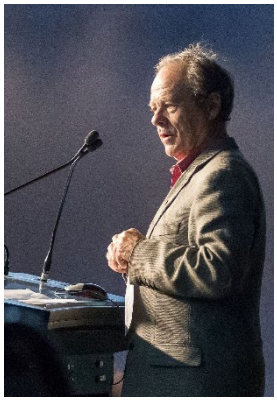
J. L. Torero 教授

R. E. Melchers 教授

S. T. Quek 教授

丁洁民教授

D. A. Nethercot 教授



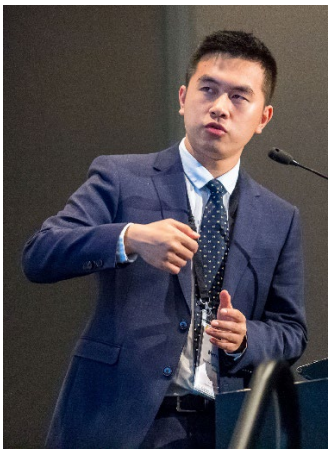
M. Bradford 教授

2019 年 12 月 4 日下午，大会举办了题为“高性能 S690 钢材在建筑结构中的有效应用”的专题会议。香港分中心的代表们一共进行了六篇论文的演讲和汇报，得到了与会者的关注和讨论。论文的题目分别为：

- Structural Adequacy of High Strength S690 Welded Sections with Various Heat Energy Input
  演讲者： 钟国辉 教授
- Correction of True Stress Strain Curves of Cylindrical and Funnel Shaped S690 Tensile Coupons After Onset of Necking
  演讲者： 何浩祥 博士
- Investigations into Compression Behaviour of T-joints Between S690 Circular Hollow Sections Under Brace Axial Forces
  演讲者： 胡亦非 博士
- Structural Behaviour of S690 High Strength SHS Columns Under Axial Compression
  演讲者： 肖蒙
- Hysteretic Behaviour of S690 Steel Plates and Welded Sections Under Cyclic Tests with Various Loading Protocols
  演讲者： 郭亦彬

香港分中心代表进行汇报：

钟国辉教授与何浩祥博士


香港分中心代表进行汇报：
胡亦非博士，肖蒙，郭亦彬

W. H. Fok 教授, 钟国辉教授,
C. M. Wang 教授与何浩祥博士合影

钟国辉教授 与 J. L. Torero 教授合影

香港分中心代表 与 S. Kitipornchai 教授合影

香港分中心代表 与 D. A. Nethercot 教授合影

香港分中心代表 与 C. M. Wang 教授和 Johnny Ho 教授合影

香港分中心会议论文摘要

Paper Title: **Compression Tests on High Strength S690 Welded Sections with Various Heat Energy Input**

Author: **K. F. Chung, H. C. Ho, X. Liu, K. Wang and Y. F. Hu**

Abstract:

Over the past twenty years, conflicting research findings have been reported on mechanical properties of high strength S690 welded sections due to different welding procedures and parameters adopted during welding. In order to quantify adverse effects on mechanical properties of these S690 steel welded sections, a total of 12 spliced S690 welded H-sections with different heat input energy adopted in the welding processes have been conducted to examine their deformation characteristics under compression, in particular, their cross section resistances. It is demonstrated that by a proper control on the heat input energy during welding, it is possible to control or even eliminate any reduction to the mechanical properties of these spliced S690 welded H-sections under compression.

Keywords: *High strength steels; Welding; Welded H-sections; Heat input energy.*

Paper Title: **Transformation Rules on Engineering Stress Strain Curves of S690 Funnel-shaped Coupons**

Author: **H. C. Ho, K. F. Chung and Y. B. Guo**

Abstract:

Funnel-shaped coupons are widely adopted for various steels low cycle high strain cyclic tests to investigate hysteretic behaviour of structural steels under cyclic actions in order to avoid plastic axial buckling. However, a technical problem is induced that the engineering stress strain curves obtained from these funnel-shaped coupons are not comparable to those curves obtained from standard cylindrical coupons. Hence, it is essential to correlate the engineering stress-strain characteristics obtained from monotonic tensile tests using these two types of coupons. This paper presents a theoretical study into such a correlation on the stress strain characteristics between the funnel-shaped coupons and the standard cylindrical coupons. A series of transformation formulae are proposed for various deformation ranges, namely i) Elastic range; ii) Plateau range; iii) Hardening range and iv) Necking range. The proposed transformation formulae have been calibrated with tensile test results and FE models of the S690 funnel-shaped coupons. These test results provide strong evidence to the effectiveness of the proposed transformation rules for subsequent investigations into hysteretic behaviour of steel materials.

Keywords: *Tensile tests; Funnel-shaped coupons; S690 steels; Stress-strain characteristics.*

Paper Title: **Investigations into Compression Behaviour of T-joints Between S690 Circular Hollow Sections under Brace Axial Force**

Author: **Y. F. Hu and K. F. Chung**

Abstract:

This paper presents an experimental and numerical investigation into the compression behaviour of T-joints between S690 cold-formed circular hollow sections (CFCHS). A total of four T-joints between S690 CFCHS were tested under axial compression in brace members. A typical failure mode was observed that all joints failed in an interaction between the local plastification of the chords and overall plastic bending of the chords. Three dimensional finite element models with geometrical and material non-linearity have been established and verified after calibration against test results. Both measured geometrical dimensions and material properties of these CFCHS are incorporated into the proposed models. Both the experimental and the numerical results are compared with design resistances obtained from existing design codes, including EN 1993-1-8 and CIDECT Design Guide 1. The investigation will facilitate development of efficient design rules for resistances of T-joints between S690 CFCHS under brace axial compression.

Keywords: *High strength steel; T-joints; Circular hollow sections; Axial compression.*

Paper Title: **Structural Behaviour of High Strength S690 Cold-formed Structural Hollow Sections under Compression**

Author: **M. Xiao and K. F. Chung**

Abstract:

High strength steels are considered as efficient constructional materials due to their high strength-to-self-weight ratios. Over the past years, a large number of investigations into structural members made of high strength steels have proved that they meet various design requirements in both strength and ductility under various actions. However, the fabrication processes of these high strength steel sections are quite different from those made of normal strength steels, in particular, the presence of residual stresses due to both cold-forming and welding. In the current study, a total of eight cold-formed structural hollow sections (CFSHS) with different dimensions and fabrication methods are tested. The structural performance of these sections is examined with a total of 8 stocky column tests and 16 slender column tests. After comparing these measured resistances with the predicted resistances according to EN 1993-1-1, further works on improvements to the design method are suggested.

Keywords: *High strength steels; Cold-formed sections; Classification of cross-sections; Section resistances; Member resistances.*

Paper Title: **Structural Responses of High Strength S690 Welded Sections under Different Cyclic Actions**

Author: **Y.B. Guo, H. C. Ho, M. Xiao and K. F. Chung**

Abstract:

Structural engineers are constantly looking for high strength constructional materials as they face huge challenges in providing structural solutions to build heavily loaded structures, such as high-rise buildings and long span bridges. Applications of high strength S690 steels to building structures are very attractive owing to their high strength to self-weight ratios which often provide significant savings in costs and time. However, there are concerns on mechanical properties of welded S690 members, in particular, in both strength and ductility, and there is a lack of technical guidance on how to assess any adverse effect on these mechanical properties. This paper presents an experimental investigation into structural responses of S690 steel plates and welded sections under cyclic actions with both constant and varying strain amplitudes, and comparison on cyclic deformation characteristics of both steel plates and their welded sections is presented.

Keywords: *High strength steels; Welded sections; Cyclic tests; Hysteretic behaviour; Ductility.*