# The 9th International Conference on Steel and Aluminium Structures *ICSAS19*

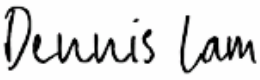
3rd – 5th July 2019, Bradford, UK

UNIVERSITY of BRADFORD

## Welcome Message

On behalf of the Organising Committee and the University of Bradford, I would like to welcome you to the 9th International Conference on Steel & Aluminium Structures, Bradford, UK (ICSAS19). This conference series aims to bring together international experts to disseminate recent research findings and discuss developments in the design and construction of steel and aluminium structures. The previous eight ICSAS Conferences were held in Cardiff, UK (1987), Singapore (1991), Istanbul, Turkey (1995), Helsinki, Finland (1999), Sydney, Australia (2003), Oxford, UK (2007), Kuching, Malaysia (2011) and Hong Kong (2016).

I would like to express my sincere gratitude to the members of the Organising and International Scientific Committees for all their hard work and, above all, to all of you attending this international conference at Bradford, UK. The conference would not happen without your participation.



Chair of the Organising Committee

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# General Tourist Information

- National Science and Media Museum, Pictureville, Bradford BD1 1NQ, England
  https://www.scienceandmediamuseum.org.uk

- Salts Mill, Salts Mill Victoria Road, Shipley, Bradford BD18 3LA, England
  http://www.saltsmill.org.uk/

- Bingley Five Rise Locks, Beck Ln, Bingley BD16 4DS
  https://canalrivertrust.org.uk/enjoy-the-waterways/walking/canal-trails/bingley-to-saltaire/five-rise-locks

- Bronte Parsonage Museum, Church Street, Keighley BD22 8DR, England
  https://www.bronte.org.uk

- Cliffe Castle Museum & Park, Spring Gardens Lane, Keighley BD20 6LH, England
  https://www.bradfordmuseums.org/venues/cliffe-castle-museum

The information of more tourist attractions in West Yorkshire is available at: https://www.yorkshire.com/places/west-yorkshire

# Conference Venue

Hollins Hall Hotel, Golf & Country Club

Hollins Hill, Bradford, BD17 7QW


*From Leeds-Bradford Airport:*

*By Bus* – Flying Tiger 737 (Timetable information), calling at the bus stop *Hollins Hill Station Road*. It takes about 35 min. Please be aware of the return and group tickets (Fares).

*By Taxi* – Arrow Cars are the official taxi partner for *Leeds-Bradford Airport*, you can book a taxi online or in person at the Arrow Cars airport office outside the main entrance, you will need the hotel postcode **BD17 7QW.**

*By Car* – Via A658 and A65, 4.8 miles, approx. 16 min.

For more information, e.g. car hire, please visit https://www.leedsbradfordairport.co.uk/getting-to-from-the-airport.

*From Manchester Airport:*

*By Taxi* – Arrow Cars and Black Cab Taxis are available 24 hours a day. There are information and booking desks in all three terminals, and at The Station. You will need the hotel postcode **BD17 7QW**. Tariff sheet viewable here.

*By Car* – Via M60 and M62, 57.7 miles, 1 h 15 min.

*By Train/Coach/Bus* –

a) *Manchester Airport* to *Bradford* city centre

   By Train – *Manchester Airport* to *Bradford Interchange* (change at *Manchester Victoria* train station)

   By Coach – *Manchester Airport* to *Bradford Interchange*

b) *Bradford* city centre to *the Hollins Hotel*

   By Bus – Flying Tiger 737, calling at the bus stop *Hollins Hill Station Road*.

For more information, e.g. car hire, please visit https://www.manchesterairport.co.uk/getting-to-and-from/.

*From Heathrow Airport:*

*By Air* –

a) *Heathrow Airport* to *Leeds-Bradford Airport*, 1 h, Non-stop, *British Airways*
b) *Leeds-Bradford Airport* to *the Hollins Hotel*

*By Train/Coach/Bus/Underground* –

a) *Heathrow Airport* to *Bradford* city centre (by underground and train)
   i. By Underground – *Heathrow Airport* to *King's Cross St. Pancras Underground*, Piccadilly Line (Cockfosters) London underground

   ii. By Train – *King's Cross* train station to *Bradford Interchange* (direct or change at *Leeds*)

b) *Heathrow Airport* to *Bradford* city centre (by coach)
   Direct coach or change at *London Victoria Coach Station*
c) *Bradford* city centre to *the Hollins Hotel*

For more information, please visit https://www.heathrow.com/transport-and-directions.

*Book train/coach tickets online:*

Book train tickets online (National Rail)

Book coach tickets online (National Express)

# Conference Information

## Instructions for Presenters

- Each keynote presentation is allocated 25 min + 5 min of Q&A.
- Each regular presentation is allocated 12 min + 3 min of Q&A.
- The presentation slides (PowerPoint) shall be uploaded prior to the respective sessions as early as possible. It would be the best that the presentation slides for the 3 July morning sessions to be uploaded on 2 July during the registration period. Alternatively, the files could also be sent to icsas19@bradford.ac.uk.

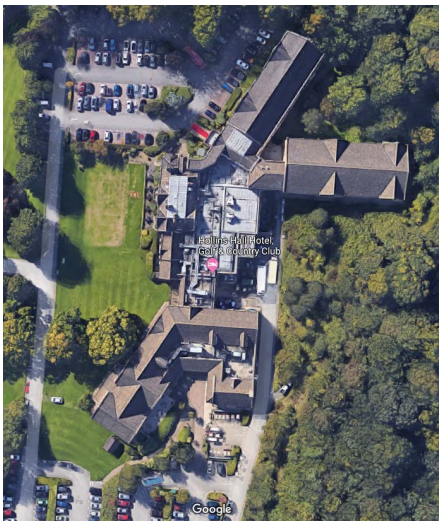
## Instructions for Session Chairs

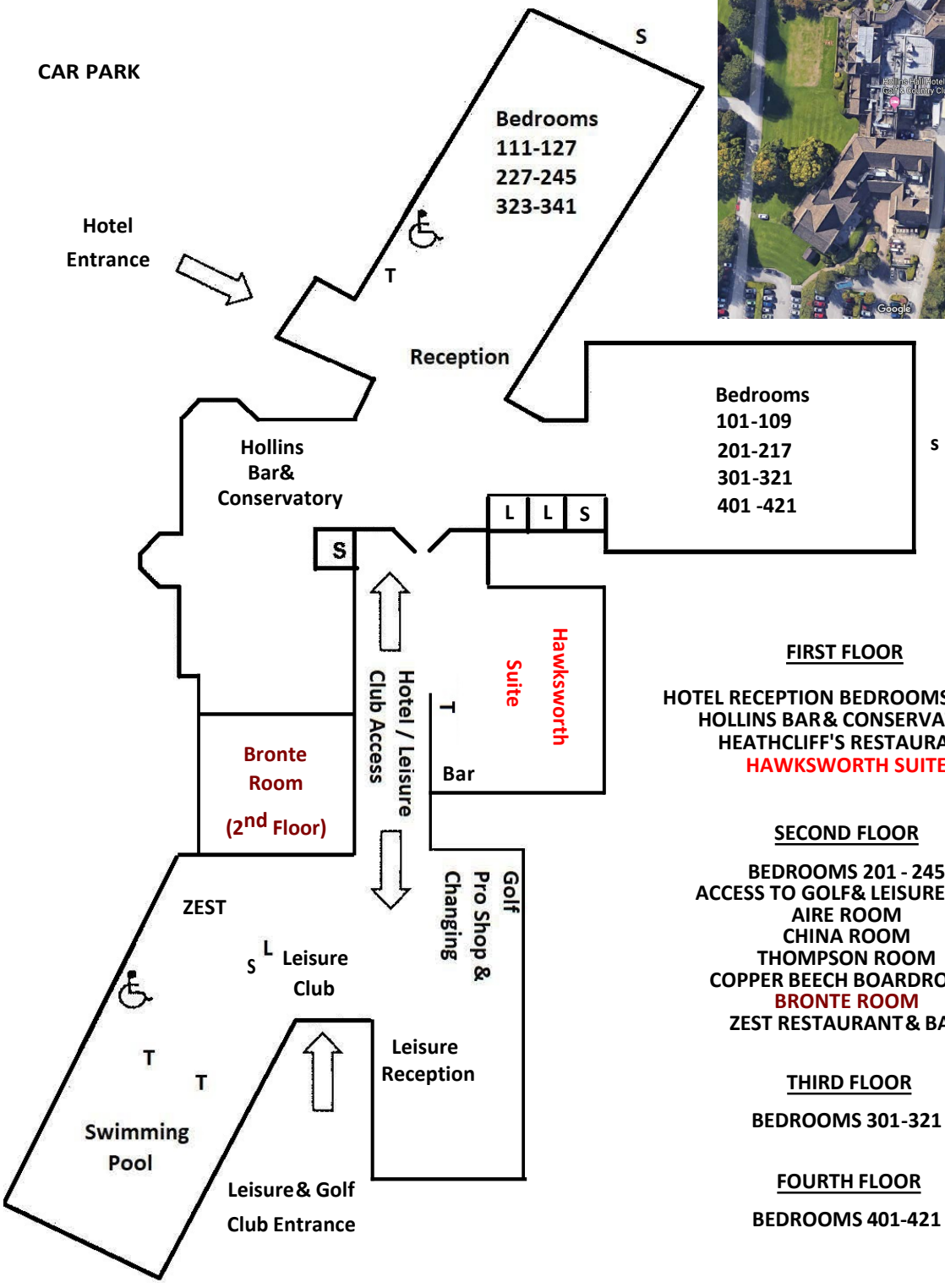
- Please come to the session room at least 5 min before the start of the session.
- Please stay until the end of the session.
- Remind the speaker 3 min before the end of presentation by a bell put on the table.

## Room information

- Keynotes, opening and closing sessions will take place in **Hawksworth Suite** on the 1st floor**.**
- Parallel sessions will take place in **Hawksworth A and Hawksworth B, Bronte Room (2nd floor).** Before the parallel sessions, the **Hawksworth Suite** will be divided into two rooms**: Hawksworth A** and **Hawksworth B.**

# Floor Plan






**FIRST FLOOR**

HOTEL RECEPTION BEDROOMS 101-127
HOLLINS BAR& CONSERVATORY
HEATHCLIFF'S RESTAURANT
HAWKSWORTH SUITE

**SECOND FLOOR**

BEDROOMS 201 - 245
ACCESS TO GOLF& LEISURE CLUB
AIRE ROOM
CHINA ROOM
THOMPSON ROOM
COPPER BEECH BOARDROOM
BRONTE ROOM
ZEST RESTAURANT& BAR

**THIRD FLOOR**

BEDROOMS 301-321

**FOURTH FLOOR**

BEDROOMS 401-421

L =LIFT
S=STAIRS
T=TOILETS
= ACCESIBLE TOILETS

# Programme Overview of ICSAS19

| | 2 July | 3 July | 4 July | 5 July |
|---|---|---|---|---|
| 8:00-9:00 | | Registration | | |
| 9:00-9:30 | | Opening session | Registration | Registration |
| 9:30-11:00 | | Keynote session 1 (3 keynotes) | Keynote session 2 (3 keynotes) | Keynote session 3 (3 keynotes) |
| 11:00-11:30 | | Morning break | Morning break | Morning break |
| 11:30-12:30 | | Parallel sessions 1 (12 papers) | Parallel sessions 4 (12 papers) | Parallel sessions 7 (12 papers) |
| 12:30- 14:00 | | Lunch | Lunch | Lunch |
| 14:00 -15:30 | | Parallel sessions 2 (18 papers) | Parallel sessions 5 (17 papers) | Parallel sessions 8 (17 papers) |
| 15:30-16:00 | | Afternoon break | Afternoon break | Afternoon break |
| 16:00-17:30 | Registration | Parallel sessions 3 (20 papers) | Parallel sessions 6 (18 papers) | Parallel sessions 9 (12 papers)<br>Closing session |
| 17:30-18:00 | | | | |
| 19:30 | | BBQ | Conference Dinner | |

# Overview of Topics of Parallel Sessions

| | 3 July | 4 July | 5 July |
|---|---|---|---|
| **11:30-12:30** | Parallel sessions 1 (12)<br>Composite Beams 1 **(4)**<br>Cold Formed Steel Structures 1 **(4)**<br>Aluminium Structures 1 **(4)** | Parallel sessions 4 (12)<br>Fire 2 **(4)**<br>Shear Connections **(4)**<br>Aluminium Structures 2 **(4)** | Parallel sessions 7 (12)<br>Aluminium Structures 3 **(4)**<br>Design of Bridges & Special Structures **(4)**<br>Composite Joint and Structures 2 **(4)** |
| **14:00 -15:30** | Parallel sessions 2 (18)<br>Stainless Steel Structures 1 **(6)**<br>Composite Joint and Structures 1 **(6)**<br>Fire 1 **(6)** | Parallel sessions 5 (17)<br>Cold Formed Steel Structures 2 **(6)**<br>Steel Connections 1 **(6)**<br>Stainless Steel Structures 2 **(5)** | Parallel sessions 8 (17)<br>Steel Structures 2 **(6)**<br>(Stainless) Steel Structures 3 **(6)**<br>Seismic Design / Robustness 2 **(5)** |
| **16:00-17:30** | Parallel sessions 3 (20)<br>High Strength Steel Structures 1 **(6)**<br>Seismic design / Robustness 1 **(7)**<br>Composite columns 1 **(7)** | Parallel sessions 6 (18)<br>Steel Structures 1 **(6)**<br>Composite Beams 2 **(6)**<br>Composite Columns 2 **(6)** | Parallel sessions 9 (12)<br>Cold Formed Steel Structures 3 **(4)**<br>Fire 3 **(4)**<br>Seismic Design / Robustness 3 **(4)**<br>Closing session |

- **Click on session names (with hyperlink) goes to the detailed programme;**
- **In the detailed programme, Click on the blank cell above 'Authors' goes back to this page.**

# Detailed Programme

| Time | **Wednesday 3 July** | | |
|---|---|---|---|
| 9:00-9:30 | Opening session | | |
| **9:30-11:00** | **Keynote sessions 1-3**<br>**Chair: Professor Brian Uy and Professor Manuel Romero** | | |
| 9:30-10:00 | Keynote 1 | | |
| | **Second-Order Direct Analysis of Long-Span Single-Layer Domes** | | Professor Siu Lai Chan<br>Hong Kong Polytechnic University, Hong Kong |
| 10:00-10:30 | Keynote 2 | | |
| | **Testing and Verification of the World's First Metal 3D Printed Bridge** | | Professor Leroy Gardner<br>Imperial College London, UK |
| 10:30-11:00 | Keynote 3 | | |
| | **Performance of Recycled Aggregate Concrete (RAC) Filled Steel Tubular Structures** | | Professor Lin-Hai Han<br>Tsinghua University, China |
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| **11:00-11:30** | **Morning break** | | |
| | | | |
| **11:30-12:30** | **Parallel session 1**<br>**Topic: Composite Beams 1**<br>**Room: Hawksworth A**<br>**Chair: Professor Michael Yam and Dr Kan Zhou** | | |
| | ID | Paper | Authors |
| 11:30-11:45 | 145 | INVESTIGATION OF THE LOAD-BEARING BEHAVIOUR OF COSF-BDOWELS | M. BRAUN, R. OBIALA, CHR. ODENBREIT and M. SCHÄFER |
| 11:45-12:00 | 251 | NEW OPTION OF BENDING RESISTANCE EVALUATION FOR COMPOSITE FLEXURAL MEMBERS OF STEEL AND CONCRETE | M.V. LESKELA and S.O. PELTONEN |
| 12:00-12:15 | 252 | PLASTIC DESIGN FOR COMPOSITE BEAMS - ARE THERE ANY LIMITS? | M. SCHÄFER, Q. ZHANG, M. BRAUN and M. BANFI |
| 12:15-12:30 | 295 | AN EVALUATION OF THE FLEXURAL BEHAVIOUR OF CONCRETE- FILLED RECTANGULAR FLANGE GIRDERS | R. Al-DUJELE and K.A. CASHELL |
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| **11:30-12:30** | **Parallel session 1**<br>**Topic: Cold Formed Steel Structures 1**<br>**Room: Hawksworth B**<br>**Chair: Professor Siu-Lai Chan and Dr Ee Loon Tan** | | |
| | ID | Paper | Authors |
| 11:30-11:45 | 140 | EXPERIMENTAL TESTS ON PERFORATED COLD FORMED STEEL BRACING DIAGONALS | F. GUSELLA, G. LAVACCHINI and M. ORLANDO |
| 11:45-12:00 | 208 | BENDING BEHAVIOR OF BOX BEAM COMPOSED OF TWO FACE-TO-FACE COLD-FORMED STEEL C-SECTIONS | W. PATWICHAICHOTEA, T. CHAISOMPHOB, E. YAMAGUCHI and H.T. TRANA |
| 12:00-12:15 | 228 | BEHAVIOUR AND CAPACITY OF COLD-FORMED STEEL BOLTED MOMENT CONNECTIONS | S.M. MOJTABAEI, J. BECQUE and I. HAJIRASOULIHA |
| 12:15-12:30 | 317 | EFFECT OF KNEE BRACES ON OPTIMUM DESIGN OF COLD- FORMED STEEL PORTAL FRAMES | D.T. PHAN, J.B.P. LIM, H.G. HARNO, I. HAJIRASOULIHA, M.S. MOJTABAEI, L.T. LAU and J.H. LIM |
| | | | |
| **11:30-12:30** | **Parallel session 1**<br>**Topic: Aluminium Structures 1**<br>**Room: Bronte Room**<br>**Chair: Professor You-Fu Yang and Dr Wei Li** | | |
| | ID | Paper | Authors |
| 11:30-11:45 | 126 | EXPERIMENTAL INVESTIGATION OF ALUMINUM ALLOY EXTRUDED T-STUB JOINTS CONNECTED BY SWAGE-LOCKING PINS | Z. WANG, Y. ZHANG, Y. WANG and Y. OUYANG |
| 11:45-12:00 | 162 | EUROCODE 9 CROSS-SECTION CLASSIFICATION OF OPTIMISED ALUMINIUM PROFILES IN COMPRESSION | A.K. ADUGU and K.D. TSAVDARIDIS |
| 12:00-12:15 | 187 | WEB CRIPPLING BEHAVIOUR OF FASTENED ALUMINIUM LIPPED CHANNEL SECTIONS | H.R. ALSANAT, S. GUNALAN, P. KEERTHAN, H. GUAN and C. BANIOTOPOULOS |
| 12:15-12:30 | 276 | DISTORTIONAL BUCKLING TESTS OF COLD-ROLLED ALUMINIUM ALLOY 5052-H36 BEAMS | L.A.T. HUYNH, C.H. PHAM and K.J.R. RASMUSSEN |
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| **12:30-14:00** | | **Lunch** | |
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| **14:00-15:30** | **Parallel session 2**<br>**Topic: Stainless Steel Structures 1**<br>**Room: Hawksworth A**<br>**Professor Jin Jiang and Dr Dan Gan** | | |
| | ID | Paper | Authors |
| 14:00-14:15 | 116 | LATERAL-TORSIONAL BUCKLING OF CLASS 4 STAINLESS STEEL BEAMS – TESTS AND MODEL VALIDATION | M. ŠORF and M. JANDERA |
| 14:15-14:30 | 135 | CALIBRATION OF CYCLIC CONSTITUTIVE MODEL OF STAINLESS-CLAD BIMETALLIC STEEL | J. ZHU, H. BAN, Y. ZHANG and G. SHI |
| 14:30-14:45 | 169 | TESTS OF COLD-FORMED LEAN DUPLEX STAINLESS STEEL SUBJECTED TO WEB CRIPPLING | Y. CAI and B. YOUNG |
| 14:45-15:00 | 243 | AN ASSESSMENT OF STARRED ROLLED STAINLESS STEEL ANGLE COLUMNS | I.S. BOTELHO, P.C.G. da S. VELLASCO, L.R.O. de LIMA, M.C. RODRIGUES, A.T. da SILVA |
| 15:00-15:15 | 254 | NUMERICAL MODELLING OF HOLLOW STAINLESS-STEEL SPIRAL WELDED TUBES UNDER PURE BENDING | Y.K.R. GUNAWARDENA, F. ASLANI and B. UY |
| 15:15-15:30 | 264 | SHEAR BEHAVIOUR OF HYBRID STAINLESS STEEL PLATE GIRDERS | R. LALTHAZUALA and K. D. SINGH |
| | | | |
| **14:00-15:30** | **Parallel session 2**<br>**Topic: Composite Joint and Structures 1**<br>**Room: Hawksworth B**<br>**Chair: Professor Lin-Hai Han and Professor Dennis Lam** | | |
| | ID | Paper | Authors |
| 14:00-14:15 | 117 | I BEAM-RHS COLUMN JOINTS WITH WELDED STUDS | M.A. SERRANO, C. LÓPEZ-COLINA, Y.C. WANG, M. LOZANO and F.L. GAYARRE |
| 14:15-14:30 | 203 | OPTIMIZATION AND PERFORMANCE ANALYSIS OF END PLATE BLIND-BOLTED JOINTS BETWEEN CFST COLUMN AND STEEL BEAM | Z. PAN, F. DING, Y. YU, D. LU and C. ZHANG |
| 14:30-14:45 | 204 | EXPERIMENTAL STUDY ON STRUCTURAL BEHAVIOUR OF BEAM-TO-BEAM COMPOSITE JOINT | Y. NISHIDA, J.Y.R. LIEW and M. ARITA |
| 14:45-15:00 | 233 | SHEAR CAPACITY OF COMPOSITE SLABS USED IN BUILDING STRUCTURES | N. SCHMECKEBIER and W. KURZ |
| 15:00-15:15 | 270 | INFLUENCE OF THE CONCRETE SHEAR CAPACITY ON THE FAILURE BEHAVIOUR OF COMPOSITE DECKS | T. MOLKENS, J. DOBRIĆ and B. ROSSI |

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|---|---|---|---|
| 15:15-15:30 | 271 | HEADED SHEAR STUD WELDED ON WELDED PLATES IN COMPOSITE FLOOR APPLICATIONS | T. MOLKENS, J. DOBRIĆ and B. ROSSI |
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| **14:00-15:30** | **Parallel session 2**<br>**Topic: Fire 1**<br>**Room: Bronte Room**<br>**Professor David Hernandez-Figueirido and Professor Yong-Lin Pi** | | |
| | ID | Paper | Authors |
| 14:00-14:15 | 111 | EFFECT OF SLIDING RESISTANCE ON MECHANICAL RESPONSE OF CONTINUOUS CABLE-TYPE SUSPENSION DOMES UNDER LOCALISED FIRE | L. XIAO, Y. DU and J. PENG |
| 14:15-14:30 | 120 | ENHANCEMENT OF THE FIRE RESISTANCE OF CONCRETE-FILLED STEEL TUBULAR COLUMNS BY USING HIGH PERFORMANCE STEELS | A. ESPINÓS, C. IBÁÑEZ, A. LAPUEBLA-FERRI and M.L. ROMERO |
| 14:30-14:45 | 193 | SIMULATION OF THE EFFECT OF NON-UNIFORM TEMPERATURES ON A BEAM OF HIGH STRENGTH STEEL WITHIN A FIRE COMPARTMENT | S. SHAKIL, W. LU and J. PUTTONEN |
| 14:45-15:00 | 227 | NUMERICAL MODELLING AND DESIGN OF STAINLESS STEEL SQUARE AND RECTANGULAR HOLLOW SECTION COLUMNS IN FIRE | A. MOHAMMED and S. AFSHAN |
| 15:00-15:15 | 119 | POST-FIRE PERFORMANCE OF ELLIPTICAL CONCRETE-FILLED STEEL TUBE STUB COLUMNS | T.Y. SONG, J.C. ZHANG and K. XIANG |
| 15:15-15:30 | 306 | DESIGN OF STAINLESS STEEL PLATES AGAINST LOCAL BUCKLING IN FIRE | Z. XING, M. KUCUKLER and L. GARDNER |
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| **15:30-16:00** | | **Afternoon break** | |
| | | | |
| **16:00-17:30** | **Parallel session 3**<br>**Topic: High Strength Steel Structures 1**<br>**Room: Hawksworth A**<br>**Chair: Professor Leroy Gardner and Professor Miguel Serrano** | | |
| | ID | Paper | Authors |
| 16:00-16:15 | 106 | EXPERIMENTAL INVESTIGATION ON MECHANICAL BEHAVIOR OF TMCP HIGH STRENGTH STEEL | J. JIANG, Z.Y. PENG and W. BAO |
| 16:15-16:30 | 165 | EXPERIMENTAL AND NUMERICAL STUDY ON OVERALL STABILITY OF Q460GJ STEEL WELDED THICK H-SHAPED AXIAL COMPRESSION MEMBERS | X. YU, S.-D. NIE, G.-X. DAI, B. YANG and J.-Y. LI |

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| 16:30-16:45 | 168 | RELIABILITY ANALYSIS OF COMPRESSION-BENDING MEMBER WELDED BY Q460GJ STEEL | J. LI, S. NIE, G. DAI, B. YANG and X. YU |
| 16:45-17:00 | 305 | EXPERIMENTAL STUDY ON THE MECHANICAL BEHAVIOR OF T- STUBS WITH Q690 HIGH STRENGTH STEEL AND 12.9 HIGH STRENGTH BOLTS | Y. SI, S.-D. NIE, B. YANG, J.-Y. LI and X. YU |
| 17:00-17:15 | 328 | ANALYSIS OF H-SHAPED BEAM TO SQUARE-HSS COLUMN CONNECTION WITH HIGH-STRENGTH BOLTS | X. LIU, F. CUI, A.L. ZHANG |
| 17:15-17:30 | 337 | MATERIAL PROPERTIES, RESIDUAL STRESSES AND LOCAL STABILITY OF S690 HIGH STRENGTH STEEL WELDED I-SECTION COLUMNS | Y. SUN, Y. LIANG and O. ZHAO |
| | | | |
| **16:00-17:45** | **Parallel session 3<br>Topic: Seismic design / Robustness 1<br>Room: Hawksworth B<br>Chair Dr Huiyong Ban and Professor Eiki Yamaguchi** | | |
| | ID | Paper | Authors |
| 16:00-16:15 | 127 | MULTI LEVEL FINITE ELEMENT DESIGN OF SEISMICALLY QUALIFIED JOINTS | F. WALD, M. VILD, M. KUŘÍKOVÁ, M. KOŽICH and J. KABELÁČ |
| 16:15-16:30 | 156 | RESEARCH PROGRESS ON SEISMIC PERFORMANCE OF STEEL FRAMES EQUIPPED WITH SMA-BASED SELF-CENTRING ENERGY DISSIPATION BAYS (SCEDBS) | M.C.H. YAM, X. ZHOU, Q. HE and K. KE |
| 16:30-16:45 | 163 | A NOVEL SELF-CENTERING STEEL BEAM-TO-COLUMN CONNECTION WITH NO FRAME EXPANSION | W. FENG, W. WANG and C. FANG |
| 16:45-17:00 | 186 | BEAM-TO-COLUMN JOINTS FOR SLIM-FLOOR SYSTEMS IN SEISMIC ZONES | C. VULCU, R. DON and A. CIUTINA |
| 17:00-17:15 | 282 | INFLUENCE OF DETAILING OF SHORT LINKS ON THE SEISMIC RESPONSE OF COMPOSITE ECCENTRICALLY BRACED FRAMES | A. VĂTĂMAN, A. CIUTINA and D. GRECEA |
| 17:15-17:30 | 230 | COLD-FORMED STEEL SHEET WALL FOR MID-RISE CONSTRUCTION: SEISMIC PERFORMANCE AND DESIGN METHOD | C. YU, P. JIA and W. ZHANG |
| 17:30-17:45 | 210 | PERFORMANCE OF STEEL BARRIER TO PROTECT BUILDING COLUMN AGAINST VEHICLE IMPACT | K.M.A. SOHEL, K. Al-JABRI and A.H.S. Al ABRI |
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| **16:00-17:45** | **Parallel session 3**<br>**Topic: Composite Column 1**<br>**Room: Bronte Room**<br>**Chair: Dr Farhad Aslani and Dr Jie Yang** | | |
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| | ID | Paper | Authors |
| 16:00-16:15 | 112 | EXPERIMENTAL STUDY ON THE BEHAVIOUR OF STEEL COLUMNS ENCASED IN HIGH STRENGTH CONCRETE | Y. DU, H. QI and R. LIEW |
| 16:15-16:30 | 125 | COMPRESSIVE BEHAVIOUR OF STEEL COLUMNS FILLED WITH COLD-BONDED LIGHTWEIGHT AGGREGATE CONCRETE | M.K. HASSAN, N. BAJRACHARYA, Z. TAO, Z. PAN and D. RAHME |
| 16:30-16:45 | 129 | PLASTIC DESIGN OF COMPOSITE STEEL AND HIGH STRENGTH CONCRETE COLUMNS WITH STEEL FIBRE REINFORCEMENTS | S. LI, J.Y.R. LIEW and B. LAI |
| 16:45-17:00 | 138 | EFFECTIVE BENDING STIFFNESS OF HEAVY STEEL-CONCRETE COMPOSITE COLUMNS WITH MULTIPLE ENCASED STEEL PROFILES | M. CHRZANOWSKI, C. ODENBREIT, H. DEGÉE, R. OBIALA and T. BOGDAN |
| 17:00-17:15 | 336 | PULL-OUT BEHAVIOUR OF EMBEDDED BLIND BOLTS IN CONCRETE-FILLED STEEL TUBES | F. XU, T.-M. CHAN and B. YOUNG |
| 17:15-17:30 | 137 | FINITE ELEMENT ANALYSIS OF HIGH-STRENGTH CONCRETE-FILLED HIGH-STRENGTH SQUARE STEEL TUBE MIDDLE LONG COLUMNS UNDER AXIAL LOAD | G. Li, Y. CHEN, Z. YANG, B. CHEN and W. CAO |
| 17:30-17:45 | 152 | NUMERICAL MODELLING OF HIGH STRENGTH CONCRETE FILLED HIGH STRENGTH SQUARE STEEL TUBE STUB COLUMNS UNDER ECCENTRIC LOAD | G. LI, Q. ZHANG, Z. YANG, B. CHEN and X. FENG |
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| **19:30** | | **BBQ** | |

| Time | **Thursday 4 July** | | |
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| **9:30-11:00** | **Keynote sessions 4-6**<br>**Chair: Professor Ben Young and Dr Therese Sheehan** | | |
| 9:30-10:00 | Keynote 4 | | |
| | **New Developments in Steel and Composite Bridges** | | Professor Ulrike Kuhlmann<br>University of Stuttgart, Germany |
| 10:00-10:30 | Keynote 5 | | |
| | **Design of Concrete Encased Steel Composite Columns Using High Strength Materials** | | Professor Richard Liew<br>National University of Singapore, Singapore |
| 10:30-11:00 | Keynote 6 | | |
| | **Recent Developments and Integration of Design Codes for Steel-Concrete Composite Structures in Fire** | | Professor Manuel Romero<br>Universitat Politècnica de València, Spain |
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| **11:00-11:30** | **Morning break** | | |
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| **11:30-12:30** | **Parallel session 4**<br>**Topic: Fire 2**<br>**Room: Hawksworth A**<br>**Chair: Professor Manuel Romero and Dr Yancheng Cai** | | |
| | ID | Paper | Authors |
| 11:30-11:45 | 235 | MECHANICAL BEHAVIOUR OF HIGH STRENGTH STEEL AFTER EXPOSURE TO HIGH TEMPERATURES | X.-Q. WANG, Z. TAO and M.K. HASSAN |
| 11:45-12:00 | 309 | FLEXURAL BUCKLING OF STAINLESS STEEL I-SECTION COLUMNS IN FIRE | M. KUCUKLER, Z. XING and L. GARDNER |
| 12:00-12:15 | 341 | NUMERICAL ANALYSIS ON POST-FIRE CYCLIC BEHAVIOR OF CONCRETE-FILLED DOUBLE-SKIN STEEL TUBE | W. LI, B. CHEN, T. WANG and K. ZHOU |
| 12:15-12:30 | 343 | SIMPLE CALCULATION METHOD OF DETERMINING THE POST-FIRE RESIDUAL STRENGTH OF CONCRETE-FILLED STEEL TUBULAR COLUMNS | K. ZHOU and L.-H. HAN |
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| **11:30-12:30** | **Parallel session 4**<br>**Topic: Shear Connections**<br>**Room: Hawksworth B**<br>**Chair: Professor Yong Du and Professor Wolfgang Kurz** | | |
| | ID | Paper | Authors |
| 11:30-11:45 | 121 | EQUATIONS TO PREDICT THE SHEAR CONNECTION CAPACITY OF COMPOSITE BEAMS WITH SLENDER PROFILED STEEL SHEETING | C. ODENBREIT, V. VIGNERI and D. LAM |
| 11:45-12:00 | 124 | FUNDAMENTAL BEHAVIOUR OF SHEAR STUDS AND PROFILED STEEL SHEETING IN PUSH TESTS | Z. TAO, U. KATWAL, M. K. HASSAN, B. UY and D. LAM |
| 12:00-12:15 | 131 | CHARACTERISATION OF DEMOUNTABLE SHEAR CONNECTOR SYSTEMS IN COMPOSITE BEAMS | A. KOZMA, C. ODENBREIT and M.V. BRAUN |
| 12:15-12:30 | 123 | MECHANICAL PERFORMANCE OF COMPOSITE STEEL–CONCRETE BEAMS UTILISING DEMOUNTABLE SHEAR CONNECTORS | S.M. HOSSEINI, F. MASHIRI and O. MIRZA |
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| **11:30-12:30** | **Parallel session 4**<br>**Topic: Aluminium Structures 2**<br>**Room: Bronte Room**<br>**Chair: Professor Enrique Mirambell and Dr Ou Zhao** | | |
| | ID | Paper | Authors |
| 11:30-11:45 | 198 | SLENDERNESS LIMITS OF ALUMINIUM OUTSTAND ELEMENTS SUBJECTED TO STRESS GRADIENTS | M. BOCK, M. GKANTOU and M. THEOFANOUS |
| 11:45-12:00 | 229 | ANALYTICAL STUDY ON PARAMETRIC RESONANCE INSTABILITY OF SIMPLY SUPPORTED RECTANGULAR THIN ALUMINUM PLATE WITH CONCENTRATED MASS | Z. ZHONG, A. LIU and Y.-L. PI |
| 12:00-12:15 | 259 | MEMBER BUCKLING TESTS ON COLD-ROLED ALUMINIUM ALLOY CHANNEL BEAMS | N.H. PHAM, C.H. PHAM and K.J.R. RASMUSSEN |
| 12:15-12:30 | 260 | NUMERICAL INVESTIGATION OF THE MEMBER BUCKLING OF COLD-ROLED ALUMINIUM ALLOY CHANNEL BEAMS | N.H. PHAM, C.H. PHAM and K.J.R. RASMUSSEN |
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| **12:30-14:00** | | **Lunch** | |
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| **14:00-15:30** | **Parallel session 5**<br>**Topic: Cold Formed Steel Structures 2**<br>**Room: Hawksworth A**<br>**Chair: Professor Matti Leskela and Professor Frantisek Wald** | | |
| | ID | Paper | Authors |
| 14:00-14:15 | 150 | COLD-FORMED STEEL WALL PANELS: SHEATHING BRACED DESIGN CONCEPTS FOR FLEXURAL LOADING | S. SELVARAJ and M. MADHAVAN |
| 14:15-14:30 | 151 | STUDIES ON THE BEHAVIOR OF COLD-FORMED STEEL CHANNEL COLUMNS AT LOW TEMPERATURES | G. S. CHOBE and M. MADHAVAN |
| 14:30-14:45 | 155 | OPTIMUM DESIGN OF COLD-FORMED STEEL BEAMS SUBJECT TO BENDING, SHEAR AND WEB CRIPPLING | R. DOBSON, K. POOLOGANATHAN, S. GUNALAN, P. GATHEESHGAR, J. YE and N. DEGTYAREVA |
| 14:45-15:00 | 255 | TRANSVERSE STIFFENER REQUIREMENTS FOR SHEAR POSTBUCKLING OF COLD-FORMED STEEL CHANNELS | S. H. PHAM, C. H. PHAM and G. J. HANCOCK |
| 15:00-15:15 | 257 | OPTIMUM SEISMIC DESIGN OF COLD-FORMED STEEL MOMENT RESISTING FRAMES | S.M. MOJTABAEI, I. PAPARGYRIOU, I. HAJIRASOULIHA and J. BECQUE |
| 15:15-15:30 | 324 | CYCLIC LOADING TEST ON COLD-FORMED STEEL-STIFFENED STEEL PLATE SHEAR WALLS | Y. H. WANG, C. W. GU, J. K. TAN and Y. SHI |
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| **14:00-15:30** | **Parallel session 5**<br>**Topic: Steel Connections 1**<br>**Room: Hawksworth B**<br>**Chair: Professor Ulrike Kuhlmann and Dr Tak-Ming Chan** | | |
| | ID | Paper | Authors |
| 14:00-14:15 | 122 | ASSESSMENT OF THE RESPONSE OF FRICTION DAMPERS SUBJECTED TO HIGH STRAIN RATES | A. F. SANTOS, A. SANTIAGO, M. LATOUR and G. RIZZANO |
| 14:15-14:30 | 329 | AN INNOVATIVE STEEL CONNECTION SYSTEM FOR REUSE: EXPERIMENTAL AND NUMERICAL STUDIES | J. YANG, X. DAI, D. LAM, T. SHEEHAN and K.ZHOU |
| 14:30-14:45 | 185 | BEHAVIOUR OF END-PLATE STEEL CONNECTIONS WITH 4 BOLTS PER ROW UNDER LARGE DEFORMATIONS | D.L. NUNES and A. CIUTINA |
| 14:45-15:00 | 194 | EXPERIMENTAL STUDIES ON A WELDED K-TYPE JOINT OF HIGH-STRENGTH STEEL IN A SLIM | P. SAREMI, W. LU, J. PUTTONEN, D. PADA and |

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| | | FLOOR TRUSS | J. KESTI |
| 15:00-15:15 | 195 | OPTIMISED 3D PRINTED METALLIC NODE-CONNECTIONS FOR RETICULATED STRUCTURES | M.M. ABDELWAHAB and K.D. TSAVDARIDIS |
| 15:15-15:30 | 226 | STRENGTH TESTING FOR DYNAMIC MESSAGE SIGNS WITH ADHESIVE CONNECTIONS | J. SEO and I. AMATYA |
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| **14:00-15:15** | **Parallel session 5**<br>**Topic: Stainless Steel Structures 2**<br>**Room: Bronte Room**<br>**Chair: Professor Zhong Tao and Dr Katherine Cashell** | | |
| | ID | Paper | Authors |
| 14:00-14:15 | 213 | FOUR-POINT BENDING TESTS ON CONCRETE-FILLED LEAN DUPLEX STAINLESS STEEL RHS BEAMS | B. XING and B. YOUNG |
| 14:15-14:30 | 216 | NUMERICAL STUDY AND DESIGN OF AUSTENITIC STAINLESS STEEL TUBULAR T- AND Y- JOINTS IN CIRCULAR HOLLOW SECIONS | G. SHU, J. WANG, B. ZHENG, Y. GU and K. ZHANG |
| 14:30-14:45 | 335 | NONLINEAR BEHAVIOUR OF AXIALLY LOADED BACK-TO-BACK BUILT-UP COLD-FORMED AUSTENITIC STAINLESS-STEEL CHANNEL SECTIONS | K. ROY, T.C.H. TING, H.H. LAU and J.B.P. LIM |
| 14:45-15:00 | 279 | EXPRIMENTAL PROGRAMME ON AUSTENITIC STAINLESS STEEL BEAMS AND COLUMNS | I. ARRAYAGO, E. REAL and R. CHACÓN |
| 15:00-15:15 | 280 | PRELIMINARY STUDY AND TESTS ARRANGEMENTS FOR EXPERIMENTAL PROGRAMME ON STAINLESS STEEL FRAMES | I. ARRAYAGO, E. REAL and E. MIRAMBELL |
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| **15:30-16:00** | | **Afternoon break** | |
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| **16:00-17:30** | **Parallel session 6**<br>**Topic: Steel Structures 1**<br>**Room: Hawksworth A**<br>**Chair: Professor Luciano Lima and Dr Marina Bock** | | |
| | ID | Paper | Authors |
| 16:00-16:15 | 132 | STUDY ON PLASTIC BEHAVIOR OF STEEL L-SECTION BENDING MEMBERS | Y. CHEN, D. HUANG and W. ZHANG |
| 16:15-16:30 | 200 | STRESSED SKIN ACTION IN SANDWICH PANEL ROOFS | J.M. DAVIES, M.J. ROBERTS and Y.C. WANG |

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| 16:30-16:45 | 180 | PLASTIC INTERACTION BETWEEN AXIAL FORCE, BI-AXIAL BENDING AND TORSION FOR DOUBLE SYMMETRIC I SECTIONS | A. BEYER, N. BOISSONNADE, A. KHELIL and A. BUREAU |
| 16:45-17:00 | 109 | EXPERIMENTAL AND NUMERICAL ANALYSIS OF CYLINDRICALLY CURVED PANELS UNDER UNIFORM COMPRESSION | F. LJUBINKOVIĆ, J. P. S. C. MARTINS, H. M. S. GERVÁSIO, L. A. P. SIMÕES DA SILVA and C.M. A. LEITÃO |
| 17:00-17:15 | 247 | EFFECTIVE STRESS-STRAIN RELATIONSHIP FOR ANALYSIS AND DESIGN OF SINGLE ANGLE MEMBERS | A.H.A. ABDELRAHMAN, Y.-P. LIU and S.-L. Chan |
| 17:15-17:30 | 285 | EXPERIMENTAL INVESTIGATION ON LONGITUDINAL RESIDUAL STRESS DISTRIBUTION OF CIRCULAR STEEL TUBE SECTIONS | X. YAN, Y.-G. ZHAO |
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| **16:00-17:30** | **Parallel session 6**<br>**Topic: Composite Beams 2**<br>**Room: Hawksworth B**<br>**Chair: Professor Adrian Ciutina and Dr Renata Obiala** | | |
| | ID | Paper | Authors |
| 16:00-16:15 | 133 | ULTIMATE BEHAVIOUR OF COMPOSITE STEEL-CONCRETE FLOOR MEMBERS | G. RANZI and O. VALLATI |
| 16:15-16:30 | 242 | INVESTIGATIONS ON THE LOAD-BEARING BEHAVIOUR OF SLIM-FLOOR SYSTEMS | J. SCHORR and U. KUHLMANN |
| 16:30-16:45 | 342 | NUMERICAL MODELLING AND PARAMETRIC STUDY OF SLIM-FLOOR COMPOSITE SHEAR BEAMS | X. DAI, D. LAM, T. SHEEHAN, J. YANG and K. ZHOU |
| 16:45-17:00 | 294 | TESTS ON COMPOSITE FLOOR PLATE TO DEMONSTRATE STRUCTURAL INTERACTIONS | E. AGGELOPOULOS, M. LAWSON, X. DAI, T. SHEEHAN and D. LAM |
| 17:00-17:15 | 338 | FLEXURAL CAPACITY OF COMPOSITE FOAM CONCRETE FLOOR SLABS WITH COLD FORM C-CHANNEL EMBEDMENT | D. LIU, F. FU and W. LIU |
| 17:15-17:30 | 206 | FINITE ELEMENT MODELLING OF PUSH-OUT TESTS FOR BUBBLE DECK SYSTEM INCORPORATING INTO COMPOSITE STEELCONCRETE BEAMS | E.L. TAN and J. SISAY |
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| **16:00-17:30** | **Parallel session 6**<br>**Topic: Composite Columns 2**<br>**Room: Bronte Room**<br>**Chair: Dr Ana Espinos and Dr Matthias Braun** | | |
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| | ID | Paper | Authors |
| 16:00-16:15 | 110 | EXPERIMENTAL INVESTIGATION ON CIRCULAR CFDST CHORD TO CHS BRACE T-JOINTS | Y.-F. YANG, C. SHI and C. HOU |
| 16:15-16:30 | 175 | BEHAVIOR OF STAINLESS STEEL-FURNACE SLAG AGGREGATE CONCRETE-CARBON STEEL DOUBLE-SKIN TUBULAR (DST) STUB COLUMNS UNDER SUSTAINED LOADING AND AXIAL COMPRESSION | H.-Y. ZHAO, F.-C. WANG, Q.-W. HAN and Y.-H. JIA |
| 16:30-16:45 | 300 | FINITE ELEMENT PARAMETRIC ANALYSIS ON DOUBLE-PLATE CONNECTED CONCRETE-FILLED STEEL TUBE COMPOSITE COLUMNS | J. LIU, Z. CHEN, T. ZHOU and L. JIA |
| 16:45-17:00 | 332 | IMPROVED COMPOSITE EFFECT OF THIN-WALLED SQUARE CONCRETE-FILLED STEEL TUBES WITH DIAGONAL BINDING RIBS | D. GAN, Z. ZHOU and X. ZHOU |
| 17:00-17:15 | 333 | ANALYTICAL BEHAVIOUR OF AXIALLY LOADED CONCRETE FILLED STEEL TUBES WITH AN INNER BAMBOO CULM | D. GAN, Z. LI and X. ZHOU |
| 17:15-17:30 | 339 | EXPERIMENTAL ANALYSIS OF THE SECTIONAL CAPACITY OF STEEL HOLLOW TUBES FILLED WITH DIFFERENT MATERIALS | C. IBÁÑEZ, D. HERNÁNDEZ-FIGUEIRIDO and A. PIQUER |
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| **19:30** | | **Conference Dinner** | |

| Time | **Friday 5 July** | | |
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| **9:30-11:00** | **Keynote sessions 7-9**<br>**Chair: Professor Yiyi Chen and Professor Lin-Hai Han** | | |
| 9:30-10:00 | Keynote 7 | | |
| | **Behaviour and Design of Fabricated Stainless Steel-Concrete Composite Structures** | | Professor Brian Uy<br>University of Sydney, Australia |
| 10:00-10:30 | Keynote 8 | | |
| | **Development of an Innovative Flat Slab to Tubular Column Connection** | | Professor Yong Wang<br>University of Manchester, UK |
| 10:30-11:00 | Keynote 9 | | |
| | **Behaviour of Aluminum Alloy Channel Sections with Flanges Restrained Undergoing Web Crippling** | | Professor Ben Young<br>Hong Kong Polytechnic University, Hong Kong |
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| **11:00-11:30** | **Morning break** | | |
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| **11:30-12:30** | **Parallel session 7**<br>**Topic: Aluminium Structures 3**<br>**Room: Hawksworth A**<br>**Chair: Professor Richard Liew and Dr Wei Lu** | | |
| | ID | Paper | Authors |
| 11:30-11:45 | 189 | SHEAR BEHAVIOUR OF ALUMINIUM LIPPED CHANNEL BEAMS | M. ROUHOLAMIN, S. GUNALAN, P. KEERTHAN, H. KARAMPOUR and C. BANIOTOPOULOS |
| 11:45-12:00 | 234 | STABILITY BEHAVIOUR OF ALUMINIUM SINGLE-LAYER LATTICED DOMES WITH ASSEMBLED HUB JOINTS | Y. XU, J. ZHENG, C. WANG and Q. HAN |
| 12:00-12:15 | 273 | STATIC STRUCTURAL RESPONSE OF A CONCEPTUAL ALUMINIUM BRIDGE | P. SAREMI, B. KARABULUT and B. ROSSI |
| 12:15-12:30 | 277 | FINITE ELEMENT ANALYSES OF COLD-ROLLED ALUMINUM ALLOY 5052-H36 BEAMS SUBJECTED TO DISTORTIONAL BUCKLING | L.A.T. HUYNH, C.H. PHAM and K.J.R. RASMUSSEN |
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| **11:30-12:30** | **Parallel session 7**<br>**Topic: Design of Bridges & Special Structures**<br>**Room: Hawksworth B**<br>**Chair: Professor Gianluca Ranzi and Dr Feng Fu** | | |
| | ID | Paper | Authors |
| 11:30-11:45 | 103 | CRITICAL ASSESSMENT OF THE DESIGN OF AN ELECTRIC TRANSMISSION TOWER | M.-Z. BEZAS, M. TIBOLT, J.-P. JASPART and J.-F. DEMONCEAU |
| 11:45-12:00 | 303 | LONGEST SCISSORS TYPE OF DEPLOYABLE BRIDGE USING TOPOLOGY OPTIMIZATON BY MICROTRUSS MODEL | Y. YOKOTANI, I. ARIO, Y. CHIKAHIRO and M. NAKAZAWA |
| 12:00-12:15 | 304 | OPTIMAL DESIGN OF LARGE-SPAN BRIDGES | I. ARIO, Y. YOKOTANI, Y. CHIKAHIRO and M. NAKAZAWA |
| 12:15-12:30 | 340 | INSTABILITY OF METAL SCAFFOLD WITH PARTIAL SETTLEMENT | J. L.Y CHAN and S.H. LO |
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| **11:30-12:30** | **Parallel session 7**<br>**Topic: Composite Joint and Structures 2**<br>**Room: Bronte Room**<br>**Chair: Dr Carmen Ibañez-Usach and Mr Johannes Schorr** | | |
| | ID | Paper | Authors |
| 11:30-11:45 | 241 | SCREWED CONNECTIONS IN LIGHT-GAUGE STEEL FRAME SHEAR WALLS SHEATHED WITH PLY-BAMBOO PANELS | T. LI, Z. LI, Y. XIAO and R. WANG |
| 11:45-12:00 | 245 | EFFECT OF END ANCHORAGE INTO THE SUPPORING BEAMS ON THE DIAPHRAGM INTERFACE SHEAR BEHAVIOUR OF COMPOSITE STEEL DECK SLABS UNDER HIGH SHEAR DEMAND | H. REZAEIAN, G.C. CLIFTON and J.B.P. LIM |
| 12:00-12:15 | 225 | STUDY ON HOT SPOT STRESS CONCENTRATION FACTOR OF WELDED CONCRETE-FILLED STEEL TUBULAR TRUSS JOINTS | C. WU, X. WEI, Z. WEN, R. WANG |
| 12:15-12:30 | 174 | INTERACTION BEHAVIOR BETWEEN OUTER PIPE AND LINER WITHIN OFFSHORE LINED PIPELINE UNDER AXIAL COMPRESSION | F.-C. WANG, Z.-X. ZHU and L. YANG |
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| **12:30-14:00** | | **Lunch** | |
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| **14:00-15:30** | **Parallel session 8**<br>**Topic: Steel structures 2**<br>**Room: Hawksworth A**<br>**Chair: Professor Ben Young and Dr Therese Sheehan** | | |
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| | ID | Paper | Authors |
| 14:00-14:15 | 177 | DIGITAL STRUCTURE DESIGN: A GRID GENERATION AND OPTIMISATION FRAMEWORK | J. YE, Q. WANG, B. GAO, P. SHEPHERD and K. POOLOGANATHAN |
| 14:15-14:30 | 149 | NEW DESIGN METHOD FOR THE STRUCTURAL STEEL BEAMS STRENGTHENED WITH LOW MODULUS CFRP | S. SELVARAJ and M. MADHAVAN |
| 14:30-14:45 | 153 | NUMERICAL STUDIES OF STEEL CHANNELS WITH STAGGERED SLOTTED PERFORATIONS SUBJECT TO COMBINED BENDING AND SHEAR ACTIONS | N. DEGTYAREVA, P. KEERTHAN, S. GUNALAN, M. LAWSON, P. GATHEESHGAR and P.-O. SUNDAY |
| 14:45-15:00 | 170 | AN EFFICIENT AND RELIABLE STEEL ASSEMBLY MODELLING SCHEME USING SECOND-ORDER CONE PROGRAMMING AND DUAL ERROR ESTIMATOR | C. EL BOUSTANI, J. BLEYER, M. ARQUIER, M.K. FERRADI and K. SAB |
| 15:00-15:15 | 311 | FRACTURE SIMULATION OF CONSTRUCTIONAL STEELS IN TWO FRACTURE MODES | S. YAN, K.J.R. RASMUSSEN and X. ZHAO |
| 15:15-15:30 | 334 | IMPROVED DESIGN RULES ON THE BUCKLING BEHAVIOUR OF AXIALLY LOADED BACK-TO-BACK COLD-FORMED STEEL BUILT- UP CHANNEL SECTIONS | K. ROY, T.C.H. TING, H.H. LAU and J.B.P. LIM |
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| **14:00-15:30** | **Parallel session 8**<br>**Topic: Stainless / steel structures 3**<br>**Room: Hawksworth B**<br>**Chair: Professor Brian Uy and Dr Kan Zhou** | | |
| | ID | Paper | Authors |
| 14:00-14:15 | 104 | ASSESSING THE AUTHENTICITY AND EFFICIENCY OF SCAFFOLD RIGHT ANGLE COUPLERS CURRENTLY AVAILABLE WITHIN THE UK CONSTRUCTION INDUSTRY WITH BS-EN 74-1-2005 ACCREDITATION | A. BERRAIS and A. KIRK |
| 14:15-14:30 | 319 | THE TENSILE BEHAVIOR OF WELDED STAINLESS STEEL T-STUB CONNECTIONS | W. HE, Y. HU and H. WANG |
| 14:30-14:45 | 215 | BUCKLING OF STIFFENED PLATES WITH MODAL DECOMPOSITION | S. ADANY and Y. LI |
| 14:45-15:00 | 299 | COMPARATIVE STUDY OF THE APPLICATION OF | C.A.S. DE FREITAS, L.M. |

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| | | THE STEEL SPACER AND TIRE RUBBER SPACER AS TRUSSES REINFORCE | BEZERRA, W.V. DA SILVA, E.U.L. PALECHOR, P.U. DA SILVA, F.F.S. MORAIS JR. |
| 15:00-15:15 | 310 | PERFORATED COLD-FORMED FERRITIC STAINLESS STEEL UNLIPPED CHANNELS WITH RESTRAINED FLANGES SUBJECT TO WEB CRIPPLING UNDER ONE-FLANGE LOADINGS | A.M. YOUSEFI, J.B.P. LIM and G.C. CLIFTON |
| 15:15-15:30 | 221 | EXPERIMENTAL STUDY OF FATIGUE CRACK GROWTH PROPERTIES OF G20MN5QT CAST STEEL | J. XUA, Y. XU and Q. HAN |
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| **14:00-15:15** | **Parallel session 8**<br>**Topic: Seismic design / Robustness 2**<br>**Room: Bronte Room**<br>**Chair: Professor Pedro Vellasco and Dr Jie Yang** | | |
| | ID | Paper | Authors |
| 14:00-14:15 | 272 | SEISMIC DESIGN OF A STEEL TRUSS RAIL-CUM-ROAD BRIDGE USING CONVENTIONAL AND BUCKLING-RESTRAINED BRACES | S. DUTTA and S.K. RAJARAM |
| 14:15-14:30 | 281 | STRUCTURAL BEHAVIOUR OF DUAL ECCENTRICALLY BRACED FRAMES WITH WELDED DOG-BONE JOINTS SUBJECTED TO CYCLIC LOADING | A. JIMÉNEZ, E. MIRAMBELL and E. REAL |
| 14:30-14:45 | 179 | NOVEL JOINT DETAILS TO DESIGN OR RETROFIT STEEL BUILDINGS WITH NOMINALLY PINNED JOINTS FOR SUPERIOR ROBUSTNESS | B. GHORBANZADEH, G. BREGOLI, G. VASDRAVELLIS and T.L. KARAVASILIS |
| 14:45-15:00 | 318 | STEPWISE HARDENING MODEL FOR THE CYCLIC BEHAVIOR OF SHEAR PANEL DAMPERS | L. XU, C. WANG and X. NIE |
| 15:00-15:15 | 331 | EXPERIMENTAL STUDY ON THE PROGRESSIVE COLLAPSE OF 3D STEEL FRAMES UNDER CONCENTRATED AND UNIFORMLY DISTRIBUTED LOADING CONDITIONS | D.-Y. KONG, Y. YANG and B. YANG |
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| **15:30-16:00** | | **Afternoon break** | |
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| **16:00-17:00** | **Parallel session 9**<br>**Topic: Cold Formed Steel Structures 3**<br>**Room: Hawksworth A**<br>**Chair: Dr Abbes Berais and Dr Cheng Fang** | | |
| | ID | Paper | Authors |
| 16:00-16:15 | 158 | ULTIMATE CAPACITY OF COLD–FORMED STEEL | T. G. SINGH and K. D. |

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| | | HOLLOW STUB COLUMNS WITH ELLIPTICAL PERFORATIONS | SINGH |
| 16:15-16:30 | 263 | PERFORATED COLD FORMED YSt 310 STEEL HOLLOW MEMBERS UNDER PURE TORSION | S. V. DEVI, T. G. SINGH and K. D. SINGH |
| 16:30-16:45 | 244 | CRITICAL MOMENT OF ASYMMETRIC COLD-FORMED C-SECTIONS | MUHAMMAD Z. HAFFAR and SANDOR ADANY |
| 16:45-17:00 | 148 | SHEATHING RESTRAINTS ON CFS STRUCTURAL MEMBERS – EXPERIMENTAL INVESTIGATION | S. SELVARAJ and M. MADHAVAN |
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| **16:00-17:00** | **Parallel session 9**<br>**Topic: Fire 3**<br>**Room: Hawksworth B**<br>**Chair: Professor Esther Real and Professor Yong Wang** | | |
| | ID | Paper | Authors |
| 16:00-16:15 | 118 | INVESTIGATION ON TEMPERATURE DISTRIBUTION OF LIGHT GAUGE STEEL FRAME (LSF) WALL | Q. SONG, X. WU and L.-H. HAN |
| 16:15-16:30 | 258 | DETERMINATION OF SPRINKLER SYSTEM RELIABILITY AND ITS EFFECT ON STRUCTURAL FIRE DESIGN OF STEEL STRUCTURES | M. SALMINEN, M. NIEMINEN and M. MALASKA |
| 16:30-16:45 | 286 | LOAD-BEARING WALLS MADE OF COLD-FORMED STEEL HOLLOW SECTION STUDS EXPOSED TO FIRE | Y. TAO, M. MAHENDRAN and A. ARIYANAYAGAM |
| 16:45-17:00 | 288 | ELEVATED TEMPERATURE MECHANICAL PROPERTIES OF COLD-ROLLED STEEL SHEETS AND COLD-FORMED STEEL SECTIONS | R. MAHENTHIRARASA and M. MAHENDRAN |
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| **16:00-17:00** | **Parallel session 9**<br>**Topic: Seismic Design / Robustness 3**<br>**Room: Bronte Room**<br>**Chair: Professor Yiyi Chen and Dr George Vasdravellis** | | |
| | ID | Paper | Authors |
| 16:00-16:15 | 330 | CYCLIC HARDENING AND SOFTENING BEHAVIOUR OF THE LOW YIELD POINT STEEL: IMPLEMENTATION AND VALIDATION | C. WANG, H. ZHAO and L. XU |
| 16:15-16:30 | 293 | COMPARISON OF FINITE ELEMENT ANALYSIS AND EXPERIMENTAL RESULTS OF COMPOSITE STEEL CONNECTIONS SUBJECTED TO LOW TO MODERATE SEISMIC ACTIVITY | Y. MAMO, E. TAN, F. MASHIRI and A. SUTER |
| 16:30-16:45 | 323 | EXPERIMENTAL STUDY ON ELASTIC-PLASTIC LOCAL BUCKLING BEHAVIOR OF Q235, Q420, Q690 STEEL UNDER COMPLEX CYCLIC | J. YU, Y. H. WANG and Q. WU |

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| | | LOADING PATH | |
| 16:45-17:00 | 113 | EXPERIMENTAL STUDY ON SEISMIC BEHAVIOR OF REPLACEABLE STAINLESS STEEL COUPLING LINKS | X. FU and B. YANG |
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