



STRUCTURES IN FIRE FORUM

STRUCTURES IN FIRE FORUM – 27TH SEPTEMBER 2024

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Provisional Agenda (20 minute talks with 10 mins Q&A):

10:00 – 10:30 Registration and Coffee

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“Fire tests of loadbearing light gauge steel frame (LSF) walls: one-sided vs. two-sided fire exposure”.

Izzy Inerhunwa, OFR Consultants

In the UK, concerns have been raised about the fire performance of light gauge steel frame (LSF) walls as a loadbearing system, particularly when exposed to fire on both sides. This presentation will examine the effects of one-sided and two-sided fire exposure on the loadbearing fire resistance of LSF walls, both with and without cavity insulation. Testing under the ISO-834 heating regime will be discussed, assessing whether current fire resistance classifications for one-sided exposure are adequate for two-sided scenarios.

“Are current best practices for coat-backs sufficient when considering steel hollows?”.

David Baron, BB7

This presentation will showcase a 3D heat transfer analysis employing Finite Element Method (FEM) to assess the possibility of omitting a coat-back on a real project involving unprotected hollow elements framing into protected I-section columns. It will also emphasise the need to re-evaluate current best practices when dealing with unprotected hollows.

“Investigation of pre- and post-fire conditions in residential buildings during COVID-19 Based on English Fire Statistics”.

Rachel Foster & Martina Manes, University of Liverpool

During COVID-19 pandemic, the general social behaviour changed in response to the government-imposed lockdowns and restrictions. This study spotlights the various aspects of residents’ daily lives that may have changed in response to the global pandemic in the context of the residential fire statistics in England for houses in multiple occupancies (HMOs), which contributes to an average of 28% of residential fires annually. The literature shows that most fire incidents are related to cooking, followed by electrical appliances and heating systems. This observation was demonstrated through the analysis of the English fire statistics, with food as the ignition item accounted for 36% of the HMO fires in 2019/20. The investigation into the English fire statistics of the pre-, during- and post-fire conditions, via the Home Office determined a general decrease in fires in houses in multiple occupancy (HMO) across England. A constant proportion of fires were notably recorded in low-rise purpose-built dwellings (60%). Nonetheless, the quantity of registered HMOs has also experienced a 1.5% decrease across England in 2021.

12.00 – 13.00 Lunch

“Car park fires; Lessons for learning. ”.

Peter Wilkinson, Designated Person with CROSS

Peter Wilkinson, a fire engineer and Designated Person with CROSS, will remind us of the confidential safety reporting system and how it has evolved over recent years. He will discuss the Safety Alert published by CROSS following the Liverpool Echo Arena car park fire in 2017, and reports received on this topic, reflecting on the event at Luton Airport last year

“Thermomechanical Performance of Protected Composite Cellular Beams at High Temperatures”

Mohamed Abdalla, Imperial College London

The study examines the fire performance of a 9m composite cellular beam with regular 200mm openings and a larger 280mm opening near midspan. Using ABAQUS, sequentially decoupled thermal-structural analysis was performed on unprotected and protected configurations under standard and parametric fire curves, including cooling phases. Various boundary conditions assessed axial and rotational restraint effects. Results reveal complex interactions between thermal effects, restraints, and beam geometry, with the large opening significantly influencing failure initiation. The cooling phase introduced additional complexities, including plastic hinge formation. Current simplified design methods inadequately capture these complexities, potentially overestimating fire resistance. Findings emphasise the need for comprehensive analysis in fire safety design guidelines for beams with large openings.

“The new Eurocode 2-1-2 (BS EN 1992-1-2:2023)”.

Jenny Burridge, The Concrete Centre

The second-generation Eurocodes are starting to be published and both parts of Eurocode 2 for concrete design were published at the end of last year. This presentation will introduce the new fire part, the caveats around its use for the time being, and discuss what has changed from the 1st generation code.

14.30 – 15.00 Coffee

“Using stainless steel strategically in key locations of steel framed buildings, for improved fire and post-fire performance”.

Hadi El Samad, University College London

It is widely accepted that stainless steel outperforms carbon steel during a fire, retaining more strength, stiffness and superior ductility both during the fire event and following cooling. This enhanced ductility may enable new load paths to develop, which is crucial for the fire resilience of steel-framed structures. This presentation covers current research on hybrid connections, where carbon steel end plates and bolts are strategically replaced with stainless steel counterparts, significantly enhancing the connection strength and ductility during and after a fire.

“Overview of research on Hot-dip galvanised steel in fire”

Maria-Mirabela Firan, Technical University of Munich

Hot-dip galvanising influences the emissivity of steel. Small- and large-scale fire tests showed that a temperature dependent of emissivity ($\epsilon = 0.35$, $< 500^\circ\text{C}$ and $\epsilon = 0.7$, $> 500^\circ\text{C}$) better represented the compared to the specified global emissivity of $\epsilon = 0.70$ according to EN 1993-1-2. This has been adopted in prEN1993-1-2 (2020). Hot-dip galvanised steel structures, in combination with moderate oversizing, can therefore achieve the required fire resistance class R30 without the need for additional passive fire protection measures. For composite beams, R30 can be accomplished with significantly improved material efficiency and economy by using higher strength steels. These effects have been investigated experimentally at the Technical University of Munich. The research project investigates also the effect of heat development and transfer in full-scale steel I-beams with various bolted connections.

“Updates on timber research from the University of Edinburgh”.

Angus Law, University of Edinburgh

Angus Law will give an update on recent findings and ongoing projects at the University of Edinburgh regarding mass timber construction. This will include studies on flammability, timber soffit behaviour, and decay of timber compartments.

16.30 END