STRUCTURES IN FIRE FORUM

STRUCTURES IN FIRE FORUM – 7TH APRIL 2025

ELM LECTURE THEATRE, THE NUCLEUS BUILDING, KINGS BUILDINGS,

THOMAS BAYES ROAD, EDINBURGH, EH9 3FG

Map location here

SPONSORS:

Attendance at the forums is free thanks to the sponsors and our hosts – The School of Engineering, University of Edinburgh. If you would like to attend this forum or to hear about upcoming ones, please see the links below.

Signup for this forum: https://edin.ac/3EUBtcJ

Sign up for mailing list: https://forms.office.com/e/1HzKdfrBP1

STRUCTURES IN FIRE FORUM – 7th April 2025

ELM LECTURE THEATRE, THE NUCLEUS BUILDING, EH9 3FG

STRUCTURES IN FIRE FORUM

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

10:00 – 10:30 Registration and Coffee

"Loss of composite action in Engineered Wood Products".

Antonela Colic, University of Edinburgh

The presentation covers the factors which can influence loss of composite action in EWP and subsequent heat induced delamination. It is a summary of the 3 years of experimental research and includes bottom-up approach from microscale to intermediate scale. Experiments reflect thermal response, thermo-mechanical response and thermo-hydro-mechanical response of timber, adhesive and their interphase (bond line).

"Composite action of OSB-CFS beam in fire"

Zhuoran Feng, University of Manchester

In the proposed talk, the presenter will explore the fire performance of composite beams made from Oriented Strand Board (OSB) and Cold-Formed Steel (CFS). The session will begin with a review of both experimental and analytical studies that assess how these composite beams behave under fire conditions. Key focus will be on evaluating the validity of ambient design assumptions when applied to fire scenarios. The talk will also cover the adaptation of existing plastic design methods to account for challenges unique to fire, such as buckling and non-uniform temperature distributions. This research aims to enhance the safety and structural integrity of buildings in fire conditions by refining design methodologies for OSB-CFS composite beams.

"Fire Resistance Of Reinforced Concrete Structures Utilising Reinforcement Couplers".

Ahmed Elsharkawi, Ashton Fire

Reinforced concrete (RC) is widely used for its durability and cost-effectiveness. Connections in RC structures, where bar lengths are insufficient, are made using lapped joints or mechanical couplers. The fire performance of mechanical couplers, particularly their strength degradation under heat, is not well understood. This study uses SAFIR software to simulate the fire resistance of RC structures with mechanical couplers sized at 150% to 300% of the bar diameter under ISO 834 conditions. Findings show significant strength reductions in larger couplers, indicating that current design codes like Eurocode 2 may underestimate their thermal response. This necessitates a revision of design standards and further research to optimize coupler dimensions for improved fire safety.

12.00 – 13.00 Lunch

"A round-robin study from 12 UK Fire Services on the fire safety of open-sided car parks: Is current guidance adequate".

Morvarid Koohkhezri, *University of Liverpool*

Recent fires at Liverpool Kings Dock and London Luton Airport challenge the fire safety of open-sided due to better ventilation, suggesting current UK fire safety guidelines possible inadequacy. A review by 12 UK Fire Services highlighted concerns for a specifically designed fire strategy for open-sided car parks based on Approved Document B (ADB). For example, nine out of twelve UK Fire Services recommended increasing current 15 mins fire resistance, or in combination with sprinklers at certain areas due to the risks of modern electrical vehicles (EVs). Automated fire detection systems near EV stations were recommended, along with improved firefighting resources and enhanced evacuation measures.

"A brief historical review of double exposure for internal loadbearing walls".

Vasilis Koutsomarkos, Building Safety Regulator

This talk will present the relevant literature and selected excerpts of how simultaneous fire exposure to structural elements was considered by practitioners. It will test (and welcome comment from the participants) a hypothesis on why some practitioners did not consider it a credible fire exposure in recent times, which was covered by a CROSS report and recent governmental research. The relevant guidance will be briefly presented and the latest technical policy position published via an FAQ discussed.

“Fire safety in existing buildings - knowing what you have and how to know if it’s enough”.

Susan Deeny, Arup

There is a strong demand to increase the life of existing buildings for economic and environmental reasons. In this talk we will explore recent experience on the challenges this can present around (a) the adequacy of fire safety provisions and understanding of performance decades on (b) changes in building use, occupancy risk and fire hazard and (c) developing confidence in as built construction.

14.30 – 15.00 Coffee

“Fire hazards of informal and humanitarian shelters”.

Sam Stevens, Kindling

The diverse materiality of informal and humanitarian shelters presents unique challenges for combatting fire spread. This talk will explore findings from fire experiments of such shelters and examine the extent to which existing numerical approaches can contribute to their quantification and modelling. In particular, it will focus on existing correlations for external venting flame and their validity in fire spread modelling and external heat transfer applications.

“Simulation of fire spread in large compartments under different ventilation conditions”

Stephen Welch, University of Edinburgh

There has been much recent interest in “travelling fires” and their consequences for structural fire design in large compartments. CFD-based fire models based on exact wood crib geometries integrate many of the relevant phenomena, including the solid degradation described by “complex pyrolysis models”. Of particular interest are the mechanisms linking fire spread with compartment scale ventilation conditions, which involve both local phenomena in the burning crib and compartment scale factors via the momentum-driven fluid flows. In this study model predictions are compared with test observations under different ventilation conditions, and the role of pre-heating in enhancing burning rates is examined. Powered by increased computational resources, this approach may offer a cost-effective alternative to expensive experimental tests, providing new insights into the detailed physics underpinning the resultant fire behaviour.

“Structural response of steel-composite structures in under-ventilated travelling fires: numerical insights from the BST/FRS 1993 Fire Tests”.

Zhuojun Nan, TU Deflt

This research utilizes experimental data from the BST/FRS 1993 Fire Test Series to simulate structural responses using the finite element method. The series explored temperature development in structural members under travelling fires, providing essential data for validating heat transfer analyses. A prototype steel-composite structure was also modelled to examine its behaviour under realistic fire scenarios. Findings highlight how spatial and temporal temperature variations impact structural responses, especially near openings and ignition points. This study offers valuable insights into structural behaviour under real travelling fire conditions, contributing to enhanced fire safety design practices.

16.30 END