STRUCTURES IN FIRE FORUM – 29th Sept 2022

IStructE HQ, 47-58 Bastwick Street, London, EC1V 3PS

STRUCTURES IN FIRE FORUM

Provisional Agenda:

10.00 – 10.30 Coffee

"*Fire performance assessment of historical buildings*"

Octavian Lalu, BRE

The presentation is focused on the assessment in fire of existing forms for construction. Many historical listed buildings are going through a refurbishment process or change in use and one of the main challenges is to establish fire resistance. The presentation describes the steps to be undertaken including site investigation, historical evidence and advanced numerical modelling to determine the anticipated performance in fire.

"Effect of Fuel Load on Fire Dynamics in a Very Large and Open-Plan Compartment: x-TWO experiments"

Mohammad Heidari, CERIB

This work presents observations from two fire experiments, x-TWO Part 1 and Part 2 in a compartment with a floor area of 380 m². The fuel load was representative of open plan offices. The fire was observed to travel with clear leading and trailing edges. Flashover was not observed. In Part 1, the flame spread rate was not constant contrary to Part 2. The observed distributions of temperatures were spatially diverse from the homogeneous conditions commonly assumed in structural fire engineering and could lead to different failure times and mechanisms.

"CodeRed experiments - fire dynamics in open-plan compartments with timber ceiling and columns"

Panos Kotsovinos, Arup

The high environmental impact of concrete and steel production means timber is becoming a compelling third option to improve sustainable construction. As architects and engineers explore the speed, quality and human appeal of this sustainable material, fire safety standards and codes are yet to evolve to support low embodied carbon structures. Here I will present a current state of the art overview as well as a series of fire experiments carried out inside a large, purpose-built, open-plan 352 m² compartment. The compartment had a fully exposed, unloaded, cross-laminated timber (CLT) ceiling and glued laminated timber (glulam) columns, made with adhesives that have been tested to not exhibit char fall-off in fire.

"Structural Fire Modelling Strategies for Exposed Mass Timber Compartments and Experimental Gaps for Model Validation"

Harry Mitchell (Imperial), Ethan Phillion and John Gales, York University, Canada

Exposed mass timber is being increasingly used for tall hybrid structures due to its sustainability, construction time, and aesthetic features. However, many knowledge gaps in timber's performance in fire exist. A review of literature primarily published after 2016 determined the state of the art of modelling timber at elevated temperatures. Following this review, an a priori model of a cross-laminated timber (CLT) ceiling subjected to a localized fire was developed to determine what datasets are currently required to better calibrate a model of timber at elevated temperatures. Datasets include the flame spread rate of CLT, the heat flux produced by CLT, charring rates at high heat fluxes, and criteria for the extinction of timber.

12.30 – 13.15 Lunch

"Intumescent coatings – The art of baking, cooking, burning, melting"

Cristian Maluk, Semper, UK

The wide use of thin intumescent coatings embodies an industry solution which enables the fire-safe construction of load-bearing steel structures. This presentation will describe findings on 10 years of research studies focused on investigating applications for which we intumescent coatings can perform as expected, and also find those conditions and fire scenarios for which intumescent coatings don't perform very well. This work is an exemplar on a shift in fire research - not seeking to evaluate the behaviour of a material for a range of fire scenarios, but to actively and strategically find fire scenarios and conditions which may be detrimental to the fire behaviour of a material. The presentation will also describe findings on studies which investigated the behaviour of thin intumescent coatings used on mass timber.

"Curtain wall systems exposed to fire"

Francesca Lugaresi, Imperial College London

Curtain walls are the most widely adopted facade system in modern office buildings; they are lightweight and are easier to erect compared to other facade systems. These facade systems play an important role during a fire and, in the case of their failure, there can be severe consequences. The heat from a fire could cause key facade elements such as the frame, brackets, or glass to fail and sections of the facade to detach and fall from the building, posing a life threat to evacuees, fire fighters attending the fire, and passers-by. In this talk we will describe the effect of insulation inserts and thermal breaks on the thermal and mechanical response of the aluminium frame and discuss the failure mechanisms that can lead to fall-out of the glass panels.

"Steel cladding systems for stabilization of steel buildings in fire"

Kuldeep Virdi, City, University of London

Research projects in recent years, notably EASIE, have led to design procedures for structures stabilised with sandwich panels under non-fire conditions. The contribution that cladding panels make to the resistance and stiffness of frameworks is primarily though their resistance and stiffness in shear. An RFCS research project (STABFI), concluded in 2020, was aimed at developing design procedures for singe storey buildings stabilised with sandwich panels under fire. This presentation describes the proposals, and software developed at City, University of London, for computing the axial resistance of main members so stabilised under fire conditions.

14.45 – 15.15 Coffee

"Experimental investigation into the behaviour of reduced web beam section (RWS) connections in fire"

Katherine Cashell, Brunel University

This presentation will focus on the ongoing work understanding the behaviour of steel moment frames with reduced web section (RWS) connections and elliptical beam web openings under fire conditions. These connections are typically used in steel framed buildings in regions susceptible to seismic events. These beams with reduced cross-sectional area are more ductile connection than the traditional configurations. Whilst there is a good deal of information available on the performance of RBS (reduced beam sections) and RWS connections during a seismic event, there is very little known about their response to fire. This talk will present the details of a recent fire test which was conducted at Tampere University Finland on a RWS connection under fire conditions. The test was designed to investigate deflections, the fire resistance in minutes, the failure mode and the temperature profile and gradient.

"What I learnt when researching the fire resistance test"

Angus Law, University of Edinburgh

Since I first encountered the "standard fire" as an undergraduate I have variously whinged about it, used it, whinged about it, ignored it, whinged about it, and been fascinated by it. The first COVID lockdown meant no lab, no lectures… just me and a computer. Finally, I decided to write something about it. This talk is about what I learnt during the process of reading and writing.

16.15(ish) Close