STRUCTURES IN FIRE FORUM – 9th April 2019

IStructE HQ, Bastwick Street, London

Provisional Agenda:

10.30 – 11.00 Coffee

"*Reuse of waste tyre fibres for fire spalling mitigation*"

Shan-Shan Huang, University of Sheffield

Modern high-performance concrete, increasingly used in tunnels and other important infrastructure, is susceptible to explosive fire-induced spalling. To prevent this, modern codes recommend the use of small quantities of polypropylene fibres in the concrete mix. These fibres can be recovered at the end-of-life of tyres, which are currently classed as hazardous waste. This research investigates the effectiveness of cleaned recycled fibres extracted from end-of-life tyres as a sustainable alternative solution for fire spalling mitigation. Promising initial results have been obtained.

"Restrained perforated beams exposed to fire using virtual hybrid simulation"

Mustesin Ali Khan, Brunel University

The behaviour of restrained composite perforated beams with a profiled slab exposed to fire has not been considered in great detail to date. An FE model is developed utilising the virtual hybrid simulation framework, and the accuracy of the model is validated using available fire test data. The effect of axial and rotational restraints due to the connection type between the beams and columns is also incorporated in the model.

"CREEP BEHAVIOUR OF STEEL AND ALUMINIUM COLUMNS EXPOSED TO FIRE"

Neno Toric, University of Split

Steel grade S275JR and aluminium grade 6082AW T6 columns were exposed to high temperature regimes to examine their creep development. More specifically, the focus of the study is creep behaviour of columns in stationary heating regimes. The study results indicate that high-temperature creep can induce column failure at 400°C (steel) and 160°C (aluminium) when columns are exposed to higher load levels (87% and higher). Furthermore, the short-term creep resistance of S275JR and 6082 T6 columns can be considered low at load levels above 90% of columns; axial load capacity within the temperature regions of 400-600°C (steel) and 160-260°C (aluminium).

"Compartmentation principles and fire stopping installation in buildings"

Octavian Lalu, BRE

The presentation discusses compartmentation principles in buildings. Fire stopping installation represents a key component which can sometimes dictate the performance of the complete assembly. A series of examples of "good and inadequate" fire stopping installation and cavity barriers are presented. The presentation highlights the benefits of using fire doors in case of a real fire. A series of examples are presented showing the key role of fire doors. A short video of a standard fire test (BS EN 1634-1) for a fire door is shown at the end of the presentation.

13.00 – 13.45 Lunch

"Structural reliability of temporary aluminium tented structures"

Tom Molkens, StuBeCo

Most of the actual research on fire resistance is dedicated to structures with a service lifetime of at least 20 years. However, there also exists a legal requirement for temporary (aluminium) structures to reach a certain level of reliability in the eventuality of a fire. It is obvious that the eventuality of an accidental event, such as a fire, must be contemplated and that an acceptable fire resistance should be reached. The presentation deals with the assessment of the behaviour of such structures submitted to a fire. Tools are FDS and SAFIR are used, results will be discussed.

"Fire load density – how to reliably estimate and describe it for fire engineering calculations?"

Piotr Smardz,

Fire load density is an important parameter for structural fire engineering calculations, as it dictates the amount of energy that can be released in a compartment fire and subsequently transferred to structural elements. EN 1991-1-2 provides a methodology for calculating the design value of fire load density and uses this parameter as an input into the natural fire models. In some European countries fire load density is also an important characteristic of a building or fire compartment which is used more broadly to define other fire protection requirements. Despite its importance the fire load density is a parameter rather difficult to predict in a reliable way, as it normally varies throughout the life of a building. It is also used as an averaged value for a compartment, which may be unrepresentative where significant spatial variations are expected. The presentation discusses some practical issues associated with fire load surveys and calculations.

''Behaviour and design of stainless-steel tubular members in fire''

Asif Mohammed, Brunel University London

The material cost of structural stainless steel is about four to six times that of carbon steel, due largely to the expense of alloying elements and relatively low volume production. Currently, design standards as those provided by Eurocode 3 Part 1-2 (2005), use the design formulation for carbon steel members, despite stainless steel having different material behaviour. In this presentation, a numerical modelling study has been carried out on the member behaviour and design of stainless steel columns and beam-columns.

"Hotspots compromising the fire performance of protected primary steelwork: How can an established issue be a new challenge in construction?"

Florian Block and Iolanda Del Prete, BuroHappold Fire Engineering

T*he functionality of intumescent paint is based its ability to expand and char if exposed to heat. Objects located within the expansion zone (such as connected unprotected steelwork) restricts the expansion, thus subjecting the primary steelwork to local increases of temperature, so-called hotspots. Whilst the ASFP and paint manufacturers have been providing hotspot guidelines, the issue appears to be a completely new challenge in the construction field. The presentation will show advanced methodologies applied in case studies, where prescriptive approaches would have led to the substantial re-design of the building.*

16.00(ish) Tea