**FIRE SAFETY DESIGN**

**Monday 28 November – Friday 2 December 2016**

**PROVISIONAL PROGRAMME**

**Monday 28 November 2016**

*Means of Escape / Human Behaviour in Fires / UK and New EU Testing Standards*

08.30 Registration and coffee

09.00 *Regulatory framework*

Nick Troth, Arup Fire

An overview of the development of UK Fire Safety legislation through history and insight into current UK fire safety legislation and guidance.

09.40 *Introduction to compartment fires*

Dr Roth Phylaktou, Energy Research Institute, University of Leeds

Importance of enclosures, phases of fire development, growth period, flashover, fully developed fire.

Relation to life and property safety.

10.35 Coffee

10.50 *Means of escape*

Nick Troth, Arup Fire


Evacuation time, occupancy, the people in the building, number of occupants, density factor, distribution, calculation of minimum number of exits, distribution of alternative exits, staircases, travel distance.

Horizontal and vertical evaluation – Worked Examples.

12.00 Lunch

13.00 *Human behaviour in fire – basic principles, modelling and design*

Dr Jeremy Fraser-Mitchell, BRE

Introduction; Movement speeds and flow rates; Motivation to evacuate; Causes of delay before evacuation; Exit /route choice; Merging flows/contra-flows; Capabilities of disabled people; Design behavioural scenarios. The talk will emphasise which aspects of human behaviour are / are not well understood, and where extra care is required in modelling and design.

15.00 Tea

15.15 *Travel time as an alternative to travel distance*

Jonny Joinson, Design Fire Consultants Ltd

The concept of travel distance as the criteria for assessing the adequacy of means of escape is limited and can be inflexible in use. Moreover, the majority of current design code distances are historic in origin and are not based on modern buildings or the fire safety systems provided therein. Travel time, determined by assessing occupant profile, fire risk, building geometry, passive and active fire protection provisions, generates a more flexible design assessment tool. When applied in conjunction with varying rates of travel a range of travel distances can be defined.

16.00 *Testing standards*

Beth Dean, Exova Warringtonfire

Existing UK and New EU Testing Standards for the classification of materials, including Fire Resistance testing.

17.00 End of day one

19.00 Course dinner

**Tuesday 29 November 2016**

*Detection and Warning Systems, Emergency Lighting and Structural Protection*

08.45 Registration and coffee

09.00 *Detection and warning systems*

Colin Newman, Healthfire Limited

Introduction, types of system, automatic fire detection, principles of automatic fire detection, smoke detectors, radiation detectors, heat detectors, radio-based systems, detector circuits, detector positioning.

10.30 Coffee

10.50 *Case studies on the performance of detection and warning systems*

Colin Newman, Healthfire Limited

An examination of real experiences with detection and warning systems and implications for designers and users of the building.

12.20 Lunch

13.20 *Identifying emergency exit routes using directional sound*

Professor Deborah Withington, Visiting Professor, University of Leeds

Faster evacuation of buildings for sighted, visually and hearing disabled people is achieved when directional sound beacons are used (in addition to conventional fire alarm systems) to locate escape routes and emergency exits.
14.05 Aspects of passive fire protection in building design
David Wickham, International Paint Ltd

15.25 Tea

15.40 Emergency lighting
Dr Roth Phylaktou, Energy Research Institute, University of Leeds
Minimum illuminance levels, defined escape routes, undefined escape routes, response time, glare, identification of escape routes and exits, emergency lighting design, siting of essential escape lighting, siting of additional escape lighting, exercise: siting of essential luminaires.

16.20 Alarm systems and sound level calculation
Dr Roth Phylaktou, Energy Research Institute, University of Leeds
Types of system, audibility, visual alarm, two stage alarms, detector positioning and design for minimum alarm sound levels.

17.00 End of day two

Wednesday 30 November 2016
Smoke Control Systems (Ventilation and Pressurisation)

08.45 Registration and coffee

09.00 Smoke production and methods of control
Stewart Miles, International Fire Consultants Ltd
How smoke is produced and why it can be harmful. Design fires, including experiment based and generic, e.g. t-squared. Air entrainment and fire plumes. Influence of water suppression. Forces that determine the movement of smoke and heat. Tenability criteria and visibility. Outline of methods available to control the effects of smoke.

09.45 Smoke control using applied airflows and pressure differentials
Stewart Miles, International Fire Consultants Ltd
Application of airflows across open doorways and along tunnels to limit the spread of smoke. Employing pressure differentials across compartments to maintain clear escape routes. Combining airflows and pressure differentials for enhanced smoke control. The required airflows and pressure differentials for different applications. The main controlling forces, including those due to the fire itself and those due to environmental factors such as wind and building stack effects. The advantages and disadvantages of different approaches and codes of practice.

10.30 Coffee

10.45 Smoke control for atria and large enclosures
Stewart Miles, International Fire Consultants Ltd
Smoke plumes and layers. Exhaust ventilation to control the smoke layer to allow safe means of escape. Venting of smoke and heat for property protection. Natural and mechanical ventilation options. Controlling the smoke generated by fires in the main enclosure and from adjoining compartments, e.g. a shop unit in a mall. The spill plume. Various atria designs and the smoke control requirements. Calculation methods available, including ‘hand calcs’, zone models and Computational Fluid Dynamics.

12.20 Lunch

13.20 Ventilation of enclosed car parks and loading bays with impulse fans
Paul White, Advanced Smoke Group
The lecture will cover current and forthcoming regulations, standards and guides relating to the ventilation of car parks and loading bays and the options available to the design engineer. The background to impulse ventilation will be explained and its application in car park ventilation. Engineered solutions will also be discussed including smoke control in car parks. Areas of higher risk will also be considered such as stacker systems, LPG driven vehicles and loading bays and what allowances should be made for these.

14.20 Tea

14.35 Smoke control by dilution
Stewart Miles, International Fire Consultants Ltd
How smoke dilution works and the relationship between ventilation and the rate of smoke clearance. Various applications, including post-fire smoke clearance and enhanced systems to assist means of escape. Dilution as an additional component of smoke control system.

15.20 Other fire engineered design examples
Ryan McCreddie, WSP UK

16.20 Hand Calculation Examples of Smoke Control
Dr Roth Phylaktou, Energy Research Institute, University of Leeds

17.00 End of day three
Thursday 1 December 2016

**Extinguishing installations – sprinkler and CO₂ systems**

08.45 Registration and coffee

09.00 **Automatic sprinkler protection systems**
   Allan Macpherson, FM Global
   Sprinkler protection systems conforming to 28th/29th edition of FOC rules and to LPC/BS 5306 Pt 2 1990 and BS EN 12845 standard.

10.00 Coffee

10.15 **Automatic sprinkler protection systems (continued)**
   Allan Macpherson, FM Global
   Types of suppression systems; automatic sprinkler systems; legislation; general considerations; extent of sprinkler protection; types of sprinkler systems; sprinkler heads and spray patterns; sprinkler response time; quick response sprinklers; early suppression fast response (ESFR); sprinkler fusing temperature ratings; sprinkler guards and shields.

11.45 **Sprinkler system design calculations**
   Dr Roth Phylaktou, Energy Research Institute, University of Leeds
   Methods of sizing pipes and water supplies, hydraulic calculation and pipe sizing, full hydraulic calculation, sprinkler arrangements, precalculated sprinkler pipe arrays, sizing the range pipes, sizing of the distribution pipes, equivalent length in pre-calculated systems, calculating distribution pipes in a pre-calculated system, static pressure gain, the life safety requirements for life safety systems.

12.30 Lunch

13.15 **Sprinkler system design calculations (continued)**
   Dr Roth Phylaktou, Energy Research Institute, University of Leeds

14.15 **Carbon dioxide suppression systems**
   Dr Roth Phylaktou, Energy Research Institute, University of Leeds
   General, carbon dioxide characteristics and hazards, types of system, total flooding systems, general design, enclosure, surface fires, deep seated fires, rates of application, distribution, local application systems, general design, quantity and rate of discharge, surface area method, volume method, distribution system, manual hose reel systems, system engineering design, system components, operation, safety, carbon dioxide supply, storage, pipework.

14.45 Tea

15.00 **Carbon dioxide suppression systems (continued)**

15.40 Developing technologies for fire suppression
   Paul Galbraith, Nuclear Risk Insurers Ltd
   The lecture will provide an overview of the latest developments in fire suppression systems, introducing the different methods of fire suppression and the advantages and disadvantages of the different systems.

17.00 End of day four

Friday 2 December 2016

**Fire Safety Engineering (Risk Assessment)**

08.45 Registration and coffee

09.00 **Qualitative fire risk assessment (Fire Safety Order)**
   David Bostelmann, Tenos Ltd
   The Regulatory Reform (Fire Safety) Order 2005 applies to virtually all buildings, including those under construction, and replaced the fire safety legislation, in England and Wales, that controls fire safety in buildings. The Order and Guides that support the Order will be reviewed together with other relevant legislation. The opportunities and difficulties that accompany this risk assessed approach to fire safety will be discussed. A framework for Qualitative Risk Assessment will be presented and BSI PAS 79, which offers a methodology for fire risk assessment, will be introduced. Some of the similarities and differences between the legislation for Scotland and Northern Ireland and that for England and Wales will be highlighted.

10.15 Coffee

10.30 **Qualitative fire risk assessment (continued)**
   David Bostelmann, Tenos Ltd

12.30 Lunch

13.30 **Qualitative design review (QDR)**
   Matthew Salisbury, Michael Slattery Associates
   The Qualitative Design Review (QDR) procedure is at the heart of Fire Safety Engineering and is a qualitative risk assessment method comprising; architectural review, building environment and occupant characterisation, fire safety management, fire safety manual, fire safety objectives, evacuation strategies, acceptance criteria, identification of fire hazards, outputs of QDR, safety investment appraisal.

15.00 Tea
Quantitative fire risk assessment
Matthew Salisbury, Michael Slattery Associates
Standard methods of Quantitative Risk Assessment (QRA) including: hazard identification, consequence analysis, frequency analysis, uncertainties and sensitivity analysis, techniques, fire risks from record of current approach, examples of life safety and financial fire QRA’s.

Questions and answers session
Led by Dr Roth Phylaktou, Energy Research Institute, University of Leeds

End of day five and course