Topic
Fire Emissions and Toxicity
Workshop title
Quantification of Fire Effluent Toxicity
Workshop description
Fire toxicity continues to be the neglected area of fire science. Robust determination of toxic product yields is now available, alongside equations predicting the physiological effects of fire toxicants on humans. In ISO 13571, the Available Safe Escape Time (ASET) can be predicted from the cumulative effect of each of the following four hazards: a) irritant gases b) asphyxiant gases c) visibility through smoke d) effects of heat The first two will be considered in detail. Working to the endpoint where incapacitation occurs, such that the victim can no longer affect their own escape, the effect of each hazard as a function of time will be predicted. A second approach is based on lethality data where correlations need to be made to ensure that, instead of death being the outcome for 50% of the exposed population, the balance of probability is that all victims will be able to escape safely. In each case different safety margins need to be employed to ensure safe escape by occupants. The workshop will cover specific examples, such as the burning of a single armchair in a typical UK living room and show how the victim will be incapacitated by smoke, irritants and asphyxiants, and the order in which those hazards occur. Methods for estimating the toxicity from other products, based on their Euro classification and toxic product yield will be discussed and examples used to see how such estimations may be performed. **The workshop goals are:** • To identify the key toxicants present in fire effluents. • To explain the effects of the toxicants in terms of incapacitation, irritancy and asphyxiation. • To predict the effects of fire effluents on human life. • To estimate the toxicity of burning products from published data.
Who should attend?
Fire safety engineers, fire safety scientists, scientists of related disciplines, regulators, toxicologists, plastics manufacturers
Workshop leaders
Anna A. Stec, University of Central Lancashire, UK AAStec@uclan.ac.uk

Topic
Wildland Fires
Workshop title
Large Outdoor Fires and the Built Environment
Workshop description
Large outdoor fires present risk to the built environment. One example often in the international media reports are wildfires that spread into communities, referred to as Wildland-Urban Interface (WUI) fires. WUI fires have destroyed communities throughout the world and present an emerging problem in fire safety science. Another example are large urban fires that occur after earthquakes. Historically, fire safety science research has spent a great deal of effort to understand fire dynamics within buildings. Research into large outdoor fires, and how to potentially mitigate the loss of structures in such fires, is far behind other areas of fire safety science research. This is due to the fact that fire spread in large outdoor fires is incredibly complex, involving the interaction of topography, weather, vegetation, and structures. At the same time, synergies between fire spread in WUI fires and urban fires have not been fully exploited. Once a wildland fire reaches a community and ignites structures, structure-structure fire spread occurs under similar mechanisms as in post-earthquake urban fire spread. In this workshop, presentations will highlight large outdoor fires throughout the world and explore synergies between these fires. Specifically, each presentation will provide an overview of the large outdoor fire risk to the built environment from each region, and highlight critical research needs for this problem in the context of fire safety science. The workshop will seek to develop the foundation for an international research needs roadmap to reduce the risk of large outdoor fires to the built environment. This workshop will also provide a forum for next generation researchers to contribute to this important topic.
Who should attend?
Fire safety engineers, fire safety scientists, scientists of related disciplines, regulators
Workshop leader
Samuel L. Manzello, NIST, USA **samuel.manzello@nist.gov**

Topic
Evacuation and Human Behavior
Workshop title
New approaches to evacuation modelling
Workshop description
Evacuation model developments have reached a crossroads. They could continue tuning parameters and perform validation studies for the existing most common sub-models in use for the representation of their main behavioural and physical components of evacuation (i.e., pedestrian movement, route choice, etc.) or start incorporating features based on fields of research different than fire safety engineering. In recent years, scientists in research fields outside Fire Safety Engineering have conducted research which is often very relevant to evacuation modelling. What is the potential of models/methods/data/theories from other fields to be integrated in evacuation models? What are the current gaps of evacuation models which need to be addressed? What are the needs of the users/practitioners? This workshop brings together International experts from various disciplines outside Fire Safety Engineering with evacuation modelling experts in order to discuss fresh ideas into the evacuation modelling world. This workshop represents an ideal platform for a dialogue between evacuation model developers, model users, fire safety practitioners, authorities and researchers who are involved in evacuation modelling. The structure of the workshop will include presentations conducted by international scientists who are experts in various areas outside Fire Safety Engineering and that will provide ideas, recommendations, suggestions, models, data, theories and methods that could be implemented in existing and future evacuation models. After each presentation there will be a Q&A session between each scientist and two experts from the evacuation modelling community who will comment about the possible implementation of the proposed ideas into existing and future egress tools. At the end of all contributions, there will be also an open discussion session in which the workshop participants will have the opportunity to present comments and questions directly to the workshop panelists.
Who should attend?
Fire safety engineers, fire safety scientists, scientists of related disciplines, regulators
Workshop leader
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Topic
Fire safety engineering
Workshop title
Better Linking Fire Safety Science and Fire Safety Engineering: Research Priorities for Fire Safety Engineering
Workshop description
Broadly, science is focused on understanding why things work, and engineers are focused on making things work. Engineers need scientists to produce knowledge and data they can apply, but scientists do not always know what the engineers need, and if they are focused on fundamental research, they likely do not care. In many cases, engineers rely on applied research to find answers for specific problems, but funding for applied research can be problematic. Arguably, engineers and scientists can work more symbiotically in an environment of use inspired basic science, as reflected in Pasteur's Quadrant. The interaction between fire scientists and fire safety engineers follows the general trend. Some fire science research is focused primarily on better understanding physical (social or other) phenomena, not particularly with any focus on how it might be used. Applied fire research is undertaken in various organizations, but in some cases it does not get to the broader engineering community, for proprietary or other reasons. Arguably, use-inspired fundamental fire research could yield better outcomes, as suggested by Croce some years ago. About the time of Croce's paper, several research agendas for fire safety were developed (e.g., SFPE, UEF, Fire Forum). However, it is not clear to what extent the identified research has been advanced, the gaps have been filled, and whether new use-inspired research needs exist. To explore the situation, the Society of Fire Protection Engineers (SFPE) embarked in 2016 on review of where the fire research and engineering situation is at: what progress has been made, what gaps exist, and what the fire safety engineering community identifies as research needs to advance the profession. This was a start. Continued dialog is needed between fire safety engineers and fire scientists to better understand what research is possible, where it might come from, how it might be funded, and how it might be implemented into practice. Likewise, discussion is needed between fire scientists and fire safety engineers regarding barriers to implementation of research outcomes: if uptake is lacking, what are the reasons, and how can the barriers be overcome? The aim of this workshop is to continue the dialog between fire safety engineers and the fire scientists, on whom they rely to provide foundational research, data and methodologies. This workshop will feature presentations by fire safety engineers and fire safety scientists on the real and perceived needs of the fire safety engineering profession, the abilities and potential timelines of fire safety science to address the needs, and how the fire safety science and engineering communities can work even more closely than they do today to address critical needs for engineering a more fire safe world.
Who should attend?
Fire safety engineers, fire safety scientists, scientists of related disciplines, regulators
Workshop leaders
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Topic
Structures in Fire
Workshop title
Global perspectives of Timber in high-rise buildings
Workshop description
As the populations of cities grow, the need for resilient high-rise structures becomes increasingly apparent. At the same time, there is a call for sustainable construction practices that reduce environmental impacts while minimizing cost. Wood as a building material has many advantages; it is environmentally friendly, a renewable resource, has low CO_2 emission, is available widely, can be constructed quickly, has a high strength-to-mass ratio, is architecturally appealing, and exhibits good seismic properties. These advantages have led to an increased interest by governments, property owners and developers to use more wood in construction. The widespread use of timber in high-rise construction however is hindered by regulations and design practices concerning the fire performance of timber structures. Research shows that adequate fire performance can be achieved through the engineering of timber assemblies, but regulations are slow to change due to perceived risk associated with large-scale timber structures. Moreover, design practices are still evolving, resulting in a situation in which engineers often lack the tools and training to do performance-based design of high-rise timber structures. The construction of mid- and high-rise timber structures is an evolving practice, and consequently many countries differ in regards to building regulations. Some countries have the same approach for combustible and non-combustible structures, while others describe in detail pre-accepted solutions to achieve the required level of fire safety for timber structures. Acceptable methods to analyse timber structures under fire hazards are also variable depending on location. Thus, the path forward is generally unclear at present. The goal of this workshop is to bring together a panel of international experts on the fire performance of timber structures to spark discussion regarding the evolution of building regulations in countries that have adopted mid- and high-rise timber construction practices, and to share best practices for the analysis and design of timber structures for fire hazards by looking at a few cases in which high-rise timber construction was achieved. The objectives of the workshop are: (1) to share information on how building regulations in different countries ensure the fire safety of mid-rise and high-rise timber structures, (2) to share information on methods of analysis and design that are being used to achieve and document the fire resistant design of timber structures, (3) to identify other barriers to the widespread use of timber in mid- and high-rise construction, and (4) to compile recommendations for those who wish to make the engineered design of mid- and/or high-rise timber structures more prevalent, including the identification of future research needs. A comparison of building regulations from Europe and some other countries will be presented, together with a more in-depth presentation of the building regulations for Canada. The background for the different regulations will also be discussed, and the applicability to real building projects. The fire safety design process for two cases, one from North-America and one from Europe, will also be presented, including the tools and methods used.
Who should attend?
Fire safety engineers, fire safety scientists, scientists of related disciplines, regulators.
Workshop leaders
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