THE ROLE OF FIRE SAFETY ENGINEERING

WHAT IS FIRE SAFETY ENGINEERING?

Fire Safety Engineering (FSE) has been defined as: "the application of scientific and engineering principles to the protection of people, property and the environment from fire" [1]. The key point here is that FSE takes a holistic approach to fire safety, rather than specifiers relying purely on complying with prescriptive regulatory requirements to achieve a particular level of fire safety. It also allows for the assessment of the fire performance of very complex buildings, where the standard methods do not provide the required answers. Simulations may take into account sprinklers, smoke release or possible consequences of smouldering and even human behaviour during escape and/or evacuation. The focus can also be extended to the protection of property, which requires consideration of other factors than life safety.

The occupancy and use of a building have a significant impact on the fire risk. The contents strongly affect the likely rate of fire growth and the intensity of the fire and its impact is generally greater than that of the building construction itself. Using the FSE approach takes these issues into account. FSE methodology can assess the most effective solution to manage the risks rather than presenting a standard fire performance specification for all constructions which may not deal with the particular vulnerabilities of individual projects or lead to the best option in terms of other building design considerations.

The FSE model approach uses proven methods but still allows room for innovation and takes budget and other design constraints into consideration without compromising on levels of safety.

FSE has been applied to individual projects, mostly large and complex ones, however it can also in some countries be applied on a more general basis within a regulatory context.

FSE OPTIONS IN REGULATIONS

For many applications, authorities in European countries (eg. Sweden, UK) recognize the benefits of performance and objective-based codes. This has also been enhanced by the need for increased flexibility in methods of designing cost-effective buildings and transportation vehicles, which use innovative construction materials and still maintain fire safety. Design approaches based on fire safety engineering principles respond to this need.

In several nations, such as Scotland, France or Germany, approval of an insulation product can be granted after demonstrating adequate performance in a large-scale test for certain types of buildings.

[1] BS 7974, 2019: *Application of fire safety engineering principles to the design of buildings. Code of practice*, The British Standards Institution 2019

EXAMPLE FOR FIRE PREVENTION MEASURES [2]

- "Do not store highly combustible materials against external façades or steel-faced composite panels or do not allow rubbish to collect against façades.
- Have damaged walls or sealed joints repaired immediately and make sure that jointing compounds or gaskets used around the edges of panels are in good order.
- Check where openings have been made for doors, windows, ducts and cables to ensure that these have been sealed or closed with flashings and the inner core has not been exposed.
- Check that there has been no mechanical damage e.g. by mobile equipment such as fork lift trucks. Repair any damage that has occurred".

An example in which an authority takes into account scenarios is the UK Regulatory Reform Fire Safety Order 2005, effective since October 2006, which places a greater emphasis on fire prevention in non-domestic premises. A result of this piece of legislation is that a 'responsible person' must carry out a risk assessment of the premises. This fire risk assessment helps the responsible person to identify risks that can be removed or reduced and to decide the extent of the general precautions that should be taken to protect people against the fire risks that remain.

At the time of writing, the process and details of the Regulatory Reform Order has been the subject of a UK government public consultation. If and how this legislation might change in the light of the Hackitt report and the resulting 53 recommendations [3] on improvements to the building regulations and the related processes is not yet known.

The European Commission announced in late 2018, that they are considering preparing for implementation of fire safety engineering in the framework of the CPR. Regarding the use of a fire engineering approach in building regulations the DG GROW is negotiating with DG JRC a contract to:

[2] *Insulated Panels, The Fire Safety Order (2005): Advice and guidance on insulated panels for responsible persons and enforcers implementing the Regulatory Reform (Fire Safety) Order 2005*, EPIC (February 2007), p. 14. N.B.: EPIC is the UK association of producers of factory-engineered steel faced composite panels. Brochure downloadable from: www.epic.uk.com

[3] Independent Review of Building regulations and fire safety: Final report May 2018 and Interim report December 2017, https://www.gov.uk/government/publications/independent-review-of-building-regulations-and-fire-safety-final-report; https://www.gov.uk/government/publications/independent-review-of-building-regulations-and-fire-safety-interim-report

- examine the feasibility of a European fire safety code ("Firecode") using fire engineering principles and by analogy to the Eurocodes (safety level remains for the Member States);
- examine the current CEN work and the current ISO work in order to mandate to CEN the development of European fire design standards and/or recommend the use of the ISO work in Member States regulations;
- develop guidance and training for engineers.

Based on this work it can be expected, that in future FSE will be applied to a greater extent than now in all European countries.

System-based tests are important and can be very useful, provided that they are designed in an appropriate way. The scope needs to be meaningful and needs to cover valid information respecting the base fire safety engineering principles.

The scale of the test should be adapted to the purpose. For the large-scale tests – which are usually complex and expensive – it is important to consider extrapolation and even deemed-to-satisfy evaluations. Fire Safety Engineering principles can be very helpful in the further development and use of system-based testing.

POSSIBILITY OF TRADE-OFFS IN FIRE SAFETY ENGINEERING

Good building design weighs up all of the different construction demands to find the optimum balance between safety and performance, functionality and aesthetics, cost and longevity. If the focus concentrates too heavily on a single aspect there is a danger of over-specification in some areas and neglect in others. The possibility of a 'trade off' helps to mitigate this, for example installing sprinklers as a fire safety measure could allow for a greater open internal space, or the specification of a thermally higher performing insulation in the walls and roof safely within the balance of risk.