Included as standard

With the final report on building regulations and fire safety due soon, **Peter Barker** argues the importance of passive protection and its critical role in life and property protection

INCORPORATING THE correct passive fire protection in the buildings in which we live and work should not just be viewed as a building regulation requirement. It is something that should be considered fundamental to constructing buildings that are capable of safeguarding people's lives and property.

Fire resisting products and systems should be manufactured in accordance with supporting documentation; as designed, approved and tested; with initial installation and subsequent maintenance carried out and assured by specialist personnel who have the requisite knowledge; and to a high standard of workmanship and quality.

Whilst there are companies that can demonstrate good practice in the field of passive fire protection, and can manufacture and/or install/maintain products and systems that are compliant and to the standard required by the building regulations, there are still a significant number that do not. Unfortunately, as for any life safety system, it only takes one element or component to fail and the entire system is jeopardised.

In the case of passive fire protection, failure could for example include structural collapse; rapid or unplanned fire and/or smoke spread within and outside of the building; compromised means of escape; loss of business and property; loss of important or critical public services (eg air and rail transport, hospitals); and ultimately loss of life and injury to people in and around the building.

This article examines the importance of considering passive fire protection as a system based approach, with examples of why seemingly small construction details can be critical for the item of passive fire protection to provide the required level of fire resistance.

Fire resistance

Fire resisting products and systems are tested against benchmark test standards (typically such as the BS 476 series, European Normative and ISO standards, as appropriate) in order to quantify their ability to resist fire in terms of containment (eg integrity), thermal transmittance (insulation) and/or load bearing performance[1].

Test conditions are standardised and, while they provide a means of establishing the fire resistance capabilities of particular products, these conditions are currently only representative of one possible fire exposure condition at the fully developed fire stage. Therefore, they are unlikely to be experienced in a real fire scenario due to the number of variables that affect fire growth, such as fire load, compartment size, ventilation conditions and availability of oxygen.

The objective of benchmark fire test standards is to provide reproducible test conditions (heating and pressure) for construction products, such that their fire resistance can be established in terms of time (eg 30 or 60 minutes) against the criteria of the standard, which can then be used to satisfy the functional requirements of the building regulations.

For the reasons given above, this time is a measure of the construction products' performance at elevated temperatures, but may have little direct relationship with the duration of a real fire. Specialist fire engineers are able to review the appropriateness of such building or site specific conditions, and consider time equivalence and other design criteria under the functional approaches to fire safety design and meeting building regulations.

Furthermore, testing only provides information on the product or system that was tested and any identical replication of such a product or system. As such, it offers no extension to scope such as alternative configurations, dimensions, and modifications to design – aspects that are likely to be required for different building scenarios and user requirements.

Engineering assessments in lieu of fire tests (also known as global assessments and field of applications) are documents that are written by competent and experienced engineers in the field of fire testing, structures and materials. These independent professional engineering reports provide scope for interpolating and extrapolating the results achieved in the fire test/s, but the conclusion of the engineering assessment will still be written and quantified in terms of likely fire resistance performance, in minutes, to the relevant fire test standard.

The engineering assessment of performance or field of application, and the associated test evidence, can then be used to show compliance with the requirements specified in Approved Document B and other codes of practice such as BS 9999 and the BS 7974 series, which serve to satisfy the functional requirements of the building regulations and are linked to building design.

Third party certification of fire resisting products and systems, as well as specialist installers, offer a greater level of assurance that the fire resisting construction product and system is capable of providing its performance as originally assessed and tested, although this process is not currently mandated in UK building regulations[2].

Compliance and systems

A fire resisting product claiming 30 minutes' fire resistance performance is therefore capable of 30 minutes' fire resistance performance to the relevant test standard. Any adjustments to the specification of the product outside of the supporting documentation (eg engineering assessment, field of application or test evidence) could lead to a failure.

Of equal importance is the correct installation of the product: fire resisting construction is only as good as its weakest link, and often it is the installation of fire resisting products that undermines the proven capabilities of the product.

All elements of fire resisting construction must be considered as systems – a complete design constructed in accordance with the supporting evidence of performance for the element of construction. These elements include fire doors; glazed screens; fire stopping materials for service installations; fire rated ducts; dampers; roller shutters; operable fabric curtains; ceiling systems; load bearing walls and floors; dry wall partitions; cladding; fire retardant coatings; structural steel and engineered joists.

Adopting a piecemeal approach to passive fire protection could, at best, result in a tortuous and potentially expensive sign off process at building handover (assuming it is picked up on); or, at worst, critical life safety systems being installed that are likely to fail in the event of fire.

Fire resisting products are only designed to be used once, which is why they need to be right first time. The following are a few examples of fire resisting construction products in which the systems approach was not followed, as a result of poor specification, manufacture, installation or ongoing maintenance, and which were subsequently fire tested to the relevant test standard:

1. Incorrect use of expanding polyurethane foam to seal around cable trays. The foam was proven for use as a linear gap seal for four hours' fire resistance, but when tested around a cable tray to the same temperature and pressure conditions, it provided 12 minutes.
2. Modified toughened glass incorrectly fitted in a glazed screen with incorrect expansion allowance, and with too large edge cover from the glazing beads. Glass capable of 30 minutes' fire resistance when correctly installed, was subsequently tested to BS 476: Part 22: 1987, and failed within four minutes.
3. A fire rated letter plate proven for 30 minutes in solid timber door construction. The same letter plate, incorrectly fitted within a tubular chipboard core, subsequently failed in 15 minutes when tested to BS 476: Part 22: 1987, as reacting intumescent flowed into the tubes within the core.
4. A 30 minute fire resisting door with head rail removed (leaf adjustment should have been from bottom of leaf only) provided less than 20 minutes when subsequently tested to BS 476: Part 22: 1987.

In the examples cited above, fire resisting products were used, but because they were not compatible or had not been tested as they

were being used on site, they were unable to provide the required level of fire resistance. In some instances, non fire resisting products are used instead of proven products, while in others, fire resisting products are omitted altogether, particularly those items that are in 'closed up' areas and out of sight when the building has been completed (eg cavity barriers and penetration sealing in risers and ceiling voids). Arguably there is a construction, design and management (CDM) issue here for designers regarding access, inspection and maintenance.

Cultural shift

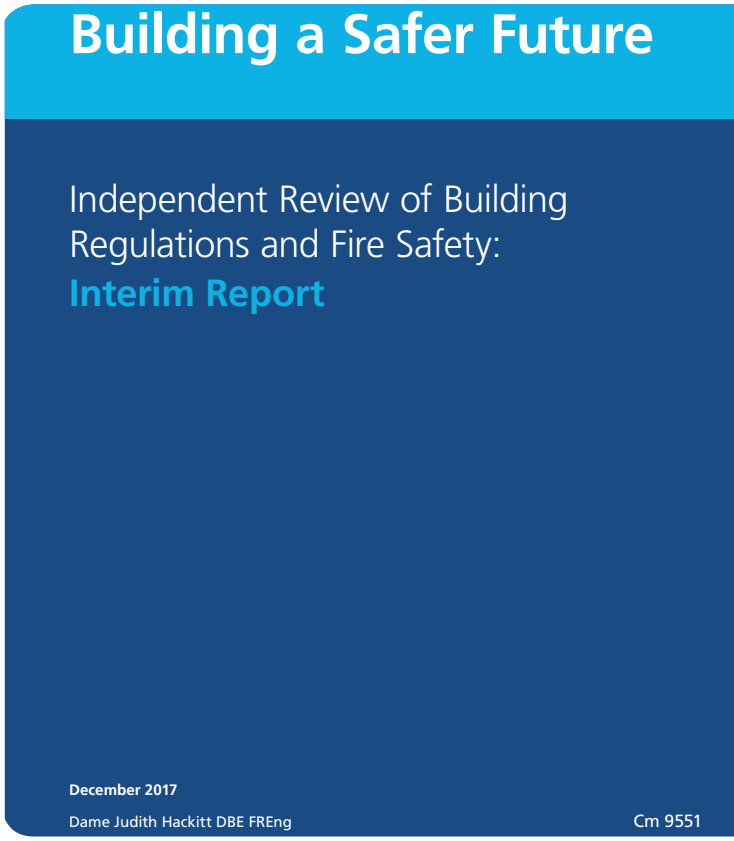
Dame Hackitt made the point that, in order for any changes that follow the building regulations review to have a lasting legacy of safer buildings, there will need to be a full cultural shift in our approach to constructing buildings[3]. The question that we should be asking in the fire safety industry is: how can we effect this change?

A number of the issues raised in the interim report to the building regulations have been recognised and known in the fire safety industry for decades – it shouldn't have to take a fire on the scale of Grenfell, with the resulting tragic loss in life, for things to change. This being said, nothing is done unless there is a driver, be it penalties, cost or other motivation. However the IFC Group has always argued that with life safety, drivers should not be retrospective after the event has occurred, as this is too late when dealing with the lives of people and their safety.

Passive fire protection, as well as other aspects of fire safety in the built environment, needs to be at the forefront of good construction practice, where corner cutting and poor workmanship is considered totally unacceptable. Specialist, competent manufacturers, installers and maintainers of fire resisting products need to be the norm, where third party certification is the minimum barrier to entry when it comes to fire resisting products and installation.

Apprenticeships and training in passive fire protection also need to be high on the agenda in colleges and other educational establishments offering qualifications in the construction industry, not only to make people aware of the industry as a viable and rewarding career path, but also to help fill the widening skills shortage in this sector.

All tradespeople that are involved with service installation, whether network system engineers or plumbers, need to be trained and made aware of the importance of maintaining fire compartment lines for means of escape and protection. Staff within offices and public buildings, as well as landlords and tenants must be made aware of the contribution they can make to fire safety within the buildings they work and live in.



Fire safety should not just be cost and regulation driven – it should be recognised by government and the public as a specialist part of the construction industry, providing a critical life safety protection system to which everyone should be entitled as a basic human right ■

Peter Barker is fire safety manager and a team leader at International Fire Consultants Ltd, IFC Group. **For more information, view page 5**

References

1. BS 476-20: 1987 (incorporating amendment No. 1) *Fire tests on building materials and structures. Method for determination of the fire resistance of elements of construction (general principles)*
2. See 'The golden thread', *Fire & Risk Management*, March 2018, pp.36-41, Peter Barker
3. *Building a Safer Future, Independent Review of Building Regulations and Fire Safety: Interim Report*, Presented to Parliament by the Secretary of State for Communities and Local Government by Command of Her Majesty, December 2017