Design considerations for Internal Fire Protection – an Architect's perspective

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Introduction

Internal fire protection elements, including passive and active fire protection measures, are vital in providing fire safety for the occupants of a building in the event of a fire. Effective fire protection measures not only ensure an adequate standard of life safety, but also provide a level of protection to property that includes:

- the protection of building fabric and content;
- the preservation of business continuity; and
- the protection of heritage and environment assets.

All aspects of a building's lifecycle, including design, construction, and maintenance, are equally important in providing fire-safe buildings. This is reflected in the most recent fire safety reforms under the Building Safety Act 2022. The Gateway regime required for Higher Risk Buildings, which includes high-rise residential developments,[1] provides a strengthened regulatory framework during the design, construction, and occupation of the building.

Designers play a critical role in ensuring that buildings are equipped with adequate fire protection systems and features. In order to achieve a comprehensive and holistic approach to fire safety, various factors need to be considered from regulatory compliance to human behaviour in emergency situations.

This article explores key considerations for the implementation of internal fire protection measures within buildings from the perspective of an architect, with a particular focus on Passive Fire Protection ("**PFP**"). It also considers the connection between fire protection and business continuity, emphasising the need for proactive planning and integration of fire safety measures into overall risk management strategies.

[1] Buildings meeting the height threshold of 18m or more, or having seven or more storeys.

Setting out requirements

PFP measures play an important role in the event of a fire by (amongst other things) limiting the spread and effects of fire and smoke, assisting in fire rescue operations, and protecting escape routes. The most common examples of PFP measures include:

- compartment walls and floors;
- fire-resisting construction elements (such as fire-rated partitions, doors and glazing);
- fire-stopping seals to gaps and penetrations through fire-resisting elements;
- cavity barriers within concealed voids; and
- structural fire protection.

The relevant regulations and guidance governing internal fire protection in England are included in the Building Regulations 2010 (as amended in 2022) ("**the Building Regulations**"), and Approved Document Part B Volumes 1 and 2, 2019 edition (with 2020 and 2022 amendments) ("**ADB**"). ADB sets out "*practical examples and solutions on how to achieve compliance for some of the more common building situations*",[2] but in unusual, non-standard, and/or more complex situations, there may be a need for alternative methods of demonstrating compliance with the 'functional' Requirements of the Building Regulations, including a fire safety engineering approach.

The primary aim of the Building Regulations is "*to ensure a reasonable standard of life safety in a fire*".[3] ADB states that "*the protection of property, including the building itself, often requires additional measures* [and] *Insurers usually set higher standards before accepting the insurance risk*".[4] Whilst the aspect of a building's design relating to insurance is not mandatory, in certain circumstances a project can demand more demanding requirements than the life safety standards set out in the Building Regulations and ADB. For example, in historic buildings, secure archiving facilities, data centres, cultural institutions (art galleries and museums), or industrial/ commercial sites, in order to minimise damage to the heritage building fabric, and/or to reduce the impact of a fire on the contents (historical collections, equipment and the like) and/or business continuity.

In those circumstances, it is important to note that "*provisions solely for life safety are unlikely to provide the full level protection to buildings and property in a fully developed fire scenario*".[5] Guidance and publications have been prepared to assist designers/ architects involved in projects where 'higher' best practice standards and framework are required, including BS 9999: 2017 'Fire safety in the design, management and use of buildings: Code of practice' ("**BS 9999**") or 'The LPC Design Guide for the Fire Protection of Buildings: A code of practice for the protection of business' ("**the LPC Design Guide**"). The above publications are clear, however, that if there is a conflict between the 'fire safety' and 'business-led' requirements, the safety of the occupants must take precedence.

Business continuity

The impact of fire incidents on business operation and continuity can be severe, leading to loss of reputation and customers, financial, legal, and regulatory penalties, or closure of business. BS 9999 states that "*the primary method for examining the potential for property and business loss should be **a risk assessment**… to provide a link between the provisions for life safety and those for property protection and business continuity*".[6] In other words, the risk assessment process involves assessing the inherent risks, determining the objectives

[2] Approved Document B Volume 2: Buildings other than dwellings, 2019 edition, incorporating 2020 and 2022 amendments, PDF, pg.5.
[3] Approved Document B Volume 2: Buildings other than dwellings, 2019 edition, incorporating 2020 and 2022 amendments, PDF, para.0.7, pg.12.
[4] Approved Document B Volume 2: Buildings other than dwellings, 2019 edition, incorporating 2020 and 2022 amendments, PDF, para.0.7, pg.12.
[5] BS 9999: 2017 'Fire safety in the design, management and use of buildings – Code of practice', PDF, pg.19.
[6] BS 9999: 2017 'Fire safety in the design, management and use of buildings – Code of practice', PDF, paras.A.1 and A.2, PDF pg.271.

for property protection, and identifying criteria/controls required to keep the risk at a level that is acceptable to the client/client's insurer. The process should be undertaken by either the owner/occupier (as self-assessment), a suitably competent member of the design team, an insurer's fire specialist, or a fire safety engineer.[7]

BS 9999 and the LPC Guide provide details of the risk assessment process and list the following aspects of the business that should be considered:[8]

- *"occupancy":* the building's usage, layout and processes;
- *"estimated values at risk":* building structures and content;
- *"surroundings":* building's type and proximity to other sites;
- "*fire protection":* augmentations to fire protection systems; and
- *"security":* site requirement.

Whilst there may be minimal scope for an architect during the risk assessment process, the collated information and identified strategies should form part of a Project Brief to inform the architectural design of internal fire protection at later stages of the project.

Design considerations for Internal Fire Protection

The requirements and strategies for the project should be decided at an early stage of the design process. The LPC Design Guide recommends "*early and close*" communications between the client, designers, and insurer, to provide "*the opportunity of discussing and developing the most cost-effective passive and active fire protection measures appropriate to the specific property and business protection needs*".[9] The purpose of early liaison is to ensure proper coordination between all parties and stakeholders involved in the design decision-making process. This also allows for any additional objectives that go beyond life safety to be identified and agreed upon with the client.

On a typical project, a fire safety strategy report is produced which "*should include the key assumptions and conditions that underpin the design*".[10] The next step involves translating the agreed requirements and standards into 'physical' fire protection proposals by designing and specifying products and systems, which when installed correctly, would meet those requirements/standards.[11] BS 9999 sets out the following key points for a designer to consider as part of the design process:-[12]

- Reviewing procurement options, including roles and responsibilities of the key parties. By way of an example, in a 'traditional' arrangement, an architect/designer is likely to be involved throughout the project (from design to completion), whereas if a 'Design and Build' procurement is adopted, the building is typically delivered by the Contractor and its design team, based on the Employer's Requirements ("**ERs**") / performance-based specification set out by the Client.

- Understanding the building lifecycle issues, beyond design and construction, such as the need for maintenance. This would include a reasonable allowance for the fire protection elements to be properly

[7] BS 9999: 2017 'Fire safety in the design, management and use of buildings – Code of practice', PDF, para.A.3, PDF pg.272.
[8] 'The LPC Design Guide for the Fire Protection of Buildings. A code of practice for the protection of business', Section 1.4.2 'The risk assessment process', PDF, pg.11.
[9] 'The LPC Design Guide for the Fire Protection of Buildings. A code of practice for the protection of business', Section 1.3 'Risk management considerations', PDF, pg.9.
[10] BS 9999: 2017 'Fire safety in the design, management and use of buildings – Code of practice', PDF, para.7.2, pg.50.
[11] The proposals are typically recorded in the scope of work documents, drawings and written specifications, either a performance / output based specification setting out the required performance or a prescriptive specification identifying a specific product / system.
[12] BS 9999: 2017 'Fire safety in the design, management and use of buildings – Code of practice', PDF, para.7.2, pg.50.

inspected, tested, maintained, repaired, and/or replaced without compromising the recommended fire performance.

- Ensuring that specified products and systems are appropriate for the end-use of the building, including durability issues, and that they have appropriate test reports demonstrating their fitness for the proposed application.

- Ensuring that the proposed fire-resistance periods and criteria are appropriate. For example, different fire-resistance criteria apply to a structural steel member that becomes part of the compartment wall than to a steel element which is only required to maintain its loadbearing function.

- Addressing the detailing and buildability of various fire protection elements so they correctly interact with each other and with the other construction elements (services, structure, and the like) once installed. This would include the interface and junction arrangements between different specialist trades, including the allowance for damage and repairs during the installation of the adjacent elements.

- Ensuring that there is an appropriate level of interaction and coordination between different specialists sub-contractors and that their roles and responsibilities are clearly defined and understood.

Conclusion

Identifying the appropriate fire protection requirements at an early stage of the project is an important part of the design development. This includes mandatory fire safety and, where required, the protection of property/business continuity. Clearly defined requirements and strategies will allow the designer to implement adequate internal fire protection measures having regard to all three aspects of the building's life; design, construction, and maintenance.

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