



## Technical information

# Historic buildings and fire safety

### 01 Introduction

Fire is the single greatest threat to the fabric and contents of any building and, in the case of a historic building, the loss of any authentic fabric in a fire is irretrievable <sup>(1)</sup>. It is vital therefore to minimise the likelihood of fire, by early elimination of major risks, or careful management and control over risks that cannot be eliminated.

Fires in historic buildings are not unusual and statistics show that between January 2002 and June 2006, an average of seven UK heritage buildings per month were lost or damaged as a result of fire <sup>(2)</sup>.

Also, whilst it is important to preserve the nation's finite stock of historic buildings and artefacts from both a cultural and economic viewpoint, the life safety of occupants, visitors and staff must not be forgotten and indeed should take precedence when considering fire risk.

The central question, therefore, is how can a historic building be protected from the threat of fire with minimum intervention to the original fabric, yet remain accessible and safe for public use?

### 02 Approved Document B and historic buildings

Approved Document B, Building Regulations for Fire Safety (ADB), is one of a series of documents that has been approved and issued by the Secretary of State for the purpose of providing practical guidance with respect to the requirements of the Building Regulations for England and Wales. However, in terms of life safety, property protection and artefact retrieval, historic buildings have specific challenges to face and rarely do they 'fit' the prescriptive nature of the information given within ADB.

In fact, it is recognised in ADB that the most appropriate means of ensuring life safety from fire in a historic building is to take into account a range of fire safety features and set these against an assessment of the hazard and risk specific to the building.

It is highly likely that to achieve this, the building and its occupants will need to be managed, and the passive and active fire safety systems within the building will have to be physically upgraded and improved. The strategy that forms the basis of this approach is the process of fire risk assessment and fire safety management.

### 03 Fire risk assessments (FRA)

Under the requirements of the Regulatory Reform (Fire Safety) Order 2005 in England and Wales, a suitable and sufficient fire risk assessment is required for all premises, other than private dwellings. It is of paramount importance that a well-structured and properly implemented fire safety management plan accompanies the assessment.

The essential components of a fire risk assessment and fire safety plan for a historic building can be broken down into the four steps: preparation, prevention, protection and management. There is no standardised format for recording or presenting the findings of a risk assessment or safety plan, but in every case the aim should be to produce clear and comprehensive documentation that is regularly reviewed.

The suite of fire safety guides from the Department of Communities and Local Government contains useful guidance on some of the methodologies used for presenting fire risk assessments.

#### 3.1 Preparation

Before undertaking a FRA it is necessary to obtain accurate plans of the building, as this will not only save time and effort in the long run, but can also be useful when preparing business continuity plans, inventories of artefacts, cleaning regimes and security assessments.

The plan of the building will form the framework for the FRA and fire safety plan and should contain information on the existing fire safety measures (if there are any), compartment lines, exit routes, room usage, location of artefacts, hidden voids (disused chimneys, goods lifts, panel infills etc.), potential ignition sources and flammable materials.

The task of risk assessing and planning is made considerably easier if careful consideration is given to the building plans at the outset. Ultimately it will be the building plans, with relevant and up-to-date information on hazards, fire fighting equipment and salvage strategies that will form the basis of how the fire and rescue service will respond in the event of a fire.

#### 3.2 Prevention

Clearly, preventing a fire in the first place is the ideal situation, and is the first stage of physically assessing the fire risk within the building. By identifying potential ignition sources and flammable materials, and either removing them or introducing alternative methods or systems, the risk will be greatly reduced. Putting in place remedial measures can be relatively inexpensive and involve minimum intervention in the fabric of the building.

**Among the relevant questions to ask when looking at preventing fire within a historic building include:**

- When were the electrical circuits last tested and have all appliances, both fixed and portable, been tested for safety?
- Are all drapes/curtains/tapestries a suitable distance from potential ignition sources such as halogen lamps?
- If smoking is allowed outside the building, have adequate precautions been taken – for example, dedicated smoking shelters located away from the building?
- Are waste and/or flammable materials appropriately stored?
- Is there a significant threat from arson and can it be deterred?

#### 3.3 Protection

Once the risk of fire has been mitigated, as far as practicable, protective measures should be introduced in order to safeguard occupants, the property and important artefacts.

Although the fire safety guidance in ADB can be difficult to implement for historic buildings, the philosophy behind the five sections (B1-B5) of Part B of the Building Regulations comprehensively covers all aspects of fire protection within a building.

Therefore, by dealing with each of the requirements in turn, and introducing practical solutions suited to the building and its contents, a holistic fire safety strategy can be developed that will not only satisfy the functional requirements of the Building Regulations, but also ensure a safer environment for occupants, reduce the risk of fire, and minimise the impact of fire, should one occur.

When it comes to historic premises, protective measures are often controversial because they can be disruptive to the original fabric of the building, and the physical installation of the systems can sometimes be difficult.

It is possible, however, to take suitable protective measures that are sympathetic to the historic fabric, but which can also be designed for individual premises. It is

highly recommended that a third-party approved company with a proven track record of installations in historic buildings is appointed.

Examples of protective measures, their relationship to the five sections of Part B and common issues and potential solutions with respect to heritage buildings are given in the tables below.

Common issues in historic buildings	Potential solutions
<p><b>Room geometry can render British Standard recommendations for use of detectors unsuitable.</b></p> <p><b>Large windows or ornate ceilings can allow a large flow of air over detectors, preventing them from responding quickly enough.</b></p>	<p>Careful selection of detectors can greatly improve the chance of detecting a fire before it becomes too large. Beam detectors can cover large areas with relatively few detectors and reflectors, reducing the disruption to the fabric of the building. Wireless systems can be used in areas of a historic building where the installation of wires is not acceptable or possible. The location of the detector must also be considered to avoid environmental conditions, such as air flow, influencing the efficacy of the detector.</p>
<p><b>Installation of systems disruptive to historic fabric of building.</b></p>	<p>'Hidden' aspirating detectors have been used in historic buildings whereby the detector head is concealed within a wall or ceiling and therefore minimises aesthetic impact. Aspirating detectors continually sample the air and will decrease the time it takes to detect a smoke signal.</p>

Table 1: B1 – Means of warning and escape

Common issues in historic buildings	Potential solutions
<p><b>Variation of linings – exposed brick, timber panelling, wall-hung fabrics.</b></p>	<p>Repositioning of wall-hung fabrics away from key circulation areas and escape routes will greatly reduce the risk of fire spread and smoke compromising evacuation from the building.</p>
<p><b>Enhancement of timber linings and panelling by surface applied treatments affecting the original fabric of building.</b></p>	<p>By only upgrading the fire performance of timber panelling (in terms of reaction to fire classification – class 0, class 1, etc.) in key circulation areas and escape routes as identified in the fire risk assessment, the impact on the historic fabric will be minimised.</p>

Table 2: B2 – Internal fire spread (linings)



Buckingham Palace – an example of a large and complex historic building where preparation will be key before undertaking a fire risk assessment.



Windsor Castle – the fire in 1992 occurred due to poor on-site work practices and is an excellent example of why fire prevention is central for all fire risk assessments. The restoration programme cost approximately £40 million.

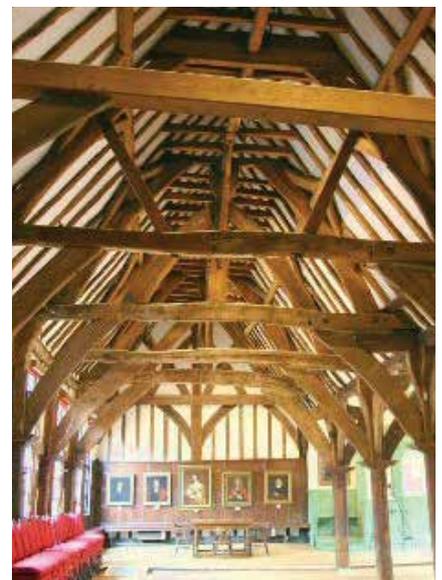


St Pancras International in London (3) will be used by over 45 million travellers every year and relies on having the latest high-performance fire detection and alarm technology and an extremely robust fire safety management plan.

Common issues in historic buildings	Potential solutions
<p><b>Installation of fire stopping measures can involve removing ornate panelling and can potentially affect the airflow within a building, creating problems with moisture and damp.</b></p>	<p>Taking care to install fire stopping measures at critical junctions with minimum disruption to the aesthetics of the panelling. If it is necessary to remove original or ornate features a restoration specialist should be consulted. It may also be worth taking advice from a historic building specialist.</p>
<p><b>Installation of fire suppression systems can be disruptive to the fabric of the building and water resources and tanks can be limited or difficult to site.</b></p>	<p>Active suppression systems need to be carefully considered and designed with respect to the location of the sprinkler heads, pipes, water resource, the building and its contents to ensure they are able to control a fire should one occur.</p> <p>Ensuring availability of first-aid fire fighting equipment and comprehensive training of staff in its use. The appropriate fire extinguishers and blankets, when used correctly, can tackle the fire at source and prevent it from becoming serious. First-aid fire fighting equipment requires little or no interference with the fabric of the building.</p>
<p><b>The use of sprinkler systems can be damaging to valuable artefacts and archived objects/materials.</b></p>	<p>Use of an oxygen reduction system will avoid damage to valuable artefacts and archived objects/materials. If appropriate to the risk, a water-mist suppression system will apply considerably less water than a sprinkler system.</p>

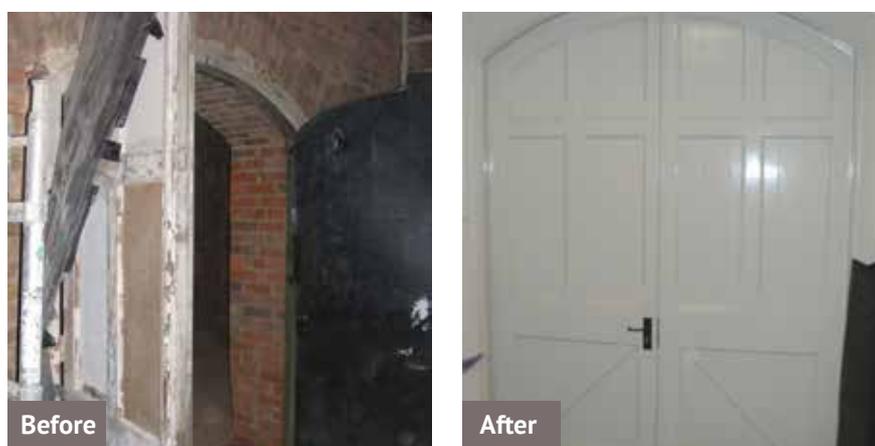


Early warning of fire is especially critical in historic buildings because of hidden voids, construction materials and suitability of escape routes.



Socket backing boxes can allow sound to pass in and out of walls.

Table 3: B3 – Internal fire spread (structure)



An example of restoring and upgrading the fire resistance performance of historic doors at St. Pancras International. (3)

Common issues in historic buildings	Potential solutions
<p><b>Risk of external fire spread predominantly applicable to buildings with combustible facades – limited to working with existing fabric of building, options for upgrading fire performance is limited.</b></p>	<p>Surface applied treatments for timbers are available but consideration should be given to their maintenance as they will often need reapplying on a regular basis due to weathering effects – ultraviolet degradation and freeze-thaw.</p> <p>Water-mist suppression systems have been used to shroud a building in water mist to prevent fire from engulfing it, such as wooden churches, parts of buildings such as thatched roofs, and historic timber ships.</p>



External fire spread must be considered, particularly for those buildings constructed with combustible materials and located adjacent to woodland.



All artefact salvage plans must be developed in co-operation with the local fire and rescue service.

Table 4: B4 – External fire spread

Common issues in historic buildings	Potential solutions
<p><b>Access for fire tender vehicles can be limited. Historic buildings can be remote from nearest fire and rescue service.</b></p>	<p>Liaise with local fire and rescue service regarding access and facilities to develop an agreed ‘planned response’. If access to the building is restricted, it may necessitate attendance by a different type of tender vehicle with specialist equipment.</p> <p>Accurate site plans with access points and other important information need to be supplied to fire and rescue service to maximise efficiency on site.</p> <p>Develop artefact salvage plans in co-operation with the local fire and rescue service.</p>
<p><b>Limited water resources (no fire mains).</b></p>	<p>Use local resources such as lakes or rivers, rather than relying on a potential inadequate mains supply.</p>

Table 5: B5 – Access to facilities for the fire brigade

### 3.4 Management

Poor management can render the most comprehensive risk assessment and protective measures ineffectual. Therefore, once the risk assessment has been completed and suitable protective measures are in place, a robust management system, in the form of a fire safety management plan, must be drawn up.

**Key points:**

- Measures identified during the prevention step are regularly reviewed/revisited to prevent fires from developing
- Maintenance schedules to ensure the protective measures put in place are still capable of performing as intended

- Comprehensive and regular training of staff in evacuation procedures, raising the alarm, first-aid firefighting and salvage plans
- Emergency drills must be performed and any shortcomings recorded and rectified as soon as possible
- Periodic review of the risk assessment and fire safety management plan, especially after a change in use of the building or a 'near-miss' incident.

Artefact salvage plans need to be considered for historic buildings and for this it is vital to meet with the local fire and rescue service to devise appropriate emergency procedures. The fire and rescue services have been asked to consider artefact salvage through their Integrated Risk Management Plans (IRMP's) and will obviously need to know priority items, location and what members of staff form the salvage team and any training that they may have had.

All staff involved with salvage operations must be fully trained and made aware of the risks and dangers involved with such tasks. Regular salvage drills should be undertaken, with any problems recorded and remedied as soon as possible.

A business continuity plan should be integrated within the fire safety management plan so that, in the event of fire, restoration work can proceed as quickly as possible. Being prepared for an emergency will significantly improve recovery rate.

## 04 Co-operation and conservation

Safeguarding our heritage from the ravages of fire should be considered as conservation of our historical record for future generations. Providing that there is co-operation between all persons with a vested interest (e.g. building owners, the fire and rescue service, fire safety consultants, historians, architects, staff and visitors), historic buildings and the treasures within will be preserved and enjoyed for many years to come.

## 05 Further information

- [www.trada.co.uk](http://www.trada.co.uk)
- [www.historic-scotland.gov.uk](http://www.historic-scotland.gov.uk)
- [www.english-heritage.org.uk/FReD](http://www.english-heritage.org.uk/FReD)

## 06 References

- 1 The Principles of the Conservation of Historic Buildings (BS 7913: 1998)
- 2 The Cost of History: Fire Risk Management Journal (February edition 2008)
- 3 St Pancras International is owned by London & Continental Railways. St Pancras International was designed and project managed by Rail Link

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testing@bmtrada.com



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+44 (0) 1494 569800