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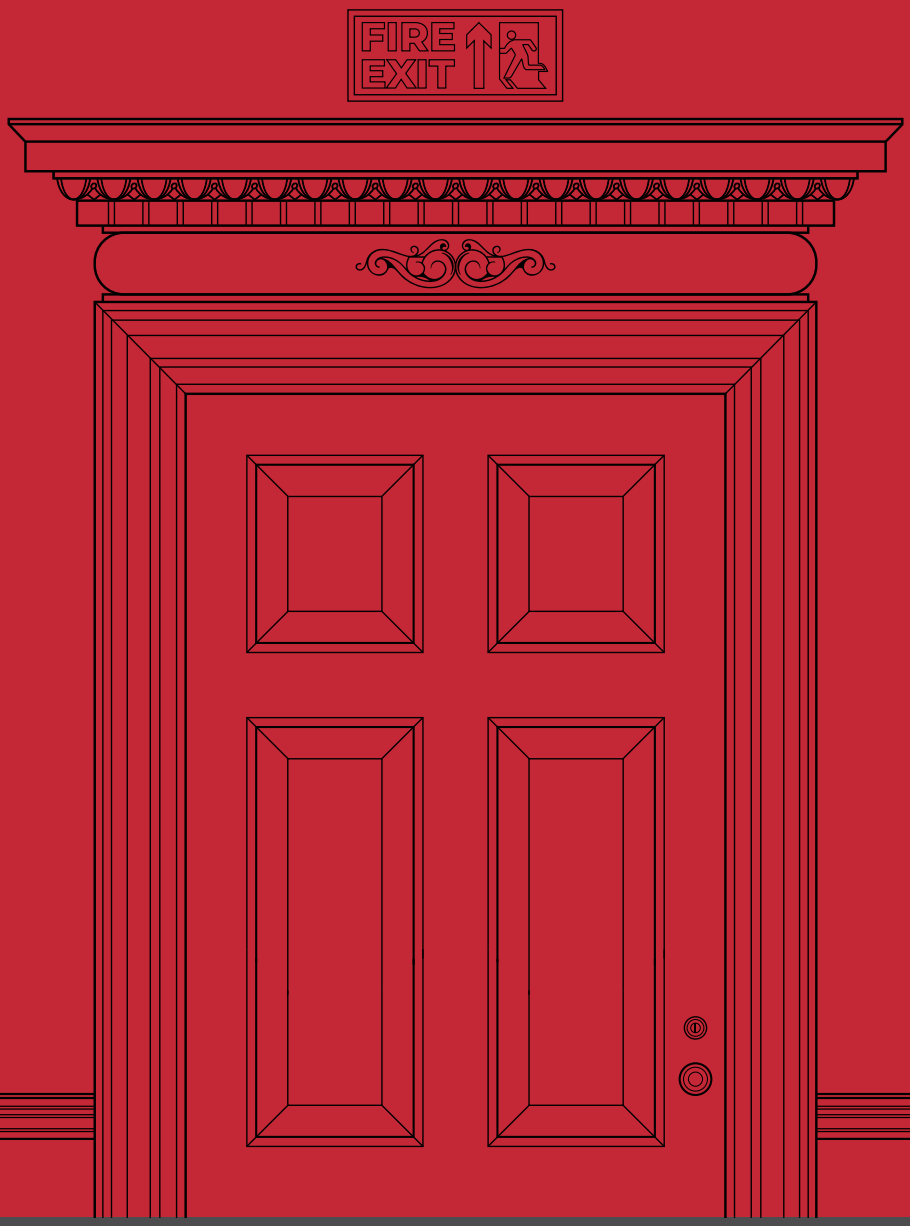
Short Guide

# FIRE SAFETY MANAGEMENT IN TRADITIONAL BUILDINGS FOR DUTYHOLDERS

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# Contents

# 1. INTRODUCTION

## 1.1 SCOPE OF THE GUIDE

This Short Guide is intended to help those with responsibilities for historic buildings to be aware of their duties in fire safety management, and to provide practical guidance for complying with the requirements of Scotland's fire safety legislation. Specifically, this guide will help 'dutyholders' (defined as employers, landlords or anyone with some control over a premises) better understand their duties and how to meet these in the context of historic buildings.

Fire is a significant threat to all buildings in Scotland and especially to older structures; the loss of historic buildings through fire is a significant cultural loss to society. The immediate consequences of fire include injury, death, distress and economic losses. For fires affecting traditional or historic buildings there are additional cultural impacts, such as the loss of building fabric, interior finishes, priceless collections, and social impacts. Total destruction of a building and its contents can occur in a matter of hours, causing losses that can never be replaced. Interest in and concern about the impact of fire on the built environment has been steadily gaining momentum since the fires at Uppark House in 1989[1] and Windsor Castle in 1992[2] and has been reinforced by more recent fires at Notre Dame (2019) and Cameron House Hotel (2017), the latter resulting in two fatalities.

While fires in high-profile historic properties such as the Glasgow School of Art (2014 and 2018)[3] and Edinburgh Old Town (2002)[4] tend to capture the headlines, fire can affect all traditional buildings, from urban tenements to farm steadings. Traditional buildings are generally considered to be those built before 1919[5] using traditional construction methods and materials: load-bearing masonry walls, pitched roofs covered in a natural roofing material such as slate, single-glazed timber-framed windows, internal timber and lime plaster finishes, and passive ventilation systems. The term 'traditional buildings' covers a broad range of structures and not just those referred to as listed (a building of special architectural or historic interest included in a list compiled by the Scottish Ministers), historic or considered 'heritage'. Scotland has 479,000 traditional buildings, comprising 19% of the total domestic building stock,[6] according to the 2019 Scottish House Condition Survey. Only 3% of these are formally protected by the listing process.

Any building, whether new or old, can fall victim to fire, but traditional buildings are particularly vulnerable as they were often constructed without regard to fire safety, before the introduction of regulatory systems. The construction techniques and materials, undivided roof spaces and combustible internal linings may all contribute to this vulnerability. A history of unchecked alterations, such as ad hoc modifications of electrical systems and increased electrical loading, can create additional vulnerability.

Protecting the historic environment from fire often requires innovative interventions that are sympathetic to the need for conservation while achieving an appropriate standard of fire safety. This publication does not aim to provide prescriptive guidance or detailed specifications; rather, it seeks to help dutyholders understand their responsibilities.

## 1.2 DUTIES AND DUTYHOLDERS

This document is intended to help those with responsibilities for historic buildings, called 'dutyholders' (usually employers, managers or owners) to discharge their duties under fire safety legislation. Dutyholders have responsibility for fire safety within their premises, and they must plan for fire safety, review fire risk and take action to eliminate or reduce fire risk. Box 1 provides key extracts from Scottish Government guidance that summarise who the dutyholders are and what their fire safety duties are. [7, 8]

### BOX 1: DUTIES, DUTYHOLDERS AND ENFORCEMENT

**Duties**

Part 3 of the Fire (Scotland) Act 2005, along with the Fire Safety (Scotland) Regulations 2006, sets out the fire safety duties in respect of the majority of non-domestic premises in Scotland.

The legislation requires the provision of fire safety measures; this includes risk reduction measures, means of fire warning, firefighting, escape, staff training and instruction, as well as emergency procedures. It sets out fire safety responsibilities and seeks to ensure the safety of persons from harm caused by fire.

The list below is a summary of the general requirements imposed and is not intended to be comprehensive; anyone in doubt about their legal obligations may wish to seek further advice:

- assessing the risk from fire;
- identifying the fire safety measures necessary as a result of the assessment of risk;
- implementing these fire safety measures, using risk reduction principles;
- putting in place fire safety arrangements for the ongoing control and review of the fire safety measures;
- complying additionally with the specific requirements of the fire safety regulations;

- keeping the fire safety risk assessment and outcome under review; and
- record keeping.

**Dutyholders**

The responsibility for complying with the fire safety duties in premises sits with the employer and other persons who operate or have control of the premises to any extent. This may include managing agents, landlords and tenants, factors, owners, and managers and staff. Contractors and volunteers working on site may also have some responsibilities through their degree of control or responsibility for safety systems. [...] Persons with fire safety responsibilities are referred to generally as 'dutyholders'.

Under fire safety law, all dutyholders are required to take all reasonable measures regarding the safety of persons on the premises. Employers additionally have a specific obligation to ensure the safety of employees in the event of fire, so far as is reasonably practicable. This means that fire safety measures need to be taken to address risk, but not to the extent that the cost, effort and other disadvantages associated with the provision of fire safety measures would be disproportionate to the risk to life. In this respect, a judgement is made about the cost of measures being proportionate to the resulting risk reduction, not the capacity of a dutyholder to pay.

Where premises or responsibilities are shared, each employer or other person who has control over any part of the premises must co-operate and co-ordinate to inform each other of risks and comply with fire safety law.

If the requirements of fire safety law are not complied with, the omission may constitute a criminal offence with a penalty of a fine or imprisonment.

**Enforcement**

The enforcing authority for this legislation is the Scottish Fire and Rescue Service. [...] They may do anything necessary to allow them to enforce the provisions of the legislation. This includes entering premises, inspecting, requesting information, records or assistance, copying or removing documents, carrying out measurements or tests, taking samples, dismantling articles, and taking possession of an article for examination or evidence.

The Scottish Fire and Rescue Service has the power to take more formal action in certain situations. This could involve: issuing an Enforcement Notice that requires specified action to be taken; issuing a Prohibition Notice in cases of serious risk so that the use of all or part of the premises is prohibited or restricted until specified matters are remedied; or reporting the matter for prosecution.

## NOTES

1. 'Fire-damaged house is restored to former glory – Uppark, West Sussex', *The Times* (9 Jul 1994), p 20.
2. 'Windsor blaze almost engulfed entire castle – Windsor Castle fire', *The Times* (12 Apr 1993), p 8.
3. *Fire Investigation Report: The Glasgow School of Art, 15 June 2018*, Cambuslang: Scottish Fire and Rescue Service (2022).
4. 'Fire devastates Edinburgh's Old Town', *The Guardian* (9 Dec 2002).
5. Stewart Kidd, *Guide for Practitioners 7: Fire Safety Management in Traditional Buildings, Part 1: Principles and Practice*, Edinburgh: Historic Environment Scotland (2010), p 5.
6. Ailie Clarkson, Rucha Amin and Claire Wood, *Scottish Housing Condition Survey: 2019 Key Findings*, Edinburgh: Scottish Government (2020), p 16.
7. *Practical Fire Safety Guidance for Existing Non-Residential Premises*, Edinburgh: Scottish Government (2022).
8. *Practical Fire Safety Guidance for Existing Premises with Sleeping Accommodation*, Edinburgh: Scottish Government (2022).

# 2. LEGISLATION, POLICY AND GUIDANCE

## 2.1 FIRE SAFETY LEGISLATION

Buildings are both physical constructs which enclose spaces, and areas where work and recreation happens. Fire safety regulation and legislation aims to protect life through a combination of passive and active fire precautions that form part of a building's construction. In addition, there are statutory procedures and management regimes that are designed to pull building fabric and management process together.

Fire legislation in Scotland may be divided into two categories:

- Legislation that covers the creation of new buildings and building work on existing buildings. These are the Building (Scotland) Regulations 2004, also known as the Building Standards.
- Legislation that covers the operation of buildings. This is the Fire (Scotland) Act 2005 and the Fire Safety (Scotland) Regulations 2006.

This guide is primarily concerned with the operation of buildings and provides practical guidance to those with responsibility under this legislation. However, fabric changes can be a part of improving the operation of buildings, and the process of managing fire risk is ongoing. This guide will also provide examples of fire safety measures successfully installed in various historic or listed buildings. The intent is to show how a variety of measures can be used to achieve improvements in fire safety within a traditional building context. Where substantial interventions are being made, it is recommended to seek further advice about Building Standards (Section 2.3).

## 2.2 WHO DOES THE LEGISLATION APPLY TO?

For properties with legislative requirements under the Fire (Scotland) Act 2005, the responsibility for compliance sits with the dutyholders, those with some control of the premises.

The legislation exempts private dwellings from various provisions. For example, it is not required to perform a risk assessment in your own private home. However, some aspects of other legislation do apply to private dwellings. Specifically, since 2022, all houses (including private dwellings) are required to have interlinked fire and smoke alarms.[1 2]

Owners of private dwellings must be aware that if there is any commercial activity within the home, they may fall under the wider remit of the Fire Safety (Scotland) Act 2005 and be a dutyholder. For example, where a private dwelling forms part of a business (even though there may be no employees) or a room is made available to paying guests, even for a few weekends annually, then the premises may no longer be considered a 'private dwelling' and are likely to require a short-term let licence from the local authority. Similarly, houses of multiple occupation (HMOs) and premises used for the provision of care home services are not exempted and therefore fall under the remit of the Act. For premises providing sleeping accommodation for paying guests, guidance produced by the Scottish Government may provide some relevant information.[3]

Other activities that may make a building subject to legislation are weddings, shooting parties, workshops, courses, retreats, etc. An example of this might be a country house that has recently taken to having paying guests in the holiday season (Figure 1). The legislation does not extend to those working from home if the principal use of the premises remains a private dwelling. For small commercial enterprises, guidance produced by the Scottish Government may provide some relevant information.[4]


**Figure 1.** An example of where a review of fire safety management should occur: an A-listed tower that has recently started to take paying guests. *Image: The Landmark Trust.*

## 2.3 BUILDING STANDARDS

The primary regulatory tools for achieving fire safety are a fire safety risk assessment and its subsequent actions. This approach requires assessing the fire risk in each premises and, so far as is reasonably practicable, implementing fire safety measures.

It is possible that the actions that arise from the fire risk assessment may require building work. In such cases, the work should comply with the requirements of the Building (Scotland) Regulations 2004.

The regulations set out the standards for the design and construction of buildings, including provisions for fire safety. They apply to new buildings and where existing (or historic) buildings undergo an alteration or change of use. Plans for such changes must be passed to the local authority for building warrant approval, as part of the design process. The regulations focus on building design to ensure adequate measures to restrict the spread of fire, allow occupants to evacuate, and facilitate firefighting.

The building regulations distinguish between domestic and non-domestic buildings. Generally, the risks in a domestic building are higher due to the nature of its use.[5] However, this guide covers both domestic and non-domestic buildings, as the principles remain relevant for older buildings of all types.

The Procedural Handbook and the Domestic and Non-domestic Technical Handbooks published by the Building Standards Division provide guidance on achieving the standards. They list the options for achieving compliance through the 'functional standards' (see Box 2), which allow a degree of flexibility, although they are often confused for being actual regulations. This is acknowledged in the Procedural Handbook, Section 3.9.9: "For historic buildings and traditional buildings, the judgement of what is reasonably practicable must be made in a wider context".

For more specific guidance on what can be deemed as "reasonably practicable", please refer to Historic Scotland's Guide for Practitioners 6: Conversion of Traditional Buildings. Application of the Scottish Building Standards, published in 2007 (due to be updated by 2026). This publication is statutorily recognised as a guidance document to the 2003 Act. Additional material is available in the Historic Scotland publication Guide for Practitioners 7: Fire Safety Management in Historic Buildings. It should be noted that the necessary fire precautions identified as a consequence of a fire risk assessment may differ from the fire precautions documented in the Technical Handbooks. This is because the fire risk assessment is building specific, while the Technical Handbooks are necessarily more general.

**BOX 2: THE 'FUNCTIONAL STANDARDS'**

The Scottish Government provides guidance on the process and procedure for compliance with the building regulations. They note that:

*The building regulations are expressed in terms of 'functional standards'. These standards are statements of functions the completed building must fulfil or allow. For example, 'every building must be designed and constructed in such a way that there will not be a threat to the building or the health of the occupants as a result of moisture penetration from the ground'. The intention is to permit a variety of ways of complying. In this example, the standard does not specify, for example, 'the floor must have a damp proof membrane', as this may not always be relevant. What is needed for compliance depends on the materials chosen, the site conditions, and the use of the building.*[6]

## 2.4 APPLYING THE STANDARDS TO TRADITIONAL BUILDINGS

Many common fire safety precautions are designed primarily for new builds. Attempting to implement such precautions within traditional buildings can present challenges as tensions arise between protecting historic fabric and achieving an adequate standard of fire safety.

For example, certain standard fire precaution measures, such as inserting partitions or escape stairs, can adversely impact a building's cultural significance, as can retrofitting new hardware systems, such as emergency escape lighting. In listed buildings, this impact is usually assessed through the listed building consent (LBC) process (see Section 2.5).

However, there may be many possible ways of achieving an adequate standard of fire safety. Where additional fire safety measures are required in traditional buildings and proposed 'standard' measures cause unacceptable damage to a building's historic character, thought should be given to alternative fire precautions that may deliver the same standard of safety. With careful planning and consultation, legal requirements can be met while protecting the cultural significance of a building.

## 2.5 CONSENTS AND PERMISSIONS FOR PROTECTED BUILDINGS

Any fire safety improvements that may affect the character of a listed building will require listed building consent. Planning permission may also be required for most works to the outside of a building or structure, including in a conservation area. A dialogue should be started with the local authority development management team early in the design process to establish the principles of the proposed changes.

The Historic Environment Policy for Scotland (HEPS) sets out policy principles for considering impacts on the historic environment when changes are proposed. Our Managing Change Guidance Note on Fire and Historic Buildings gives advice on how these principles apply to fire safety measures.

Similarly, details from the Building Standards Division Technical Handbooks, which are used for building warrant compliance, may not be suitable if these require excess intervention or the loss of historic building fabric. Sections 5 and 6 of this Short Guide provide some information about how interventions may be made sensitively within a traditional building. More substantial information may be found in Guide for Practitioners 6 and Guide for Practitioners 7.

## 2.6 PROTECTION OF PROPERTY

Fire legislation is primarily designed to protect life and not property. Compliance with the legislation guarantees that the life safety provisions meet the legal minimum; however, protection afforded to historic building fabric or contents may be limited. In historic buildings, further precautions may be necessary to provide an appropriate level of protection for the building and its contents against the effects of fire. Duff House, reopened to the public as a country house gallery in 1995, has a sophisticated fire detection system (Figure 2) which, while configured to protect life, is also designed to protect the contents in parts of the building.


**Figure 2.** Duff House in Aberdeenshire has an air aspirating fire detection system designed to protect the contents as well as the occupants. The system features a sampling point that is constantly sampling the air for smoke particles, allowing for a fast response to a potential fire.

## NOTES

1. *Fire and Smoke Alarms: the Law*, Edinburgh: Scottish Government (14 Aug 2024), www.gov.scot/publications/fire-and-smoke-alarms-in-scottish-homes.
2. 'Satisfactory Fire Detection', *Tolerable Standard Guidance: Satisfactory Fire and Carbon Monoxide Detection*, Edinburgh: Scottish Government (2023).
3. *Practical Fire Safety Guidance for Existing Premises with Sleeping Accommodation*, Edinburgh: Scottish Government (2022).
4. *Practical Fire Safety Guidance for Existing Non-Residential Premises*, Edinburgh: Scottish Government (2022).
5. *The Causes of Fire Fatalities and Serious Fire Injuries in Scotland and Potential Solutions to Reduce Them – Phase 1: IRS Review*, Watford: BRE (2019).
6. *The Scottish Building Standards: Procedural Handbook*, 3rd edn, Edinburgh: Scottish Government Building Standards Division (2019).

# 3. FIRE SAFETY MANAGEMENT

At the heart of delivering fire safety is ensuring that people are alerted to a developing fire and that they are able to promptly escape to a place of safety. This is often achieved through a set of physical fire protection and alarm measures, but there are also management and system requirements that bind the fabric, the fittings, the equipment and the users of a building together. This is called fire safety management, and it can be defined as the application of a disciplined systematic strategy and plan to ensure that the risks of fire and its potential consequences are minimised. In a historic or listed building, such a structured, holistic approach allows consideration of alternative compliance solutions that are sensitive to the historic fabric and contents while delivering an adequate level of fire safety.

Fire safety management will vary in scope according to the size and complexity of the building, but it can be summarised in five components and actions that are required in the development of a fire safety management plan for a building:

1. **Roles and responsibilities** – who is required to do what. See Section 3.1.
2. **Preparation** – the fire risk assessment process. See Section 3.3.
3. **Prevention** – steps to prevent fires starting and an outcome of the fire risk assessment process. See Sections 3.4–3.5.
4. **Protection** – responding to a fire. See Sections 4–7.
5. **Review** of the completed arrangements at appropriate intervals. See Section 3.6.

Effective management is critical to the success of any strategy. Whatever fire safety provisions are in place, they can be seriously compromised by poor management. For example, an advanced detection and alarm system may fail if management procedures are not in place to ensure that it is regularly serviced, or if it functions properly but staff are not trained in the correct actions.

Every traditional building is different, in terms of both its special cultural and historic significance and its anticipated fire performance. Fire performance varies depending on building complexity, construction materials, fire load, the building's use and its occupancy profile. Analysing the problems that exist in a building enables a fire safety strategy to be specified that is appropriate to that building. For example, salvaging artefacts would be a major concern in a museum setting, while in a commercial premises business continuity may be the primary driver.

As fire safety management is an ongoing process, reviews are important and are never considered 'finished'. The following sections will briefly discuss each of the five aspects of fire safety management.

## 3.1 ROLES AND RESPONSIBILITIES

As more than one person can have fire safety responsibilities, it is important to have clear designation of duties and lines of communication, and to assign overall accountability.

**Dutyholders** typically know their premises best in terms of both the activities which are undertaken (and their hazards) and the nature of the traditional building. However, they may not have the necessary knowledge, skills or experience to ensure that adequate levels of fire safety are achieved. For example, they may not know how best to undertake a fire risk assessment, identify appropriate remedial measures or formulate an overall fire safety strategy for the premises.

Dutyholders should therefore carefully consider their own skills, knowledge and experience and whether they are able to discharge their duties without seeking additional help from specialists. For example, a dutyholder might appoint a fire safety manager and/or a fire risk assessor to assist them in discharging their duties.

A **fire safety manager** may be appointed to develop and/or implement an organisation's fire safety management strategy. The post can be combined with similar functions such as security or safety; smaller organisations may expect an existing manager to undertake this duty. Additional staff may be appointed as fire marshals or wardens to assist the fire safety manager. Appropriate training should be provided to those with dedicated fire duties. The fire safety manager may also have the skills, knowledge and experience to undertake the fire risk assessment; otherwise, this could be undertaken by a different individual.

The **fire risk assessor** is the person who undertakes the fire risk assessment and makes recommendations about any improvements that are necessary in order to improve fire safety within the premises. As noted above, this activity might be undertaken by the dutyholder, or a competent individual may be appointed to perform the risk assessment. The risk assessment process is described in more detail below.

## 3.2 SUPPORTING DOCUMENTS

To help document roles and responsibilities, it is recommended that the dutyholder facilitates the development of some baseline documentation. This includes the following:

### 3.2.1 The fire safety policy

A written fire safety policy should reflect management's commitment to providing a safe working environment and to adopting measures

which are appropriate to the historic nature of the property and its contents. It should address the following priorities:

- Safeguard occupants from death or injury in the event of fire.
- Safeguard the building fabric and contents though the adoption and installation of suitable systems.
- Provide and maintain appropriate fire safety protection measures according to the use of the building and occupancy profile, as identified through a fire risk assessment. See Section 3.3.
- Provide comprehensible information to occupants.
- Ensure fire safety training requirements are met.

### 3.2.2 Fire safety management plan and fire safety logbook

This is an overarching collection of documents that brings together the other elements of fire safety management. It will usually incorporate information about building fabric, physical protection systems and management procedures. It is a working document which is an effective way of demonstrating compliance with legal responsibilities in relation to fire safety. A fire safety logbook records fire safety arrangements including: fire risk assessment, fire protection systems and equipment maintenance records, staff training, fire evacuation drills, enforcing authority audit reports, safety provisions for special events, and any liaison with the Fire and Rescue Service. Also included would be an improvement plan, if the fire risk assessment had identified that improvements were required.

All fire protection equipment and systems should have a separate record sheet of tests and maintenance in the logbook to allow oversight and checking. Any past use of asbestos will have an impact on fire safety, so its location must be mapped to ensure that firefighters and those involved in salvage operations are not endangered by this hazardous material.

### 3.2.3 Emergency fire action plan

This document sets out the actions that staff and others should take in the event of an emergency. Additional details of the supporting documentation are provided in Section 4.

## 3.3 THE FIRE RISK ASSESSMENT

The fire risk assessment is a core component of a fire safety management strategy and lies at the heart of the current fire legislation. The fire risk assessment can be expressed as a seven-step process (see Table 1) and is described in detail within Scottish Government guidance.[1]

This Short Guide is not intended as an exhaustive guide to fire risk assessment. If dutyholders are undertaking a fire risk assessment for themselves, then the purpose of this section is to provide some information about key parts of the process and serve as a signpost to other government guidance.

It is also common for dutyholders to appoint an external fire risk assessor. However, it can be very difficult for a dutyholder to judge the competence of companies and persons who advertise their services.[2, 3] The fact that a person or company is operating in the fire sector, or that someone has previous fire service experience, does not mean that they are a competent risk assessor,[4, 5] as the task of fighting a fire is very different from preventing one from starting or growing.

When considering a fire risk assessment, it is important to commission the right professional with the right background. Many fire professionals have a background in compliance only; this can lead to a range of prescriptive solutions involving physical adjustments to remedy perceived weaknesses in the building fabric. A 'whole building' approach from a fire safety management point of view will give a very different assessment, resulting in a less invasive intervention.

As traditional buildings are very different to modern buildings, it's extremely important that when appointing an external fire risk assessor, you take the time to carry out research and ask suitable questions. Your fire risk assessment must be carried out by a competent person or assessor with experience and an understanding of fire safety within traditional buildings.

The guidance on fire risk assessment below is primarily intended to assist dutyholders when interacting with appointed (or potential) fire risk assessors. This will help dutyholders to check that the advice they are receiving accords with norms for fire risk assessment.

The fire risk assessment process is documented extensively in Scottish Government publications. It is a seven-step process:

1. Identify people at risk
2. Identify potential causes of fire
3. Evaluate risk
4. Decide if fire safety measures are adequate
5. Formulate improvement plan
6. Record findings
7. Review.

Dutyholders should be aware that any building with paying visitors staying overnight is termed as 'sleeping risk', and the fire precautions with building occupants who are not familiar with the internal layout are more demanding.

An outline of the fire risk assessment process is shown in Table 1. The text has been angled towards a listed building in non-domestic use such as a hotel or visitor attraction, although elements concerning historic features and finishes, as well as contents, are referred to.

## TABLE 1: OUTLINE OF THE FIRE RISK ASSESSMENT PROCESS

**1. Identify people at risk**

This requires an evaluation of the occupancy profile.

- Is there a sleeping risk?
- Are there spaces where large numbers of people gather?
- Are there vulnerable groups such as young persons, the elderly, people with disabilities, lone workers or visitors unfamiliar with the premises?

**2. Identify potential causes of fire**

Ignition sources include:

- Electrical wiring systems
- Electrical installations and appliances
- Overloaded circuits
- Naked flames – candles, open fire, gas cookers, discarded smoking materials
- Heating appliances
- Lightning protection
- Wilful fire raising
- Hot works during construction or repair
- Lithium-ion batteries being charged.

Sources of fuel include:

- Waste paper, wood, kindling, cardboard, textiles
- Seasonal and religious decorations
- Flammable liquids, such as cooking oils, oil fuels and paint
- Flammable gases, such as aerosols and LPG
- Stored materials
- Combustible wall and ceiling linings
- Medical oxygen.

**3. Evaluate risks**

Fire risk has two components: the likelihood that a fire may occur, and the potential to cause death or injury (consequence). With the people at risk and the potential for fire evaluated in the previous steps, the evaluation should seek to evaluate the consequence of the fire for the people.

The evaluation would typically include:

- an evaluation of the likelihood of fire starting
- an evaluation of the consequences to people from the fire.

The risk assessor may also seek to evaluate the consequence to the property as part of the assessment.

When evaluating likelihood and consequence, it would be typical for the risk assessor to consider how rapidly people may be alerted about the presence of a fire and their ability to escape before coming to harm. This might include considering:

- the location and functionality of detectors and alarms

- the potential for escape routes to be compromised by a growing fire or by smoke
- the facilities available to evacuate vulnerable building users.

**4. Decide if fire safety measures are adequate**

Once the risk has been evaluated, a judgement must be made about whether the fire safety measures are adequate and/or whether there are additional fire precautions that can be taken which are reasonably practicable.

It is important to recognise that absolute safety cannot be achieved. The fire risk assessor must therefore make a judgement about what is reasonably practicable given the level of risk.

**5. Formulate an improvement plan**

Once the risk has been assessed and a judgement made about whether additional fire precautions are needed, an improvement plan can be created.

The improvement plan is the mechanism whereby the fire risk assessment can be acted upon. An improvement plan will typically prioritise work and resource allocation based on the level of risk (as identified in the fire risk assessment). It will typically document what actions should be taken, in what order, and over what timescales.

The improvement plan may encompass both actions by management and changes to the building fabric. These could relate to:

- Removal or reduction in sources of ignition
- Removal or reduction in fuel
- Limitations on access or number of people
- Changes or improvements to detection and alarm systems
- Provision of firefighting equipment (eg fire extinguishers)
- Improvements to passive fire protection (eg staircase compartmentation or fire doors)
- Addition of means of escape and/or signage
- Identification of temporary measures during other construction work, including detection and compartmentation
- Changes to management of fire safety measures and processes
- Changes or improvements to staff training and fire drills.

As noted above, some physical improvement may constitute building work, in which case the work should be carried out in accordance with building regulations procedures.

**6. Record the findings**

It is a requirement of the Fire Safety (Scotland) Regulations 2006 that records should be kept of the fire safety arrangements. The records that should be kept are:

- Significant findings from the fire safety risk assessment
- The resulting fire safety measures and action to be taken
- Persons who are especially at risk
- Fire safety arrangements for the effective planning, organisation, control, monitoring and review of the fire safety measures.

**7. Review**

Fire safety is an ongoing endeavour. The fire risk assessment should be regularly reviewed as part of the ongoing operation of a premises. In addition, any changes either to the building fabric or the use of the building should trigger a review of the fire risk assessment. Changes that might prompt a review of the risk assessment include:

- A change in the number of people present or the characteristics of the occupants
- Changes to work procedures, including the introduction of new equipment
- Alterations to the building, including the internal layout
- The introduction or increase in the storage of dangerous substances.

Similarly, a fire event (or near miss) should trigger a review of the risk assessment. Even where the dutyholder has appointed an individual to undertake the fire risk assessment, the dutyholder remains responsible for ensuring that it is reviewed at an appropriate juncture.

A fire risk assessment performed under the Fire (Scotland) Act 2005 relates only to life safety, not property protection. However, when assessing historic properties, an additional step is recommended: to consider risks to the building fabric and contents, where additional protection might be necessary. This is addressed later in the guide.

## 3.4 FIRE PREVENTION: IGNITION

Any fire safety management plan must address fire prevention – that is, seeking to prevent fires starting in the first place. While the occurrence of fire might appear to be random, it is not. Ignition occurs due to a build-up of heat, often accompanied by a flame or spark. There are always underlying causes. Common sources of ignition in a context relevant to historic properties are described below.

### 3.4.1 Electrical

Electrical systems are a common cause of fire in older buildings, especially where the wiring is overloaded. Higher loads through increasing technological demands can result in overheating junction boxes and sockets. However, installing modern circuit breakers and fuse box arrangements will help to ensure that overloaded circuits trip. As an additional precaution or where problems are suspected, thermal monitoring systems such as infrared cameras that work by detecting abnormal heat at electrical connection points can assist in identifying hot spots or problematic areas (Figure 3).

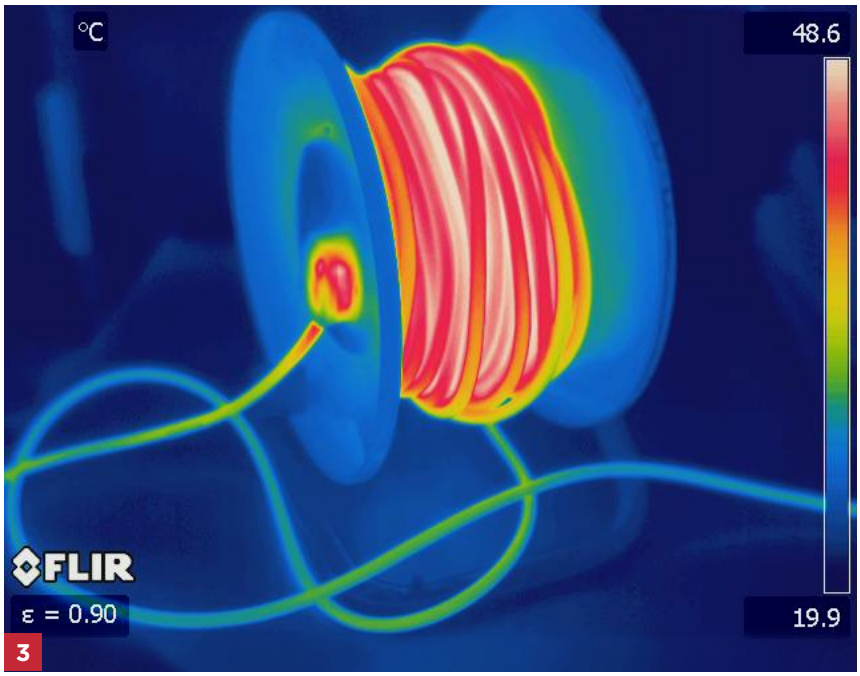



**Figure 3.** This thermograph shows overheating of a cable reel that has not been properly unwound before use. The scale on the right shows a temperature difference between 19.9 and 48.6°C (emissivity value is low ε=0.90).

When reviewing electrical distribution arrangements, look for ad hoc additions. Incremental small additions to power and lighting circuits are the greatest risk and often result in overloading. An electrical inspection and condition report (EICR) of the fixed wiring installation should be completed in accordance with the Institute of Engineering and Technology (IET) wiring regulations. The frequency of inspection depends on the occupancy of the building: it is normally recommended every five years, but higher-risk occupancies could result in an EICR being completed every one to three years. The EICR will determine if there is any requirement for a rewire of the system.

Portable Appliance Testing (PAT) is a requirement in all commercial premises, including any residential property that has paying guests. The frequency of inspection is determined through a risk-based approach and can depend on the type of equipment and working environment. Further guidance on the frequency of inspection is available from the Health and Safety Executive (HSE) or, for short-term let properties, the local authority responsible for issuing the licence.

Common electrical hazards include:

- Overloading sockets
- Over-reliance on multi-way adaptors
- Permanent trailing leads (install floor sockets or secure leads)
- Frayed wiring
- Hot plugs and sockets, frequent fuse blows, flickering lights and brown scorch marks can all be signs of faulty wiring, fittings or incorrect bulb wattage.

To reduce the frequency of incidents resulting from electrical equipment, all electrical equipment should be installed, used and maintained in accordance with the manufacturer's instructions. Where there is a risk of heat-producing equipment being left on unattended (such as cooker plates or portable heaters), the equipment should have automatic shut-offs.

### 3.4.2 Open fires

If they are well designed and managed carefully in use, open fires are generally safe. Combustibles should be a safe distance away. A fire guard is essential, and hearthstones should be free of cracks. Care should be taken around the disposal of ashes. It is recommended that there are robust procedures in place (informed by an assessment of risks) to ensure that ash from open fires is removed and disposed of in a safe manner. This was a key recommendation from the Cameron House Fatal Accident Inquiry.[6]

When planning repairs on hearths, like-for-like replacement is most appropriate. A cracked hearthstone can either be replaced with a new stone hearth of the same dimensions (there is no requirement to raise it through the addition of a raised masonry plinth) or a repair mortar used to smooth over any cracks (Figure 4).


**Figure 4.** This previously damaged hearthstone has been repaired with a repair mortar. Note the wrought-iron basket designed to fit the opening and to burn logs.

The choice and condition of fuel is important. Dry hardwood will cause minimal soot build-up in a chimney, but damp wood of any type will burn poorly, smoke, and give rise to excessive deposits of soot and tar in the chimney. This increases the risk of a chimney fire.

In addition, to prevent a chimney fire, the flue should be swept annually as a minimum. The integrity of the flues also needs to be addressed to prevent the spread of heat and smoke through cracks in the flue. The stone feathers forming the subdivision between

flues may have become damaged, mortar between joints may have loosened, and timber joists may abut or project into the chimney breast. Repointing or re-lining of the chimney may be required.

A smoke test before use is always recommended, checking within the roof space for obvious smoke leakage.

### 3.4.3 Candles

Candles are a potential ignition source for building fabric and other flammable furnishings. They need to be properly managed to be safe. The risk can be managed through risk assessment and implementing control measures (for example appropriate receptacles such as metal drip trays, safe positioning of candles away from combustibles such as curtains, and management procedures for extinguishing at the end of events). Better still, their use can be prohibited and they can be replaced with battery-operated candles.

### 3.4.4 Cooking

Kitchens, whether commercial, staff kitchenettes or domestic, are deemed higher-risk areas. Statistics gathered by Scottish Fire and Rescue Services from 2022–23 suggest that across Scotland, 58.8% of accidental dwelling fires resulted from cooking appliances.[7] Where a structure cannot comply without excessive intervention in sensitive of important areas, then the hazard needs to be revisited and managed and the risk revised.

*Example:* Following a review of fire safety on board a historic ship, it was decided that in order to remove the hazard (naked flame) and reduce the risk, all catering operations would be moved off the ship. Limiting menus as a result was felt to be a reasonable compromise. As a result, a costly and invasive fire suppression system was not required.

### 3.4.5 Wilful fire raising

Wilful fire raising in inhabited buildings in Scotland is rare, but it is very common where a building has been empty for some time. However, such incidents do not generally occur without some warning signs. Repeated small-scale acts of vandalism such as broken windows, theft of fittings, graffiti and scorch marks can be a forewarning of the potential for a larger incident.

Fires started deliberately can be particularly dangerous or damaging because they may develop rapidly if accelerants are used, may be intentionally started in escape routes, and often occur when a building is unoccupied or vacant with poor or no security.

In seeking to reduce the likelihood of wilful fire raising, the best deterrent in the medium term is the presence of a resident or staff resident. For example, this can be someone who is prepared to live in a building in an interim state for a reduced rent. Such services are provided through specialist agents such as ‘property guardians’. Other security measures include patrols, engagement

with police, secure doors/barriers, CCTV, intruder alarms, ensuring temporary scaffolding does not facilitate entry, and waste management.

### 3.4.6 Building or maintenance work

A significant number of large fires in older properties occur when they are undergoing maintenance or refurbishment work, often caused by the negligent application of heat. High-profile examples include the Cutty Sark at Greenwich in 2007, Leslie House in Fife in 2009 and Glasgow School of Art in 2018, where fires started towards the end of construction work with serious damage resulting (Figure 5).


**Figure 5.** Leslie House in Fife suffered a serious fire towards the end of construction work in 2009.

Such fires can be extremely destructive because the construction activity itself sometimes means that certain fire precautions are compromised or decommissioned. For example, where fire-resisting partitions have been temporarily breached by construction work, there may be a delay in detection and alarm if smoke detectors have been temporarily disarmed or not yet commissioned.

Similarly, fires during construction may be destructive because there may be a build-up of construction waste that serves as fuel, accelerating the growth of a fire.

'Hot works' are recognised as a major hazard. This term refers to any construction process or activity that uses or produces heat, eg welding, soldering, grinding, cutting and brazing, or hot torch applied roofing. Such work should be carried out off site or a safer alternative specified. Traditional cold bossing or dressing of lead does not involve heat and can be safely done on site; however, the quicker and more modern technique of burning or welding lead does involve heat. In such cases, where modern techniques involve the use of heat, older or alternative techniques should be considered. For plumbing, naked flame work can be replaced by compressed joint fittings (Figure 6). Such risk mitigation should be considered at design stage and specified in the tender documents. Where hot work is unavoidable, a formal permit system should be enforced to ensure that hot works are only permitted under strictly controlled circumstances. Additional information about hot works may be found within Health and Safety Executive guidance.[8]


6

**Figure 6.** Gas meter in the Great Hall kitchen at Stirling Castle with a compression fitting (the elbow below and above the 'Gas' marker tape on the chrome pipe at the right of the meter). Such fittings can be mandated at tender stage to eliminate hot works on site.

It is vital that contractors are carefully managed and inducted when on site. In addition to the relevant Health and Safety inductions, dutyholders may wish to consider specific fire safety inductions in relation to minimising the fire hazard from construction. In a heritage setting, consideration should be given to longer fire watches than the standard 30 minutes following the end of hot works (eg where the hot works are taking place in a heritage sensitive building or area), or if there is significant fuel loading in the immediate vicinity (eg hot works in an attic with structural timber roof elements or an area with wall panelling or tapestries, etc).

In larger projects, where risks are greater, consideration should be given to the provision of temporary smoke/fire detectors. Similarly, consideration should be given to the provision of temporary compartmentation to mitigate the spread of fire.

### 3.4.7 Lightning

Lightning can be a fire risk, but it is more of a property protection issue than one of life safety. Where a significant risk exists, such as a church steeple in a non-built-up area, a lightning protection system should be considered.

## 3.5 FIRE PREVENTION: FIRE GROWTH

Limiting the rate at which a fire can grow is key to controlling fire hazard. This is most simply achieved by removing or minimising the presence of fuel in a location where ignition may occur or where a fire may pose a hazard to people. This may include fuels such as furniture or waste, or items such as gas cylinders or, in a clinical setting, piped oxygen.

### 3.5.1 Waste management

Accumulation of waste helps fire spread and can also be attractive to wilful fire raisers. As waste levels in buildings may fluctuate, management procedures should be tailored accordingly. In historic buildings operating as tourist attractions, waste levels may increase during the summer months when visitor numbers escalate: shops are fully stocked, cafés open their doors and special events are staged. Building a new theatre set or unpacking a touring exhibition at a museum or gallery are scenarios where waste levels may temporarily peak. Another common example is waste being temporarily stored near an exit route. Where waste is located too close to a building, fire could spread into the building under timber eaves or through an open window. Secure bin stores or metal bins with lockable lids located a safe distance from a building are safer than an open skip in close proximity.

### 3.5.2 Massive stone structures

Some historic buildings, such as castles, churches and tower houses, are constructed with a much higher proportion of stone than in later or smaller buildings. Features include stone vaulted ceilings and roofs, plaster on the hard and substantial timber components. In such buildings, particularly on the ground floor, there is little to burn and the fire loading is typically low. In this context, it is the smoke from burning furniture and fittings that will cause risk, not the actual building itself. Measures should therefore focus on the reduction of movable fuel load as a means to reduce the potential for fire growth.

## 3.6 REVIEW

As noted in Table 1, fire safety management is an ongoing process that is required to be considered on a regular basis, and assumptions and plans must be reviewed at appropriate intervals to take changes into account. Change may happen for a number of reasons.[9] For example, the operational nature of a property may change in that visitors are being shown areas previously closed off. There may be changes to catering arrangements that result in a change to the fire hazard due to the introduction of hotplates or other heat sources in new locations, or retrofit works that introduce new materials into a building.

### 3.6.1 Frequency of review

It is difficult to set down exactly how often fire safety arrangements should be reviewed, as this will depend on the nature of the property and what its business is. Plans and systems may become outdated and inappropriate if they are not checked and revised. For developing businesses and attractions, every six months may be suitable, and for more established buildings, once a year may be appropriate. The management of the organisation must have a regular focus on this matter, show leadership and set a firm direction.

### 3.6.2 Planned building works

The occurrence of construction work will also require a review of the fire safety management process, both in terms of managing the construction phase fire risks (identified earlier as the most common and most risky period in a building's life) and how fire safety will be managed in the building during and following the works. In both cases, the fire safety risk assessment should be reviewed, and additional hazards likely to be introduced should be considered and evaluated. The impact of the building work on general fire safety measures should be continuously monitored during a project. Dutyholders should liaise closely with anybody undertaking building work to ensure that the implications for fire safety have been taken into account. Dutyholders should seek to identify and liaise with the principal contractor and/or principal designer who are identified under the Construction Design and Management Regulations (2015).

## NOTES

1. *Practical Fire Safety Guidance for Existing Non-Residential Premises*, Edinburgh: Scottish Government (2022), Fig 1.
2. *Practical Fire Safety Guidance for Existing Premises with Sleeping Accommodation*, Edinburgh: Scottish Government (2022), para 28.
3. *Practical Fire Safety Guidance for Existing Non-Residential Premises*, Edinburgh: Scottish Government (2022), paras 17–20.
4. *Practical Fire Safety Guidance for Existing Premises with Sleeping Accommodation*, Edinburgh: Scottish Government (2022), para 28.
5. *Practical Fire Safety Guidance for Existing Non-Residential Premises*, Edinburgh: Scottish Government (2022), para 19.
6. *Determination of Sheriff Thomas McCartney into the deaths of Simon Midgley and Richard John Dyson under The Inquiries into Fatal Accidents and Sudden Deaths etc (Scotland) Act 2016*, Paisley (Jan 2023).
7. *Statistical News: Fire and Rescue Incident Statistics 2022–23*, Cambuslang: Scottish Fire and Rescue Service (Oct 2023).
8. *Fire Safety in Construction*, 3rd edn, Norwich: Health and Safety Executive/TSO (2022).
9. *Practical Fire Safety Guidance for Existing Non-Residential Premises*, Edinburgh: Scottish Government (2022), para 59.

# 4. FIRE SAFETY MANAGEMENT ARRANGEMENTS

The importance of fire safety management was discussed in Section 3. In this section we consider the documentation, plans and related actions (such as training) required to underpin fire safety management arrangements and enable an effective response to fire safety incidents.

## 4.1 FIRE SAFETY POLICY

All historic buildings should have a fire safety policy which should, at the very least, set out the intentions of the owner or occupier in respect of managing fire safety effectively. The policy should reflect their intention to provide a safe and controlled working environment and should be signed off at the highest level. Fire safety policies should form part of the building's fire safety management plan and should be posted in prominent locations.

Effective internal mechanisms should exist to ensure that the policy is communicated to employees, is subject to regular review, and takes account of special or occasional events. In larger organisations with devolved management or diverse locations, there may need to be additional local policy statements.

The fire safety policy should include the arrangements for planning, organisation, control, monitoring and review of fire safety measures. Factors to consider include:

- Planning: adopting a systematic approach which identifies priorities and objectives
- Organisation: having a structure with the aim of ensuring improvement in fire safety performance
- Control: ensuring that decisions for achieving fire safety are being implemented as planned
- Monitoring and review: constantly developing policies and approaches.

## 4.2 EMERGENCY FIRE ACTION PLAN

An emergency fire action plan sets out the appropriate actions that occupants should take in the event of a fire. Every plan should be specific to the premises, but some of the key items that should be included within an emergency fire action plan as set out by the Scottish Government are as follows:[1]

- How people will be warned if there is a fire
- What staff or occupants should do if they discover a fire
- What staff or occupants should do in the event of a fire or the fire alarm activating
- Arrangements for calling the Fire and Rescue Service
- Action to be taken by the person in charge (if relevant) when the fire alarm activates, or a fire is discovered
- Arrangements for fighting fire by staff trained to use fire extinguishers
- Any processes or power supplies that need to be stopped or isolated
- Procedures for evacuating the premises, taking into account the personal evacuation needs of individual residents or occupants
- Procedures for checking whether the premises have been evacuated and where occupants should assemble or be taken after they have left the premises
- Procedures for meeting the Fire and Rescue Service and passing on details of the incident, whether all persons are accounted for, and the presence of any dangers
- Contingency arrangements for the relocation or welfare of evacuees.

### 4.2.1 Responsibilities

It is a management responsibility to have in place an emergency fire action plan as well as suitable arrangements to implement the plan. This should not rely on the attendance of the Fire and Rescue Service to work.

Staff should be aware of the emergency fire action plan through their training and instruction. In premises where staff are not usually present, arrangements should be in place to make occupants aware of these arrangements, so they are in no doubt of the action to be taken in the event of fire or the measures necessary to prevent an outbreak of fire.

Fire action notices containing extracts of the emergency fire action plan should be permanently displayed in appropriate positions throughout the building (Figure 7). Residents and overnight guests should be made aware of the fire procedure by means of a fire action notice within their bedroom.[2]


**Figure 7.** One of the fire action notices found throughout Edinburgh Castle.

### 4.2.2 Considerations

When drawing up an emergency fire action plan, the fire risk assessment findings should be considered along with the needs of all occupants and visitors, including the elderly, parents with children, and people with permanent or temporary conditions that can affect usual abilities (ie broken bones, illness or surgery), as well as hidden conditions and disabilities (see Section 4.4).

Where special events are organised, an emergency fire action plan may be required to address the additional risks and control measures required, but also the adequacy of means of escape and evacuation procedures given the increased number of occupants.

For hotels or similar sleeping accommodation, the emergency fire action plan should also include robust arrangements for promptly ensuring all persons are accounted for in the event of an evacuation during a fire event. These procedures should address foreseeable contingencies such as difficulties in accessing guest lists or inclement weather.[3] Additional guidance for premises with sleeping accommodation may be found in Scottish Government guidance.[4]

## 4.3 RECORDING MAINTENANCE OF FIRE SAFETY PROVISIONS

A fire safety logbook should be maintained to record all fire-related events such as fire incidents, false alarms, training, drills, inspections by the insurance company or fire and rescue service, and full details of when and by whom all inspections, tests and equipment maintenance have been undertaken.

Records of the maintenance and testing of fire safety measures in a historic building should be retained. It is for the dutyholder to determine how long they wish to retain this type of record, but for the purposes of audit by the enforcing authority, records should be available for a minimum period of three years. Records can be kept in either an electronic or a paper-based format and should include:

- escape routes, including exit locking mechanisms, such as panic bars, push pads and electromagnetic locking devices
- means of escape (self-closing doors, stairways, corridors and essential structural features)
- fire alarm systems, including weekly alarm tests and periodic maintenance
- false and unwanted fire alarm actuations
- emergency lighting systems
- fire extinguishers, hose reels and fire blankets, etc
- any automatic life safety fire suppression systems, such as sprinklers
- smoke control systems and other components of any fire safety engineered design
- instruction and training in fire safety and the evacuation procedure
- fire drills.

## 4.4 EMERGENCY EVACUATION OF PEOPLE WITH DISABILITIES AND IMPAIRMENTS

Making premises universally accessible needs to be matched with arrangements for safe egress in the event of fire. People with cognitive, physical or sensory impairments, including hidden impairments, whether permanent or temporary, can be at greater risk during a fire emergency and may require assistance to evacuate.

Under the Fire (Scotland) Act 2005, it is a dutyholder's responsibility to make provisions for the safe evacuation of all occupants, including those requiring additional assistance to evacuate safely. This should not be delegated to the Fire and Rescue Service. The safe evacuation of people requiring additional assistance will take careful consideration, and there may be differences between the needs of regular users and visitors (such as employees) versus infrequent visitors. Any such arrangements and provisions to ensure their safe evacuation should be compatible and included within a building's emergency fire action plan.

Where a dutyholder cannot demonstrate that they have taken reasonable steps to improve provisions for people with disabilities, this is likely to constitute a failure to comply with fire safety law and may also be considered as discrimination under the Equality Act 2010.

Staff nominated to assist in the evacuation of persons requiring assistance should be trained and be competent to fulfil their duties.

Physical adaptations and alterations to the building fabric may also be required. Such adaptations may have far-reaching effects in a historic setting, and an access audit will identify how best to address provisions in a sympathetic manner. Some examples of these adaptations include:

- Demarcated waiting or refuge areas, with appropriate signage and emergency two-way communication system
- Flashing beacons
- Access ramp
- Reconfiguration of escape routes, eg widths
- Opening mechanisms for emergency doors
- Emergency evacuation lift
- Evacuation chairs.

Further information can be found in the Scottish Government's Fire safety guidance on evacuating disabled people from buildings.

### 4.4.1 Personal emergency evacuation plan (PEEP)

In addition to general arrangements for evacuating visitors who require assistance, it is important to address the requirements of staff or regular visitors who may be unable to reach a point of safety unaided, or within an adequate amount of time, during an emergency. These requirements should be addressed through discussions with the individual and a tailored personal emergency evacuation plan (PEEP) drawn up by someone who is trained and competent to create one. PEEPs can be permanent or temporary depending on the individual's needs. For example, an employee in the later stages of pregnancy would require a temporary PEEP, whereas an employee with hearing impairments would need a permanent one.

It is important to communicate to both staff and visitors that if they require a PEEP or have specific needs, they should make it clear at their earliest convenience.

Provisions may include personal emergency evacuation plans, eg carrying down apparatus, such as evacuation chairs or paging devices which vibrate or issue a text alert on the fire alarm sounding.

## 4.5 PLANNING FOR INCIDENTS AND EMERGENCIES

### 4.5.1 Training

Effectively implementing a fire emergency action plan requires that staff should be both familiar with the plan and be trained to deliver it. Plans should be tested to prove they work. This requires training staff and possibly obtaining relevant qualifications for key personnel.

Exercises to test procedures should be desk-based first, followed by a practical exercise. A key recommendation from the Cameron House Fatal Accident Inquiry was that robust arrangements should be put in place to ensure that all staff (including night shift, part-time and seasonal staff) have experience of evacuation drills. This includes night-time staff being asked to attend a daytime evacuation drill and/or mock drill taking place during night shift hours.[5]

For some properties, staff training may extend to a joint exercise involving the local fire service (see Section 4.5.2). Training may also cover historic and culturally significant collections salvage, for sites housing such material.

### 4.5.2 Liaison with the Fire and Rescue Service

In complex historic or remote buildings where the isolation can result in longer emergency response times, a good relationship should be instigated with the Scottish Fire and Rescue Service local area managers and stations. This will mean that firefighters are familiar with the building and its arrangements, including location of fire hydrants. Through informal familiarisation visits, an agreed response could be discussed, covering such issues as water supply, access, internal layout, requirement for specialist equipment, and particularly significant areas within the property. On a more formal basis, in-depth training drills or exercises (eg tabletop exercises) with the fire service are mutually beneficial and can help to dovetail sites' emergency fire action plans with the fire service's operational response.

If there are any historic collections or valuable materials on site, the fire service should also be made aware in case they may be able to aid the salvage process, or if there may be additional people coming to site to assist with the salvage process.

The fire service should also be made aware of forthcoming special events, major building works and temporary closure of access routes.

Key information that should be included in liaison with the Scottish Fire and Rescue Service is indicated in Box 3.

## BOX 3: WHAT SHOULD BE INCLUDED IN LIAISON WITH THE SCOTTISH FIRE AND RESCUE SERVICE

**Details of the premises and its use**
The property should be easily identifiable by the Fire and Rescue Services, formally through postcodes and proper addresses, making sure that if it is locally known by a different name that is recorded as well. Floor plans including the locations of building services such as electrical sub-stations and gas shut-offs must be available in plan form, with emphasis on the functions and activity within rooms and spaces. Particular hazards in the construction or contents of the building (eg asbestos and mercury) should also be recorded and be readily available.

**Approach and access**
Ensuring quick and effective access by the Fire and Rescue Services should be a high priority. Things to consider are lack of hard standing, weak or narrow bridges, and low archways, all of which can potentially hinder access for fire appliances. Parking and turning areas need to be provided to prevent vehicles becoming stuck in soft grass. Reinforced grass paving can give the appearance of grass but with the load-bearing capability of a well-constructed drive. The best entry point to the building should be identified and explained to the emergency services. Street furniture in pedestrianised zones can present obstacles for fire appliances, as can parked cars in front of a property with no side or rear access.

**Water supplies**
If water supplies are unreliable, open water sources or well-maintained private hydrants may provide alternative sources, as well as a specialist water tender vehicle. Pre-calculating the number of hose lengths required to run a hose relay from an open water source to the property can save time during an incident.

**Key contacts**
In an emergency, there will be a number of calls that will need to be made in addition to the Fire and Rescue Service. This is sometimes called a telephone tree and it will include the insurers, the parent organisation, emergency services and possibly neighbours. In addition to these, contact details for security firms, contractors and first aid conservators will also be necessary. If a property has objects on loan from another organisation, the lenders will also need to be made aware of the incident. If resourcing issues render it difficult to keep a telephone tree updated, consider outsourcing to a call receiving centre.

**Salvage**
For properties with historic collections, liaison with the Fire and Rescue Service may also extend to include discussion of salvage operations. This would likely include the communication of priorities and agreement of a strategy for any feasible recovery, protection in situ or removal of objects based on a collections salvage plan.

## 4.6 COLLECTIONS SALVAGE PLANNING

Some historic buildings can house historically or culturally significant artefacts and collections. An established, tested and communicated collections salvage plan is central to ensuring the most efficient response to incidents affecting this material. This plan should set out a clear response to a range of potential incident types, with the effects of fire damage being potentially one of the most severe incidents to be encountered. The plan should aim to mitigate further unnecessary damage to artefacts by setting out roles and responsibilities, priority objects, access and removal approaches, as well as immediate processes of protection in situ, documentation or conservation. A collections salvage plan should also include considerations such as provision of salvage equipment and security measures for the salvaged items (see further details in Box 4). It should provide contact details for trained or specialist staff, or contracted support if required. Large sites or remote properties with significant collections present may benefit from the creation of an official salvage team. Any historic site which is also an Accredited Museum will be required under that standard to have a current salvage plan.

To ensure an effective response to a fire incident, it is important to engage the local fire service by communicating and discussing the plan and reviewing it regularly.

### BOX 4: KEY CONSIDERATIONS WHEN CARRYING OUT COLLECTIONS SALVAGE PLANNING

Identification of salvage priorities. This is a list of items that are a priority for salvage during or after a fire, often called a priority objects list. Ensure that clear priorities and a methodology for object removal (for instance, an object at high level) are established using a categorisation system. Plan for the worst-case scenario using a list of criteria to help with decision-making; decisions on what to leave can be hard but have to be made. Where artefacts are in secure cases, instructions on their removal will be required, though it is often better to leave them encased unless they are at immediate risk.

For pre-identified storage requirements, identify a temporary triage area that could be used during an incident for documentation and assessment of condition and a longer-term facility to safely store salvaged objects.

In situ protection. Items of value that cannot physically be moved due to weight or size may be afforded some degree of protection in situ. Bags or sheets made from appropriate lightweight protective materials can provide a degree of fire resistance, protect against smoke and water, and shield items against mechanical damage.

Provision of salvage equipment. Anticipate the types of salvage operations and the materials and equipment required. If a human chain to remove books is not sustainable, waterproof sheeting can be fashioned into a book chute. Bags or collapsible plastic boxes can facilitate the removal of small objects. Personal protective equipment should be provided for the salvage team, and this equipment should be stored close by and be accessible.

Security of salvaged items. Items that have been removed from buildings as part of a drill or exercise will be outwith the normal security environment and therefore will be at greater risk of theft. Measures need to be put in place to ensure their security, either through documentation or physical security measures.

## 4.7 BUSINESS CONTINUITY PLANNING

Business continuity planning means planning for any emergency that would cause disruption in business operations in the short term and could possibly result in long-term losses such as income, stock, equipment (including IT systems) and buildings. Where one exists, a damage limitation plan would feed into a Business Continuity Plan. The aim of the Business Continuity Plan is to manage the consequences to facilitate a return to operations in the quickest possible time. Utilisation of even restricted resources can make a considerable impact on the extent, cost and impact of fire damage, and stimulate a quicker recovery. Proving that an effective fire safety management plan was in place may also be critical when dealing with insurance companies, as well as any actions taken by a salvage team (eg through an incident log).

## NOTES

1. *Practical Fire Safety Guidance for Existing Premises with Sleeping Accommodation*, Edinburgh: Scottish Government (2022), Table 5.
2. *Practical Fire Safety Guidance for Existing Premises with Sleeping Accommodation*, Edinburgh: Scottish Government (2022), paras 85–89.
3. *Determination of Sheriff Thomas McCartney into the deaths of Simon Midgley and Richard John Dyson under The Inquiries into Fatal Accidents and Sudden Deaths etc (Scotland) Act 2016*, Paisley (Jan 2023).
4. *Practical Fire Safety Guidance for Existing Premises with Sleeping Accommodation*, Edinburgh: Scottish Government (2022).
5. *Determination of Sheriff Thomas McCartney into the deaths of Simon Midgley and Richard John Dyson under The Inquiries into Fatal Accidents and Sudden Deaths etc (Scotland) Act 2016*, Paisley (Jan 2023).

# 5. FIRE SAFETY BUILDING IMPROVEMENTS

An output of the fire risk assessment process will be a set of findings that may require changes or improvements to be made to the building fabric (see Sections 6 and 7 on passive and active fire protection measures). Once the findings have been made, consideration can be given to how to implement these within the building fabric. In most cases, the fabric intervention will carry a management and maintenance obligation to ensure installed equipment and materials are still fit for purpose.

Before proceeding with any improvement to building fabric, dutyholders should establish whether the proposed interventions constitute building work. To do this, it may be necessary to consult with a construction professional such as an architect, fire engineer, building surveyor, or by contacting the local authority and speaking to their Building Standards verifier(s). If it is determined that the interventions constitute building works, such works must comply with the requirements of the Building (Scotland) Regulations 2004.

There are various ways to implement measures to improve the building fabric. These will depend on the building and its significance. In cases where the building is of special architectural or historic interest, a conservation plan for the building is a useful tool. It can act as a good starting point for identifying which areas or elements of the building are of most significance, which will require additional protection, and/or where intervention demands greatest sensitivity. Such plans are particularly useful for buildings with complex needs or where there will be a range of different works. The different approaches taken to achieve reasonably practicable safety in respect of harm caused by fire can allow the building professionals to identify the best methodology and deliver the improvements needed.

**Levels of intervention**
The degree of intervention can vary depending on outcomes of the fire risk assessment, the status of the building and the wishes of the client. Establishing the degree of intervention can assist designers to achieve a balance between adequate provision for life safety and protection of a historic building's structure, internal arrangements, contents and finishes. The design options should take into consideration the value of the existing building fabric and what is special about it. A historic building of great significance may have had some poorly implemented additions made in the past that can be reworked to give a better conservation and fire risk management outcome.

**Proportionality**
Regardless of the level of intervention, the measures taken or installed should be proportionate to the risk. As discussed, risk varies according to the construction of a building, the use of the building and its cultural significance. A remote rural residence may have a different risk profile to a suburban residence well provided with fire and rescue service cover. Suitably balanced measures need to be considered for each situation to ensure that it is reasonable and practicable.

## 5.1 APPROACHES TO FABRIC IMPROVEMENTS FOR FIRE SAFETY

Several approaches to improvements are available for a client or designer to resolve building fabric shortcomings for fire safety in traditional buildings. These include the general approach, the advanced approach, and the fire-engineered approach. The general approach and the advanced approach are largely covered by the Technical Handbooks and by British Standard BS 9999:2017 (Fire Safety in the Design, Management and Use of Buildings. Code of Practice) respectively.[1] The Technical Handbooks are published by the Scottish Government (Building Standards Division) and give guidance on how to comply with Scottish building regulations, whereas BS 9999 uses a more flexible risk-based assessment system.

In a listed building, alternatives to conventional fire safety measures may be appropriate and require a fire engineered approach. The fire engineered approach is covered by the British Standard BS 7974:2019 (Application of Fire Safety Engineering Principles to the Design of Buildings), which should be utilised by those experienced and qualified in fire engineering design. For more information on these approaches, see Box 5.

### BOX 5: APPROACHES TO FIRE SAFETY IMPROVEMENTS

**The general approach**. The most general approach is to follow the guidance provided in the Scottish Government's Technical Handbook. However, as noted in The Scottish Building Standards: Procedural Handbook, 3rd edn (3.9.9.), "For historic buildings and traditional buildings the judgement of what is reasonably practicable must be made in a wider context". Such a context may require a more detailed assessment of how best to achieve compliance with the legislation.

For simple buildings, a design can be based on the general approach following the guidance provided in the Scottish Government's fire safety practical guides. The guides are a modification of the Building Standards designed for new builds; they are not meant to be prescriptive, so there is no obligation to adopt any particular benchmark. Specifically relating to historic buildings, the guides state that "alternatives to conventional fire safety measures may be appropriate".

This does not mean a reduced level of fire safety, rather achieving a comparable level through an alternative solution more suited to that individual property. For example, enhanced management procedures and the installation of a modern alarm and detection system may be acceptable in lieu of building fabric alterations. However, this approach is fairly generic and can, therefore, be onerous or limiting for some buildings.

Annex 2 of Practical Fire Safety Guidance for Existing Premises with Sleeping Accommodation provides guidance where a property is used for small bed and breakfast and self-catering premises, many of which will be traditional buildings.

**The advanced approach**. If a more flexible solution is required, the advanced approach, which takes into account the individual characteristics of the building and its occupants, should be used. This approach is based on BS 9999:2017. It recognises the importance of a package of measures to ensure that the fire provisions in a building work effectively together. The standard also formally recognises management systems as part of the package. This approach may be particularly useful for traditional or historic buildings where physical interventions are undesirable.

A building is allocated a risk profile depending on its physical characteristics and its occupancy profile. Features such as high ceilings (often an intrinsic characteristic of historic buildings), which can act as a smoke reservoir, increasing available escape time, are factored into the equation. Additional measures can be taken to reduce the risk profile, such as the installation of fire detection or suppression systems. Using a fire suppression system, the resultant reduction in the risk profile may allow larger compartment sizes and extended travel distances. BS 9999 is a holistic approach to fire safety to be taken from the start. It is a complete fire safety package that should be applied in its entirety and not to overcome a single fire safety issue at the end of the design stage.

**The engineered approach**. The final approach is the engineered approach, BS 7974. Fire engineering can sometimes be the only practical way to achieve a satisfactory standard of fire safety in properties with a complex infrastructure, a high-risk occupancy profile, or a particularly refined historic interior. This approach, using scientific and engineering principles, maximises design flexibility, which can allow traditional buildings to achieve an acceptable standard of fire safety without compromising the character or fabric of the building. Computer modelling can be employed to assess fire growth rates and egress.

Fire engineering solutions may address difficulties in achieving compliance with the standards, but they can also be costly and disruptive. For example, fire suppression systems also require guaranteed water supplies and may require holding tanks – facilities that are costly, take up a lot of space and require high levels of maintenance. Engineered water mist systems can overcome some of these traditional constraints.

## 5.2 KEY AREAS FOR IMPROVEMENT

The fire risk assessment may identify improvements to the building fabric, some of which may be subject to building warrant. Repairs of existing systems do not typically require a building warrant.

The following is intended to help the dutyholder understand key terminology and considerations for navigating such procedures within the context of historic buildings, but it is non-exhaustive. For more detailed information, refer to Guide for Practitioners 7.[2]

### 5.2.1 Communication and alarms

Occupants should be alerted to the outbreak of fire. This typically includes smoke and heat detection and alarm systems, often configured for those with visual or hearing impairments (see Section 4.4 for more information).

### 5.2.2 Means of escape

Where improvements to the means of escape are required, it should be recognised that what is reasonably practicable in the context of a historic building might be different to what is reasonably practicable in a new building. The balance of intervention versus operational management must therefore be carefully considered on a case-by-case basis, seeking to protect the historic fabric where possible (Figure 8).


**Figure 8.** A category A-listed building where a window has been sympathetically converted into an additional fire escape route.

Escape routes enable occupants to evacuate quickly in the event of fire or move to a place of ultimate safety or relative safety, such as a protected stair. Escape routes should be unobstructed, not contain any combustibles, be clearly signed, adequately lit and with accessible exits. They may also have to be protected or enclosed by fire-resistant construction. Factors affecting means of escape provision are: who is in the building and their mobility; the time it will take occupants to escape; the nature of the building construction; and the level of risk within the building.

Means of escape typically covers horizontal escape (the horizontal distance an occupant may have to travel to reach a staircase or exit to outside) and vertical escape (the staircases or lifts that are used for vertical evacuation from a building). In addition, where a staircase or lift does not exit directly to outside, consideration must be given to the route from the vertical escape route to outside.

**Horizontal escape routes:** There is guidance on maximum travel distances, as well as whether or how that route is physically protected from fire. This may require a certain degree of fire resistance to walls, floors and ceilings along that route.

**Vertical escape routes:** Vertical escape routes (ie stairs or lifts) often benefit from being enclosed within fire-resisting construction. A fire-rated enclosure of an existing internal stair may be achieved by the careful introduction of doors and screens, or if the risk is perceived to be too great, then it may be necessary to integrate an additional escape stair.

*Example:* A listed building provides office accommodation for ten staff. The fire risk assessment may identify that escape relies on a single direction of travel which exceeds the recommended distance by several metres. However, given that the occupancy is low and restricted to trained staff familiar with the building, and fire safety is well managed with adequate fire protection measures in place, this may be acceptable.

### 5.2.3 Fire compartmentation

Fire compartmentation is the subdivision of a building into discrete fire-resisting cells to inhibit the spread of fire and smoke beyond the compartment of origin and into escape routes, giving occupants time to safely evacuate. Higher fire hazard areas, such as plant rooms, may require to be within fire-resistant compartments.

There may be some flexibility in recommended compartment sizes. For example, large compartments in a gallery may be acceptable if fire loading is low and fire safety is well managed. Upgrading compartmentation is the most effective way to inhibit the spread of fire and smoke, but it can be disruptive in older and historic properties. However, additional doors in corridors do not have to be intrusive, and they can also be configured to improve energy efficiency. Compartmentation must be contiguous with other building areas, and roof spaces must be separated in the same vertical plane as rooms below.

Alternative solutions should be considered where compartmentation is poor and upgrading would be detrimental to the character of the building. Such solutions can include enhanced detection systems to facilitate early warning, fire suppression systems such as sprinklers, and enhanced management procedures. During some types of work on a building, the use of temporary compartmentation may be necessary to minimise the spread of smoke and fire at a time of greatest risk.

*Example:* A fire suppression system has been retrofitted in the Palace block at Stirling Castle to help compensate for poor compartmentation and long escape routes, where more invasive physical interventions would have adversely affected the presentation of the spaces and the visitor experience.

### 5.2.4 Structural stability

Structural protection of escape routes and the structural stability of the building is often required to support evacuation and fire service operations in the event of a fire, or to prevent the spread of fire to other buildings. Therefore, where the fire risk assessment shows that such an area of the building has inadequate fire resistance, improvements to the construction of floors, ceilings and walls may be required. For example, a corridor used as an egress route may be deemed to need additional fire resistance to ensure that it remains useable during a fire. Where structural interventions would be considered too damaging to the building fabric, then an alternative approach may be warranted, such as an enhanced fire alarm system to ensure rapid detection and evacuation.

### 5.2.5 Facilities to assist firefighters

Building regulations also require buildings to have facilities and equipment to assist firefighters. These may include built-in equipment such as pipes for firefighting water, called dry risers or sometimes ‘rising mains’, which allow water to be quickly brought to the upper floors of a building. Similarly, smoke ventilation may also be used to assist firefighters.

Ensuring that fire service appliances and personnel can easily access the property is key to developing an emergency fire action plan. Where improvements may need to be made, these could involve turning circles for pumping appliances or reversing areas and hard standing for vehicles and rescue equipment.

External underground fire hydrants provide a water supply for use by firefighters. Where no piped water supply is available, or there is insufficient pressure and flow in the public service main, an alternative supply may have to be provided, such as an underground tank, swimming pool, ornamental lake or access provided to some other source of water. When considering the availability of water supplies, the impact of weather and tide changes should be considered to ensure that the supply is available at all times. Hard standing for fire appliances may have to be provided adjacent to the water source (as well as suitable access facilities) to enable pumping.

## NOTES

1. *BS 9999:2017, Fire Safety in the Design, Management and Use of Buildings – Code of Practice*, London: BSI (2017).
2. Stewart Kidd, *Guide for Practitioners 7: Fire Safety Management in Traditional Buildings, Part 1: Principles and Practice*, Edinburgh: Historic Environment Scotland (2010).

# 6. PASSIVE FIRE PROTECTION

Passive fire protection means the physical precautions within a building's fabric (such as walls, partitions and ceilings) that deliver compartmentation and inhibit the spread of fire and smoke. Defects or the absence of compartmentation where it is needed will be identified in the fire risk assessment process, and addressing this is likely to involve the repair or upgrade of various elements.

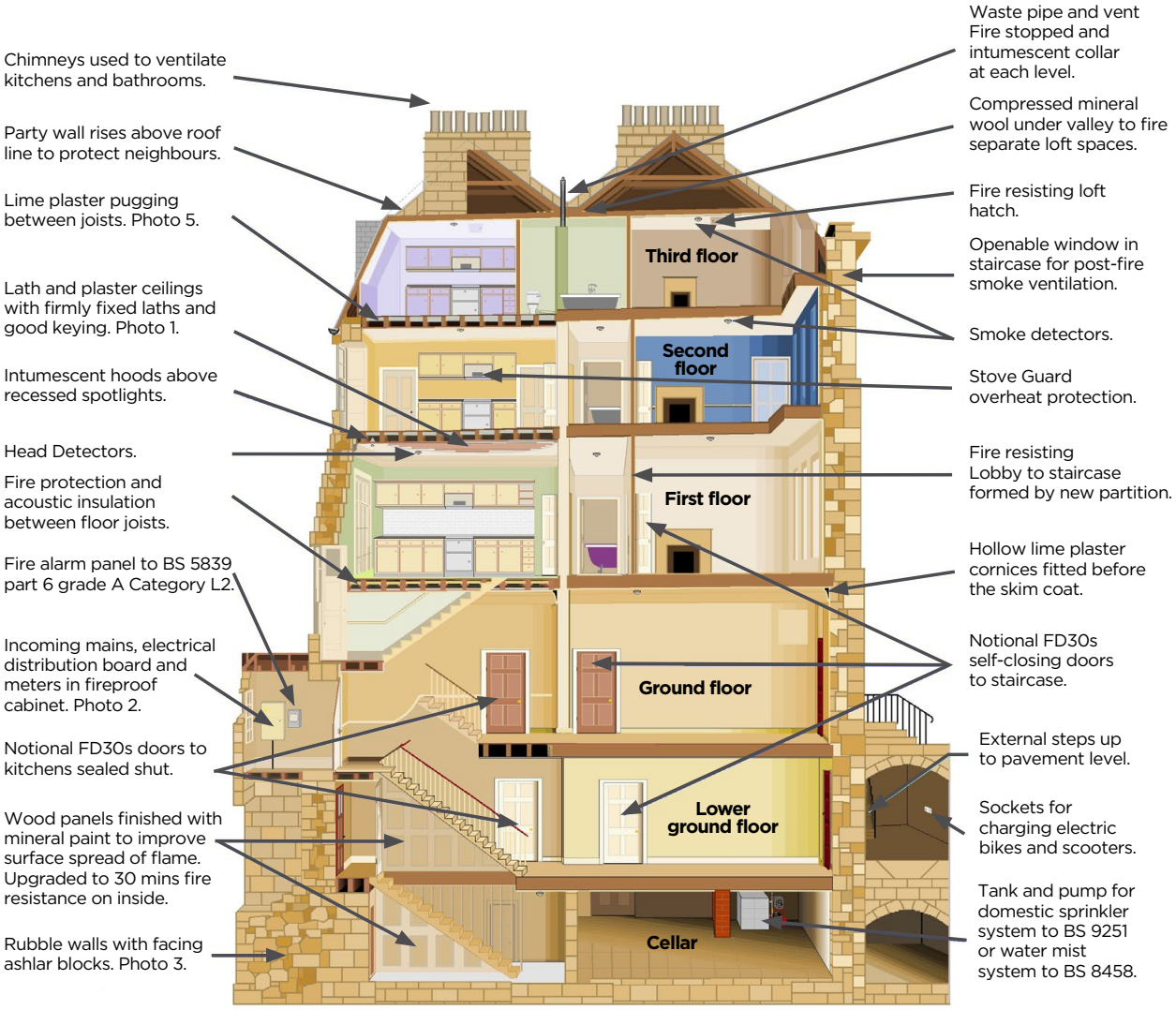
The functional standards, set out in Section 2 of the building regulations, cover a range of fire protection aspects concerned with protecting occupants from the various effects and hazards of a fire. Such measures include prevention of the spread of smoke and flame, fire spread through voids, the creation of fire-resistant escape routes and reducing the effects of fire on structural components. The interaction between the areas of risk identified in the fire risk assessment and the physical measures required to meet the standards in the building regulations is complex, but frequently comes down to delivering fabric-specific assessments and upgrades in some key areas. Some of these are considered below, along with indicative solutions to achieve the required performance (Figure 9).

## 6.1 STRUCTURAL ELEMENTS

### 6.1.1 Structural timber

The fire risk assessment may recommend improvements to structural fire resistance. The fire resistance of timber increases with thickness, meaning that structural timbers common in older properties, such as floor joists and roof members, can perform relatively well. Therefore, structural timbers may only need modest protection to ensure that there will be continued structural performance for the required time in the event of a fire. Fire-protective (intumescent) paper and intumescent varnishes will be of use for this. For hidden structural timber members, covering with fire board is an option.

## Townhouse converted into short term let serviced apartments




**1.** Lath and plaster

**2.** Fire resisting cabinet

**3.** Rubble wall

**4.** Behind cornice

**5.** Rough plaster pugging

9

**Figure 9.** Indicative drawing of a townhouse converted into short-term let apartments, showing areas where fire safety improvements would have to be made.

### 6.1.2 Structural steel and cast iron

Many commercial, industrial and domestic buildings have wrought iron and cast iron structural components. While the most well-known and visible are the cast iron columns often seen in warehouses and stables, wrought iron lintels and cast iron beams are also common but frequently hidden. It is the distortion and failure of such components in the heat of a fire that needs to be prevented. Cast iron is a brittle material and can fail if it is subjected to heating or distortion in a fire. Mild steel and wrought iron joists will also soften and distort in a fire and will require protection to ensure they remain cool and therefore retain their load-bearing capacity.

Improved fire resistance can be achieved by adding layers or coatings onto the surface. For modest protection, an intumescent paper or paint may be sufficient. For longer-term resistance (over an hour), enclosure within a thicker fire protection layer is required. This is often provided with a layer of spray-on insulation or an intumescent coating. In the event of a fire, this layer chars and protects the metal from the heat. Where structural cast iron members are present and are required to deliver some fire performance, specialist advice should be sought.

*Example:* In the conversion of a 19th-century warehouse to flats, the fire risk assessment concluded that the cast iron columns supporting the floors were of sufficient strength and fire resistance not to need cladding or enclosure (Figure 10). In addition, the existence of a fixed fire suppression system was used to reduce the overall fire risk.


**Figure 10.** These columns were retained as a fire risk assessment identified that the fire suppression system would control the spread of fire and the damage to the columns.

## 6.2 WALLS

Many corridors and stairwells are designated escape routes. Therefore, their boundary walls, floors and ceilings should have some degree of fire resistance. Intumescent paper to cover the plaster or an intumescent paint will improve fire resistance. Alternative approaches include the addition of fire board fastened onto the existing plastered surfaces and the injection of a fire-rated fill material behind the existing lining.

## 6.3 STAIRCASES

Stairs of all types often form part of an escape route and typically require a degree of fire resistance and protection. This can be improved by the use of intumescent paint. The application of fire board to the underside of the stair will also improve fire resistance. Where the integrity of an escape stair cannot be made to deliver adequate performance, consideration should be given to the provision of an alternative route.

*Example:* Corgarff Castle is a Scheduled Monument of considerable height and therefore susceptible to the spread of fire and smoke. The single, open means of escape from the top floor, used by educational groups, was not deemed acceptable by the enforcing authority. Compartmentation of the stair was discounted as an option due to its effect on the building and the visitor experience. As a compensatory measure, a sprinkler system was installed to reduce the risk to an acceptable level.

## 6.4 CEILINGS AND FLOORS

Existing traditional plaster on timber laths that are firmly attached to the structural timber may provide adequate fire resistance for rooms in ordinary use, but for escape routes and areas of high risk some upgrade may be needed. The security or firmness of such ceilings should be checked by pressing upwards on the plaster. Plaster that is loose will need to be repaired or replaced. The fire performance of ceilings is often required to be improved for flats, where the ceiling is deemed to be a separating floor (that is, one between two dwellings). This is often the case in conversions. Ceilings with no embellishments can be lined with fire-resistant intumescent paper to increase fire resistance. Where greater fire resistance is required, fire board (similar to plasterboard) may be secured to the existing ceiling. Normally, this is a plasterboard-type material supplied in 1200x2400mm sheets, with a thickness of about 12mm. This is then skim-coated with plaster in the normal way. Due to the relatively modest thickness of these layers, common cornices at the wall junction are not usually affected.

### 6.4.1 Deafening layers above ceilings

Nearly all traditional ceilings have a layer of deafening between the lath and plaster of the ceiling and the floorboards above. When intact, this can be assessed as an effective fire barrier. However, past interventions may mean that this layer has been damaged. Repairs should be made using lime mortar mixed with sawdust laid onto new deafening boards.

### 6.4.2 Improving the fire rating of decorated plaster ceilings

Plain ceilings in tenements with normal ceiling roses and cornices may be added to without significant change. The upgrade of more decorated or coffered ceilings will require a different approach. In such cases, upgrades to the floorboards above may be possible. They may have to be lifted and improvements made to the mortar packing, or deafening, that is normally laid between the joists. If this is damaged or missing, a new fire-stopping material can be put in. This may be the addition of packed mineral wool or additional solid material, similar to the original deafening.

### 6.4.3 Beam and board ceilings

In this type of ceiling, often dating from the 16th century and frequently encountered in castle restoration works, the main timber joists are very thick and have a relatively high fire resistance. However, the floorboards that they carry are relatively thin and have minimal fire resistance. The performance can be improved by the addition of fire board between the floor joists. This can then be painted or decorated as required. For open timber ceilings where the fire resistance can't be enhanced for any reason (eg a 16th-century timber painted ceiling), options to enhance the floor above should be considered.

### 6.4.4 Improving the fire resistance of timber floors

Timber floor constructions are the most common type of flooring encountered in traditional buildings. They are generally of a later date than the beam and board type ceilings and are made of much thinner timbers with low fire resistance. To improve their fire resistance, the underside can be sheeted over with plasterboard to enclose the timbers completely. Alternatively, the floorboards of the room above can be carefully lifted and the areas between the joists filled with a fire-resistant material. This may be a proprietary product, or it may be possible that the existing deafening material be checked and repaired.

*Example:* During the restoration of a category A-listed cottage, the fire resistance of the low ceiling was improved with a fire-resisting lime plaster infill floated on a metal mesh (Figure 11).


**Figure 11.** The fire performance of this modest timber ceiling was improved by the addition of a lime plaster between the joists. © Calum Innes.

## 6.5 TRADITIONAL DOORS

Doors are frequently of significant importance in assessing fire risk, as they offer both a means of escape and also a potential means to protect an escape route. However, historic panelled doors are unlikely to have a fire rating and must therefore be assessed on a case-by-case basis.

### 6.5.1 Assessing and improving doors

Doors should be considered individually, depending on their location, whether they are part of an escape route and, if so, what fire resistance is required. Upgrading the fire performance of doors enhances life safety while also retaining their original fabric and appearance. In general, the thick frame of a traditional door (termed the styles and the rails) has a relatively good fire performance, but the panels in between are often quite thin and therefore present a weak spot. The performance can be improved by the application of intumescent paper or a fire-resisting board fastened on the panels. If there are panel beads, these can be removed for the new fire board to be inserted onto the existing thin panels and then refastened with the same or thinner beads (Figure 12). Intumescent paint or varnish may then be applied to complete the work. Strips of intumescent seal with cold smoke seals can be set (or adhered to) into the door or door frame (Figure 13). This is a fairly standard treatment to prevent the spread of smoke and flame. These strips are available in a range of colours to blend with varying wood types.

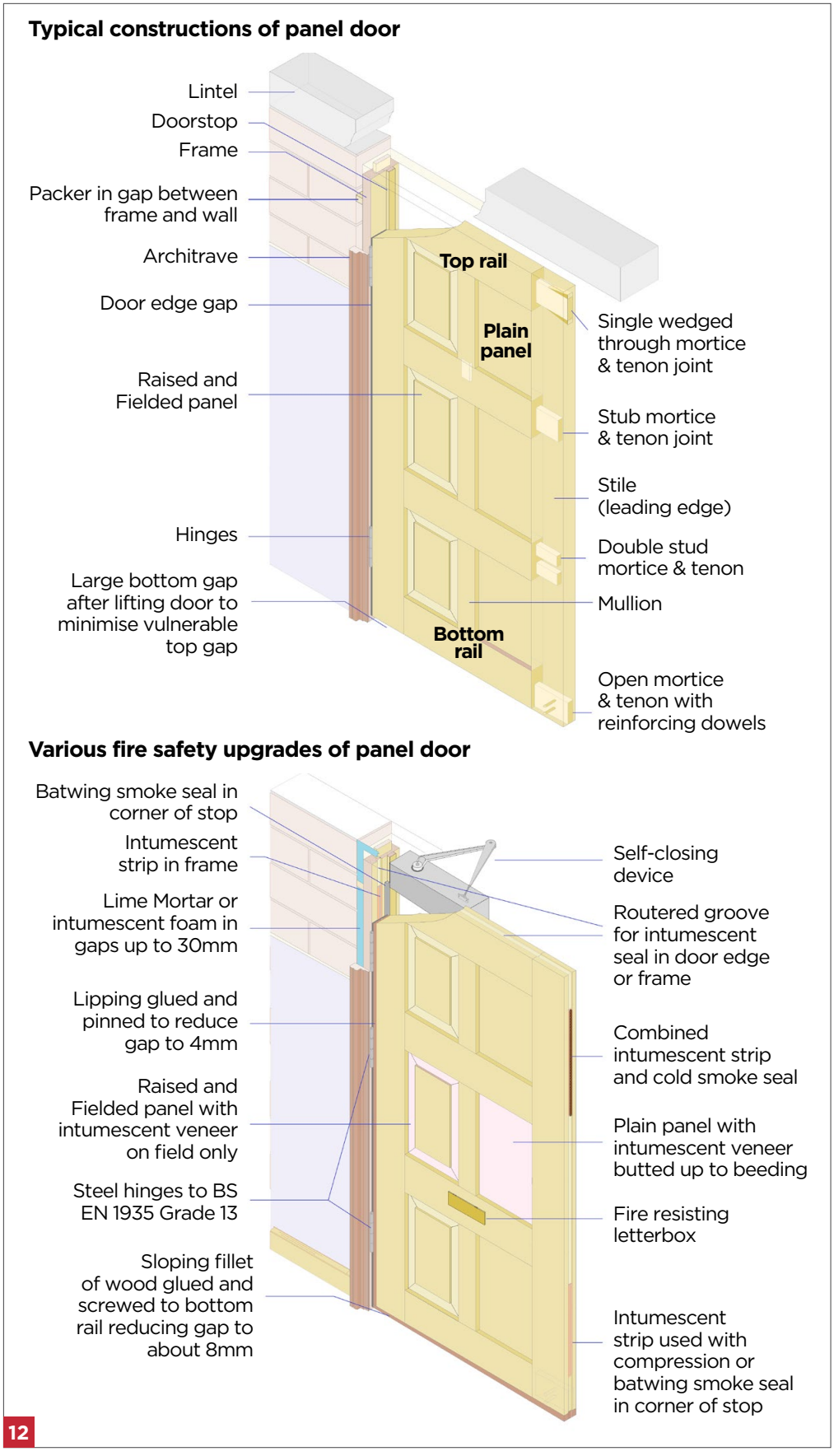



**Figure 12.** Indicative drawing showing improvements to a traditional six-panel timber door to improve fire resistance.

*Example:* Doors in a category A-listed school. A dormitory corridor with two means of escape and adequate compartmentation, but in view of the sleeping risk, 60-minute fire resistance doors would be the norm. However, as the doors are a significant part of the character of the building, a more sensitive approach was taken. The inner panels were faced with fireboard, allowing the more decorative outer faces to be retained. The outer faces were painted with clear intumescent coating and the glazed aperture was infilled with non-combustible boarding.

### 6.5.2 Door hardware

Existing door hardware should generally be retained, though it may require upgrading (ie intumescent strip around a lock case), but it is likely that some form of door closer may be required for fire doors to ensure that they close after people have escaped through them. Self-closing devices can be floor-mounted or concealed, overhead or in the door jamb. In areas of high traffic, or where there is a wish to hold doors open for aesthetic or operational reasons, electromagnetic hold-open devices can be used, automatically releasing the holding mechanism when the fire alarm is actuated.

Door hinges can be improved by replacing the pins, tightening, or fitting larger or longer screws. Where existing hinges need to be moved, the rebates should be repaired by gluing and pinning a fillet of wood in its place, which should be routered and the whole smoke seal/intumescent strip replaced. If the hinges need replacing, the new hinges should comply with BS EN 1935:2002 (Building Hardware. Single-Axis Hinges. Requirements and Test Methods).


**Figure 13.** At category A-listed Duff House in Banff, there was a need to improve the fire resistance of doors. This was achieved by the insertion of intumescent paper on the panels of the doors and intumescent strips around the door edges.

### 6.5.3 Verifying the performance of fire and smoke resistance of doors

For existing traditional doors, demonstrating compliance by testing the door in a standard fire test is not possible because it would require the door to be destroyed. If the door is to be retained, then engineers and regulatory authorities must accept an assessment of likely performance in lieu of a furnace test result. Demonstrating that the performance is adequate requires a judgement about how best to improve the performance of the door and whether this is reasonably practicable in the circumstances. This may require that the door (and any improvements) is assessed by a fire engineer alongside the usual variables. The fire engineer may take a more performance-based approach, considering the geometry of the adjacent room. For example, a sizeable room with high ceilings will act as smoke reservoir, delaying the time taken for the smoke layer to descend from the ceiling, spread out and pass through gaps around the door. The fire engineer may also consider the predicted type of fire and speed of growth (eg slow growth if the fire loading in the room is low). This provides the opportunity to reduce or avoid the need to rely on furnace test data while demonstrating adequate performance. When assessing the fire resistance of doors, any gaps between the door frame and supporting wall must not be overlooked.

Following furnace testing on recycled doors carried out by Historic Environment Scotland, the Institution of Fire Engineers (IFE) Heritage Special Interest Group completed further research on the effect of room size on fire growth and upgrading fire doors. This research was published by Historic England (approved by the Chief Fire Officers' Association) under the Guide to the Fire Resistance of Historic Timber Panel Doors. Using the matrix provided, it is possible to determine the requirement for upgrading doors.

## 6.6 GLAZING

### 6.6.1 Glazed internal openings

These are common in Scotland and were often a way of providing light and ventilation to an internal room or a stairwell. Glazed openings in a compartment wall may represent potential routes for the spread of smoke and flame, as they will crack and break in any heat. While retention of historic glass is to be encouraged, their performance may need to be improved with modern fire-resistant glass. Options to consider include improving the way the glass is held within its frame and adding an additional layer of fire-resistant glass, keeping the old glass in situ. Several types of fire-resistant glass are available, including wired, laminated and insulated.

### 6.6.2 Windows adjacent to escape stairs

In some properties, the external escape stair, often an additional new provision, passes several windows. In order to ensure that those escaping are not harmed by a window disintegrating from the fire inside, such windows need to have fire protection designed in. For traditional fenestration, this is difficult to achieve. An acceptable solution is to install secondary glazing with a fire-rated frame and glass to the inside face of the existing window, but this can be compromised if the window and secondary glazing is opened by occupants. Alternatively, an automatic dropping fire shutter can be installed over the inside of the window which activates to close the opening off in the event of fire. However, this is an active fire protection measure, the maintenance of which will need to be included in the fire safety management plan.

## 6.7 SMOKE MANAGEMENT

Smoke may be prevented from entering an escape route through the use of physical barriers such as fire doors or smoke curtains. This is often seen where stairwells and adjacent corridors are sectioned off with fire doors on the landings. This can be achieved by the use of fire-resistant glass doors and other materials that give a light contrast. Conversely, a more formal partition can be formed to copy adjacent joinery details.

### 6.7.1 Smoke clearance

In stairwells or atria, there is often a need to allow firefighters the means to clear smoke during the incident. The Building Standards Division Technical Handbooks indicate that a square metre of opening should be available to firefighters. Normally, any glazed opening that can be operated or broken through is sufficient. In some situations where access is a problem, actuators may be used to open remotely. Where space prevents such fittings, smoke clearance devices may be required. Larger buildings may also require extractor fans. Such measures may be considered 'active' systems, as discussed in more detail in Section 7.

*Example:* A category B-listed hospital in Edinburgh was converted into office space, which included extending the building at the rear. With various offices opening onto the stairwell (designed to be one of the escape routes), fire doors were added at each landing to prevent spread of smoke into the stairwell (Figure 14).


**Figure 14.** A new fire door onto an escape stair at a former hospital in Edinburgh that has been converted into offices.

## 6.8 IDENTIFYING AND ADDRESSING VOIDS

Voids and gaps behind lath and plaster linings can provide a route for fire to travel behind the linings up to the next floor. Non-invasive surveying equipment is available which would allow investigation of building fabric (eg thermography, industrial radiography and ultrasonic pulse velocity equipment). Alternatively, endoscopy involves drilling a small hole to gain access for a camera – useful for inspecting narrow and difficult difficult-to-access spaces. Filling of cavities may require direct intervention into the void where greater fire resistance is required. Alternatively, additional layers of fire protection may be provided to prevent fire from breaking into cavities.

### 6.8.1 Separating walls and roof voids

The thick stone or brick walls frequently encountered in traditional buildings can provide high levels of fire resistance. However, their integrity can often be weakened by poor alterations or penetrations, especially in roof or attic spaces, as can be seen in Figure 15.


**Figure 15.** Poor fire compartmentation in a roof space.

Many fires in historic buildings have been contained within spine or party walls only for the fire to travel across through a roof void (the very damaging Leslie House fire in 2009 is an example of this)[1] – particularly if walls are not carried up to the underside of the roof. Breaches in spine or party walls should be repaired with new lime-bonded masonry. Consideration should be given to introducing spine walls or party walls up to the roof line if acceptable to the client (and the local authority, if listed). The passage of cables or pipes through compartment walls should be fire-stopped and fire dampers inserted into any ventilation ducts. Lack of fire-stopping is an area of frequent failure in refurbishment projects and adds considerable risk in the fire safety management process.

## 6.9 DECORATIVE FINISHES

### 6.9.1 Decoration and paintwork

Care should be taken to ensure that efforts to improve the fire safety performance of the building fabric are not compromised by the inadvertent use of combustible decorative finishes. While decorative wallpapers and paint are not a major issue, multiple layers of oil-based paint accrued over the years can increase the potential for flame spread and can give off thick smoke and toxic fumes. If their removal is being considered, an assessment should be made prior to that to determine their significance against any potential risks.

*Example:* In the refurbishment of a 19th-century mansion house, the multiple layers of paint on the timber panelling in an entrance hall was judged to be at risk from spread of smoke and flame due to the many flammable layers of paint. These layers dated from a time of institutional use and had no historic value. The paint layers were removed and the panelling was varnished with a clear intumescent coating.

### 6.9.2 Drapes and hangings

In larger properties, curtains, pelmets and tapestries can constitute a significant fire load alone. In these situations, measures should seek to minimise the risk of fire starting. Lamps and other sources of heat must be controlled. Halogen bulbs are of particular concern; this was probably the source for the Windsor Castle fire in 1992 where a faulty spotlight ignited a curtain.[2] LED bulbs present a lower hazard due to the relatively low levels of heat given off while conserving energy. While there are fabric coating and treatments available, expert conservation advice is required where there is a risk that the treatment may damage a historic lining.

Example: Large tapestries at Stirling Castle were assessed as a significant risk from fire and were required to be treated to increase fire resistance. However, tests found that the fire-retardant treatment damaged the silver thread. As there was a fire suppression system and sound management procedures in place, the enforcing authority accepted that the tapestries could remain untreated.

## NOTES

1. 'Fire devastates historic Leslie House', *The Herald* (5 Feb 2009).
2. *Historic incidents: Windsor Castle fire – 1992*, Theale: Royal Berkshire Fire and Rescue Service, www.rbfrs.co.uk/your-service/about-us/historic-incidents

# 7. ACTIVE FIRE PROTECTION

Preventative measures aim to stop fires happening, but the unfortunate reality is that fires may still occur, and this scenario should be planned for. Active fire protection measures come into play once a fire has started and are intended to safeguard occupants and property by limiting the spread of fire and aiding the escape of people. When installing fire suppression systems, as with other types of invasive service installation such as heating pipework, this will require the joint expertise and collaboration of building conservation professionals and fire engineers to achieve the most appropriate solutions, often on a room-by-room basis.

## 7.1 FIRE DETECTION AND ALARM SYSTEMS

Early detection saves lives and can enhance property protection by enabling effective action to be taken against a small fire. Fire detection and warning systems raise an alarm on detecting heat, smoke, flame or gases. They can be either manual or automatic. The complexity of systems varies greatly, and choosing the appropriate system should be carefully considered. In a simple property, a manually operated gong or sounder may be sufficient.

At the top end of the scale, certain types of risk will require an addressable system which enables the precise location of the fire to be pinpointed (Figures 16 and 17). As an added safeguard, automatic systems can also be connected to an alarm receiving centre, ensuring that the emergency services are promptly alerted. Such systems are advisable where a fire might develop unnoticed, where there is a sleeping risk, or where the building and its contents are of historic significance. In addition, automatic fire detection and alarm systems can make up for deficiencies in building fabric.

Note that since July 2023, Scottish Fire and Rescue Service no longer routinely attend fire alarms in workplace and business premises due to the very high incidence of false alarms.[1] It is essential, therefore, that any detection system in a historic building is backed up by procedures for on-site fire detection investigation, with the fire service summoned only if there is a confirmed fire or sign of fire by personnel, or automated smoke cameras routed to a call centre handler. But these may be too intrusive or not acceptable to the client. Discussion is recommended with local Scottish Fire and Rescue Service staff regarding protocols for callout. The types of detection systems are described in Box 6.

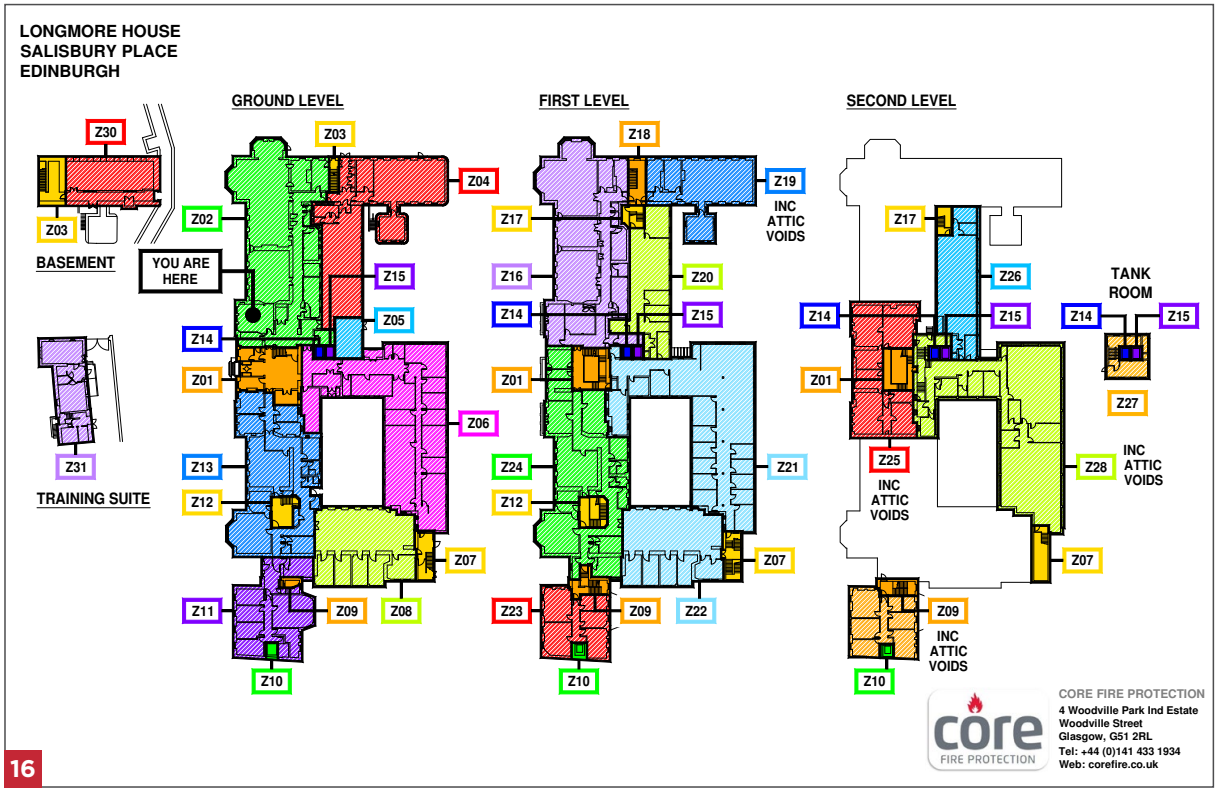



**Figure 16.** A plan showing distinct fire alarm zones.


**Figure 17.** A unit that indicates where a fire is registering with a lit display corresponding to the zoned plan in Figure 16.

### BOX 6: TYPES OF AUTOMATIC FIRE DETECTION

The choice of automatic fire detector type depends on the nature of the hazard and the balance between the speed of system response and the need to avoid false alarms. The common types of automatic fire detector are:

**Smoke detectors**, which detect the presence of smoke (either ionisation or optical type). They give a speedier response to most fires than heat detectors but have greater potential to generate false alarms. Smoke detectors within corridors and stairs should be the optical type.

**Heat detectors** operate when a fixed temperature is reached (and may also respond to abnormal rate of rise of temperature). Heat detectors have a good performance in respect of false alarms but are not appropriate where the detection of smoke is required, such as in escape routes.

**Multi-sensor detectors** contain a combination of heat, smoke or combustion gas detection. These sensors enhance system performance, and some types have a low potential for false alarm actuations.

**Beam detection:** There are two main types of beam detector. An end-to-end beam detection system incorporates a single transmitter unit and a receiver unit placed diagonally opposite, both located high up on side walls. Beam detectors can cover large spaces such as atriums or churches, and their side wall location means that architecturally refined ceilings can remain intact.

In a reflective beam detection system, both the transmitter and the receiver are mounted in the same housing. A beam is directed at a reflector, mounted at the opposite end of the protected area.

**Air aspirating systems** operate by continually sampling air. These systems are discreet (a 3–4mm sampling hole in a ceiling is the only visual evidence) and have a low probability of false alarms. Such detector heads are small and can be positioned in decorative or plain areas of a ceiling. Narrow pipework and a sampling unit can be accommodated above ceilings, in cupboard spaces or in other hidden voids.

#### 7.1.1 Hard-wired systems

All hard-wired systems will require wiring around the building. Wiring can be installed in a number of ways. It can be hidden behind linings or into cut channels but can also be surface mounted. This avoids damage to wall finishes through installation, but it is clearly visible. However, a neatly mounted fire-rated protected cable can be run on the surface with no ill effects (Figure 18). It is clearly visible, easy to install and access and costs are reduced as there is less disruption. Mineral-insulated copper-sheathed (MICS) cable is usually required for such work.

**Figure 18.** Discreetly mounted and painted to match the decor, this beam detector at Edinburgh Castle has a modest impact on the decoration.

### 7.1.2 Wireless systems

Benefits of wireless technology include quick installation, high reliability and coverage, which can be extended at a later date using repeater units or installed as an add-on to a conventional wired system. This relies on a good Wi-Fi signal, and as such, any interruption due to fire needs to be considered for the router and boosters.

### 7.1.3 Positioning of detectors

Detection and alarm systems should be installed to comply with BS 5839 (Fire Detection and Alarm Systems for Buildings – Multi-part Document) The ideal position of a detector head is towards the centre of a ceiling, avoiding corners. But the location may have to take into account any plaster decoration. Care must be taken to ensure that detectors are not compromised by natural air flows, such as doorways and windows.

*Example:* In a richly decorated plaster ceiling, to achieve adequate coverage while protecting the historic fabric, an additional detector head was provided to give flexibility in siting the heads (Figure 19).


**Figure 19.** An aspirating smoke detection system was installed in the Laich Hall at Edinburgh Castle during restoration work. These systems draw air through small pipes to detect smoke. You can see the small white pipe here before it has been cut back to lie flush with the ceiling, forming a nearly invisible detection system.

### 7.1.4 Positioning manual call points

These points are the primary way by which an individual can manually raise the alarm on discovering a fire. BS 5839 recommends that the body should be red and located by exits, but compromised solutions may be acceptable. For example, in a managed tourist attraction where trained staff oversee publicly accessible areas, the manual call points could be flush mounted, coloured to blend with the background and not placed directly beside exits, but located in a cupboard or behind a curtain (Figure 20).


**Figure 20.** A discreet manual call point.

## 7.2 FIRE SUPPRESSION

Fire suppression systems operate automatically following the detection of a fire. They allow a very quick and effective response to 'knock down' a fire before it has any chance to develop. They can operate by smoke detection, heat detection, or infrared detection.

Historically, suppression has been synonymous with sprinklers, however, options are now much wider, including water mist, inert gas and oxygen depletion. All such technologies have a place dependant on the risk identified in the fire risk assessment. There are many benefits in such systems, and they can offer a way around difficulties in compliance where building fabric cannot take physical changes or adaptations. However, this comes with a cost both financial and in terms of building intervention, as they can be complicated to install. Back up water supplies and other support systems will also likely be required, obliging a high level of mechanical and electrical service provision. Such works may suit a significant refurbishment project where there is considerable opening up of access routes for other reasons.

The storage of the extinguishing medium should also be considered. For water-based systems, where water is not mains fed, water tanks and pumps can be discreetly housed in underground tanks, in basements or in outbuildings.

### 7.2.1 Types of suppressants

There are a number of different extinguishing mediums (water, foam and gas) and their selection will depend on the particular circumstances. Where appropriate, an alternative to a traditional water sprinkler system is a water mist system which uses less water. An oxygen reduction system (hypoxic air venting) may be appropriate in archive and collection storage areas. In these cases, the risk to occupants of suffocation needs to be considered.

*Example:* In a library where there is an important book collection, a hypoxic system has been installed to allow fire control measures which will not damage the book collection.

### 7.2.2 Type of extinguisher heads

Interior layouts and decoration will determine the type and positioning of sprinkler heads; on the ceiling or side mounted on the walls (Figure 21). A range of extinguisher heads are available, from the traditional drop down pendant, to concealed heads that are fully recessed within the ceiling (Figure 22).

**Figure 21.** A sprinkler head can be seen at category A-listed Newhailes House but is partly obscured by the alcove room cornicing, minimising its visual impact. It was installed as part of the building's 2018 refurbishment.


**Figure 22.** Concealed sprinkler heads in the decorated ceilings at Duff House have coloured caps to blend with interior finishes in the rooms.

### 7.2.3 Fitting a suppression system

Where possible, this work should run in tandem with other service works to minimise disruption. Existing routes for other services should govern pipework runs, and pipes may have to take a circuitous route. In some service areas, pipework should be surface mounted to minimise interventions and maximise accessibility for servicing and repairs.

Where routes are constricted or narrow, CPVC piping may offer an alternative as sections are jointed requiring less space than the jointing of more traditional steel or copper pipes. It may be possible to run exposed pipework along the top of a deep cornice or, with expert advice, paint pipes to blend with internal finishes (Figure 23).


**Figure 23.** The sprinkler system at Corgarff Castle. The piping has been painted to match the colour of the surrounding timber.

## 7.3 LIFETIME AND MAINTENANCE

It is accepted that the lifetime of many building systems is finite; sometimes less than 25 years. However, historic buildings have lives measured far in excess of that, and any interventions required for the installation of such systems should be designed in such a way that any adverse impacts to the building fabric are minimised, and that the systems are easily maintained and removed and replaced. For example, this might be the conscious decision to surface mount a fire suppression system in a room with highly decorative ceilings and timber panelling, thus reducing the need to lift floors and make pipe runs in the ceiling above.

### 7.3.1 Maintenance

Fire protection systems require regular maintenance and testing by specialist service companies. Maintenance records should be kept in the fire logbook. Failure to ensure that systems are capable of performing as intended may endanger occupants, firefighters and leave the dutyholder(s) liable to prosecution.

### 7.3.2 False alarms

All systems can be prone to errors. Unwanted fire alarms have financial implications, waste emergency services' time and reduce confidence. Likelihood of false alarms can be reduced if the systems are correctly designed, installed, and maintained. One simple rule is that a heat detector, as opposed to a smoke detector, is more suited to a kitchen area.

## 7.4 PORTABLE FIREFIGHTING EQUIPMENT

### 7.4.1 First aid firefighting

A small fire tackled in the early stages with portable firefighting equipment (extinguishers or fire blanket) may prevent a fire that could threaten life and property. This is sometimes called 'first aid firefighting'. Managers of a building should ensure that staff are trained in the use of extinguishers as using the wrong type of fire extinguisher can put staff, other occupants, and the building at risk (eg a water fire extinguisher should not be used on an oil or electrical fire).

### 7.4.2 Types of extinguishers

Different types of fire extinguishers exist for different classes of fire. It is, therefore, essential when selecting extinguishers, that the type is appropriate to the anticipated types of fire. Dry powder extinguishers are no longer typically used indoors, due to issues with visibility and damage from negligent discharge. However, there are newer types of multi-purpose extinguishers available, eg water mist. BS 5306: Part 8 (Fire Extinguishing Installations and Equipment on Premises – Multi-part Document) provides information on the selection and installation of extinguishers, but any selection will ultimately depend on the nature of the building, its use and the fire risk assessment findings.

### 7.4.3 Positioning of extinguishers

In historic buildings, careful consideration should be given to the positioning of extinguishers. While physically fitting an extinguisher to a wall might be damaging to the fabric, a free-standing base may provide an alternative (Figure 24). In a museum, where exhibition rooms are permanently staffed, it may be acceptable for extinguishers to be enclosed in cupboards or recesses, but the staff must be trained on their location, and they must be easily accessible.


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**Figure 24.** A fire extinguisher on a free-standing wooden base at Stirling Castle's Chapel Royal.

## 7.5 ESCAPE LIGHTING AND SIGNAGE

A power failure triggered by the outbreak of fire can cause failure of lighting. In these instances, emergency escape lighting is intended to assist occupants to exit a building, illuminating escape routes (stairs, change of direction, exits, etc) and specific hazards. The fire risk assessment will identify any additional needs for emergency lighting as part of the regular review process.

*Example:* As part of the refurbishment of the Palace block in Stirling Castle, innovative free-standing podiums were installed, incorporating exhibit information and escape lighting, with extinguishers tucked away out-of-sight behind. An icon of an extinguisher is displayed on the front and the area is always staffed, with staff aware of where the extinguishers are located (Figure 25).


**Figure 25.** A free-standing podium at Stirling Castle featuring visitor information, escape lighting and a concealed fire extinguisher, clearly marked at the front.

### 7.5.1 Power for lighting

Emergency lighting requires a backup power system in case of mains power failure. There are two main types: self-contained, where a battery is housed within each individual light fitting, or a centralised power system (a bank of batteries, sometimes referred to a as a static inverter or CPU). For hard-wired systems, cable runs should be carefully contemplated. On a stone wall, the cable should follow the lines of the mortar joints and the colour of the sheath of the cable should match the mortar.

### 7.5.2 Discreet fittings

Standard emergency escape lighting can often look incongruous in a historic building and positioning requires consideration. Lighting units are available that are more suited to historic settings, both in terms of their design and fixing details (Figure 26). Small and/or recessed light fittings are available and thin fibre optic cabling mounted at skirting level or under shelves may offer a discreet option where rooms are elaborately detailed. Many modern lights of modest appearance are designed to have an emergency light capability within the same unit.


**Figure 26.** Discreet escape light fittings can be configured to suit a historic interior, as seen at Duff House.

### 7.5.3 Scope of escape lighting

Emergency escape lighting may not be required throughout an entire building. If a function space is frequently used in the evenings, but not the rest of the building, emergency escape lighting could be restricted to the function space, its escape routes and any other rooms connected with its use.

### 7.5.4 Temporary escape lighting

Where special events are held on an infrequent basis, temporary emergency lighting or emergency torches may be an acceptable measure (though the ratio of staff with torches to members of the public may not always be manageable).

### 7.5.5 Fire action notices

Fire action notices detailing the emergency fire action plan should be appropriately displayed, usually beside manual call points and exits (Figure 7).

## 7.6 EMERGENCY SIGNAGE

Like emergency lighting, signage is a mandatory requirement and helps occupants navigate their way out of building during an emergency. It should be visible, recognisable and illuminated. However, standard emergency signage can often also look incongruous in a historic setting (Figure 27).

It should be accepted that in historic buildings, especially those that are not open to the public on a continuous basis, there is a case for taking a more flexible view on the need for and positioning of signage, thus meeting the spirit of the legislation.


**Figure 27.** Standard escape signage can look out of place in a historic setting.

### 7.6.1 Scope of emergency signage

Factors which might impact on signage include familiarity of occupants, the presence of trained fire wardens to direct evacuation, complexity of the means of escape, etc. For example, in a tourist attraction, where rooms are always staffed by stewards, free-standing signs which can be moved as appropriate (Figure 28) can be the preferred approach or it may be acceptable to omit such signage. In small simple premises, where occupants are familiar and the means of escape straightforward, signage may also not be necessary. In such cases, it is recommended to discuss with local Fire and Rescue Service representatives.

Where there are two escape routes, a single sign indicating an alternative route may be all that is needed. In more complex premises, a series of signs is usually required to indicate the direction of escape.


**Figure 28.** Free-standing signage seen in the Great Hall at Edinburgh Castle.

### 7.6.2 Appropriate ways of providing emergency signage

Where signage is required, its impact can be minimised with careful consideration to design and positioning. There are alternatives to physically affixing notices to the historic fabric, such as adhering them to linings (Figure 29), or signs can be suspended by chains to avoid spoiling ornate architraves. Fastenings and cabling for signs should be fastened carefully into the wall linings and following masonry joint lines, if suitable.

Photo luminescent signs (constantly charging in light conditions) can also be used as they do not require hard-wiring and to further minimise the need for additional hardware, lighting and signage can be combined in one unit. Standard white plastic bulkheads can be replaced with more stylish units such as a chrome finished fitting (Figure 30).

### 7.6.3 Temporary emergency signage

Temporary signage may also be acceptable in a number of instances, such as in a private house hosting a series of special events or one that is only open in the summer season.


**Figure 29.** A fire exit sign at Fyvie Castle, which is attached to the wall using velcro rather than being surface mounted.


**Figure 30.** Lighting and signage combined with a chrome fitting.

## NOTES

1. *UFAS – Reducing Unwanted Fire Alarm Signals*, Cambuslang: Scottish Fire and Rescue Service (2023), www.firescotland.gov.uk/businesses-and-landlords/reducing-unwanted-fire-alarm-signals-ufas

# 8. CONCLUSION

The dutyholder is the person who has overall responsibility for fire safety in occupied buildings, central to which is engaging in the process of fire safety management. Fire safety management is a systematic approach to creating an effective strategy that protects people from fire. In the context of historic buildings, fire safety management is also essential to protecting against the loss of historic fabric or important collections. It is, therefore, important that dutyholders understand their responsibilities and know when to seek help from fire safety or built environment professionals.

A key component of fire safety management is a fire risk assessment, which forms the basis on which hazards and fire safety improvements can be identified, and is used to inform further action. While the responsibility for compliance with the legislation sits with the dutyholder, the fire risk assessment is likely to be performed by a fire assessor or engineer with appropriate experience in working with historic buildings.

Where the implementation of the findings of a fire risk assessment results in building work, this should be carried out in accordance with building regulation procedures where possible. This risk-based approach to fire safety management facilitates flexibility on how the legislative requirements may be achieved. While every building is unique, historic buildings can be more complex, and careful consideration is required so that life safety requirements can be fulfilled in a manner that is sympathetic to the historic fabric of the building. Robust management arrangements are also key to providing an appropriate and sustainable fire safety strategy in any historic building.

# 9. GLOSSARY

| | |
|---|---|
| **Architrave** | The moulded framing around a door or window. |
| **Atria/atrium** | An open space within a building, leading up to either open-air, or a skylight or glass roof. In multi-storeyed buildings atria pass through every floor. |
| **Accelerant** | A flammable material that can be used to start or accelerate the spread of a fire. |
| **Active fire precautions** | Fire detection or suppression systems and measures that are required in the event of a fire. These may involve a person taking manual action (such as fire blankets, fire extinguishers and fire alarms), or they may set certain actions in motion, such as smoke detectors and sprinklers. |
| **Aspirating smoke detection system** | A central sensor that draws in air through small pipes to detect smoke. |
| **Carrying down apparatus** | Equipment used to transport a person downstairs, eg evacuation chairs. |
| **Coffered ceiling** | A ceiling consisting of a grid of sunken panels in geometric shapes. |
| **Cold bossing** | A process of shaping lead using hand tools without heat. |
| **Compartmentation** | The process of dividing a property into smaller areas or sections to prevent fire spread and contain smoke and toxic gases. |
| **Compression fitting** | A fitting used in plumbing and electrical conduit systems that connects two pipes securely, including those made of different materials. |
| **Conservation plan** | A document that identifies and details the areas of particular cultural or historic significance of a property/site and its environs. It also outlines how to retain and protect these areas and sets out a policy and strategy for the management and conservation of the site. |
| **Cornice** | A decorative moulding that runs around the top of a wall abutting the ceiling. |
| **Deafening boards** | Boards that carry sound-deafening material (traditionally an ash mix) to help reduce sound transmission. |
| **Door jamb** | An individual section of a door frame, such as the vertical side posts and the top horizontal section (head jamb). |
| **Dry riser** | A system of pipes and valves that allows fire rescue services to access water and distribute it to the upper floors of a building rapidly. |
| **Dutyholder** | An individual, such as an employer, landlord, manager, owner or anyone with some control over a premises who has fire safety responsibilities within their premises. |
| **Eaves** | The lower edges of a roof that that meet or project over the walls of building. |

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| **Endoscopy** | An investigative method that involves inserting a small camera into a drilled hole to allow visual inspection of difficult-to-access spaces. |
| **Feathers** | Thin slabs of stone that divide a chimney into individual flues. |
| **Fire action notice** | A sign that details the actions that should be taken by occupants or visitors to a property in the event of a fire. |
| **Fire board** | A fire-resistant board that is used to prevent the spread of fire. |
| **Fire load** | The quantity of heat which could be released by the complete combustion of all the combustible materials in a floor area, including the facings of all surrounding surfaces. It is used to measure the potential severity of a fire within a specific area. |
| **Fire watch** | The process of a designated person checking the working area for signs of combustion for a period of time (dependant on the significance/ proximity to flammable materials etc) during and after hot works have taken place. |
| **Furnace test** | A test that replicates conditions of a fire incident through controlled exposure to extreme heat to evaluate the fire resistance of materials. |
| **Hard standing** | Ground that has been paved or has had a hard surface applied (eg concrete) typically to create pathways or areas for parking vehicles. |
| **Horizontal escape route** | The horizontal distance travelled to reach an exit. |
| **Hot works** | Any construction process or activity which uses or produces heat eg welding, soldering, grinding. |
| **Hypoxic system** | Prevents fire by reducing the oxygen composition in a set area. Also referred to as an oxygen reduction system. |
| **Ignition** | Fire starting due to a build-up of heat, often accompanied by a flame or spark. |
| **Intumescent paper/ varnish** | A fire-resistant material that expands as a result of heat exposure, leading to an increase in volume and decrease in density, which helps maintain structural loadbearing capacity. |
| **Joist** | A beam supporting the floor or roof, which is normally made of timber. |
| **Lintel** | A structural support, traditionally of timber or stone, that sits across the top of a door or window. |
| **Manual call point** | An alarm system that is manually activated by someone on site. |
| **Mortice and tenon** | A type of strong joint that connects two pieces of a material, such as timber or stone. |
| **Fuel load** | The total amount of combustible material in a space, measured in relation to the floor area of the space. This can be moveable or fixed. |

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| **Mullion** | A vertical bar that separates timber panels or pieces of glass in a panelled door. |
| **Party walls** | Shared walls between adjoining buildings. |
| **Passive fire precautions** | Building components that slow or impede the spread of fire and smoke and don't require activation, such as fire doors. |
| **Photoluminescent sign** | A sign that absorbs light energy which it can then release as light energy to allow it to glow in the dark to provide direction. |
| **Pugging** | A material, such as clay or mortar, that can be inserted between a wooden flooring and the ceiling that reduces the transmission of sound. |
| **Radiography** | A non-destructive form of investigation that uses ionising radiation to penetrate material to reveal hidden flaws. |
| **Rails** | The top and bottom horizontal sides of a door. |
| **Rebates** | Door frame grooves where the latch is attached to. |
| **Reinforced grass paving** | A durable interlocking mesh that can be laid over areas of grass to protect it from wear. |
| **Repair mortar** | A mortar designed to restore the original profile of a stone, or area of stone, that has been damaged or weathered. |
| **Repeater unit** | A panel remote from the main fire alarm control unit that mimics the display of the control unit and allows the user to monitor any output. |
| **Smoke test** | A smoke test involves igniting smoke pellets placed in the fireplace or at the base of a flue which is then sealed to establish if the smoke is evacuating through the flue outlet and to identify any leaks. |
| **Spine wall** | A load bearing wall which runs at a 90-degree angle to the party wall (see above). |
| **Styles** | The left and right vertical sides of a door. |
| **Thermography** | A non-destructive testing method which captures infrared video and combines it with still camera images to measure and record the temperature of a building. |
| **Ultrasonic pulse velocity** | A non-destructive testing method that assesses the strength of stone by measuring the velocity of an ultrasonic pulse passing through it. |
| **Vertical escape route** | The vertical distance travelled to reach an exit, eg by a staircase or a lift. |
| **Water tender vehicle** | A firefighting vehicle that transfers water from a water source to the location of a fire. |

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