ASFP Guide to Inspecting Passive Fire Protection for Fire Risk Assessors

Association for Specialist Fire Protection

ASFP

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Foreword

I am very pleased to welcome this essential guide to inspecting passive fire protection for fire risk assessors. It lays out clear, pragmatic guidance to enable the identification and inspection of all types of passive fire protection in the formation of a fire risk assessment, as required by legislation in the UK and Ireland

This technical guidance document will act as a valuable tool for all those directly involved in the inspection and maintenance of passive fire protection.

My congratulations and thanks go to Niall Rowan as technical author of this document and to the all those who have assisted and supported in its production with both time and expertise.

Brian Robinson CBE, QFSM, FIFireE
ASFP President

Association for Specialist Fire Protection (ASFP)

The Association was formed in 1975 and currently represents the majority of UK contractors and manufacturers of specialist fire protection products, with associate members representing regulatory, certification, testing and consulting bodies.

ASFP seeks to increase awareness and understanding of the nature of fire and the various forms, functions and benefits provided by passive fire protection. It is willing to make available its specialist knowledge on all aspects of fire protection and can assist specifiers and main contractors in identifying products suitable for specific requirements, both in the UK and related overseas markets.

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URLs

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ASFP, Kingsley House, Ganders Business Park, Kingsley, Bordon, Hampshire GU35 9LU, United Kingdom
www. asfp.org.uk Tel: +44 (0)1420 471612 Fax: +44 (0)1420 471611 Email: info@asfp.org.uk

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For provision of material and information: GAI/Jacky Sinclair – for material included in the text on fire doors, GGF – for material used in Annex E, Paul White – for material included in the text on fire dampers, PFPF – for material used in Annexes E, F, G, I, J & K (subsequently modified).

Endorsements

"LABC fully supports ASFP's Guide to Inspecting Passive Fire Protection for Fire Risk Assessors. This document is an excellent resource for all fire risk assessors and will help ensure safety in buildings. We hope that this, along with the long overdue registration and, recently published, competency criteria for fire risk assessors, will improve the effectiveness of fire risk assessment industry and improve life safety."

"As a health and safety professional working in the social housing arena I specialise in fire safety and I have spoken as an expert for the Housing Quality Network and Inside Housing. I write documents and risk assessment templates to assist persons carrying out fire risk assessments. I have never taken the time to write endorsing a document before but, having read the ASFP Guide to Inspecting Passive Fire Protection for Fire Risk Assessors, I have concluded this is not a 'nice to have' for a risk assessor it is a 'MUST have'." ***Graham Fieldhouse***

Contents

1. Introduction

This guide has been produced to assist fire risk assessors (FRAs) to carry out inspections of Passive Fire Protection (PFP) as part of a fire risk assessment under appropriate fire safety legislation which includes the:

- Regulatory Reform (Fire Safety) Order 2005 (England & Wales) (FSO)
- Fire (Scotland) Act 2005
- Fire and Rescue Services (Northern Ireland) Order 2006
- General Application Regulations 2007 under the Safety, Health and Welfare at Work Act 2005. Fire Services Act 1981 & 2003 (Ireland)

It provides assessors with appropriate guidance for them to be able to verify that the PFP supporting means of escape is adequate. The legislation referred to above is designed to save lives in the event of a fire but does not necessarily cover the issue of property protection. Building owners or insurers wishing to ensure that the building is capable of withstanding the spread of fire for a period longer than that necessary to evacuate its occupants should contact the ASFP for further guidance.

1.1 How to use this document

The fire risk assessor should initially read this document in its entirety to obtain a basic understanding of PFP and its role in means of escape. Thereafter, it can be used as a reference source to assist the inspection process.

- Chapter 1 contains background information, including a brief explanation of the relevant regulations
- Section 1.5 explains how to decide what to check to ensure life safety and where to get information on the location of installed PFP in the building.
- Chapters 2 - 6 explain how to identify each type of PFP, and what to look for.
- Further information on each type of construction is given in the Annexes starting on page 29, but the main points to check are detailed in section 1.6.
- A checklist of what needs to be inspected for each type of PFP is given in Annex A. The checklist contains cross references to the relevant text in chapters 2-6.

1.2 Background

Passive Fire Protection products are those 'built-in' to the fabric of a building to restrict the growth and spread of fire and smoke. They do this by controlling the flammability of wall and ceiling linings; dividing the building into fire-resisting compartments; providing protection to the structure of the building to prevent its collapse; and providing protective routes for escape.

PFP products include: fire doors, fire-resisting walls, floors and ceilings, fire-resisting ducts and dampers, fire-stopping, and fire protection to structural members.

The supporting guidance documents to the Building Regulations make reference to the PFP in a building. In the United Kingdom and Ireland the PFP measures that need to be considered are detailed in the following documents:

- England & Wales – Approved Document B 2006 (AD-B)
- Scotland – Technical Handbook B 2010
- Northern Ireland – Technical Booklet E 2005
- Ireland – Technical Guidance Document B 2006

Much of the PFP included in the supporting guidance documents is designed to ensure that in the event of fire, the occupants can escape from a building; fire will not spread easily within it or to other buildings; the fire and rescue service can attend safely; and the building will not collapse prematurely.

As part of undertaking a fire risk assessment, fire risk assessors will need to undertake an evaluation of PFP in a building. Whilst much of the information given in this guide relates to the regulations listed above, this is mostly given in terms of fire-resistance using conventional failure criteria. In practice, smoke is one of the major causes of deaths in fire and consequently a competent risk assessor should concentrate on passive fire protection measures that restrict the spread of smoke within the building.

1.3 Scope

For the purposes of a fire risk assessment under legislation in the UK or Ireland, the main aim is to reduce the likelihood of a fire occurring to as near zero as is practical and for the occupants to be able to escape if a fire occurs. Consequently, when

considering passive fire protection, such a fire risk assessment only needs to verify that those measures supporting means of escape are satisfactory and do not compromise life safety. The assessment would typically consider the operation and condition of any fire doors and an evaluation of the condition of escape route walls and ceilings protecting escape routes, including any penetrating services. For example, such an assessment would include evaluating the fire-resisting construction in roof spaces, but would not normally include a detailed survey of the fire protection to the structural steelwork of a building.

Whilst a full investigation of all PFP is the ideal; it is generally not necessary for a fire risk assessment under the current legislation. In addition, such investigations cannot be undertaken thoroughly without a detailed and, in some cases, invasive inspection.

More invasive inspections are described in **'Fire safety in purpose-built blocks of flats'** published by the Local Government Group but these are outside the scope of this document and the capability and expertise of most fire risk assessors undertaking routine risk assessments. In addition, some high risk buildings which use a 'defend in place' principle may require a thorough detailed inspection. Should this be required, or if during a fire risk assessment significant issues or problems with the PFP are discovered, then the need for an appropriate professional site inspection should be included in the report of the fire risk assessment.

Table 1: Summary of the applicable legislation

Country	England & Wales	Scotland	N Ireland	Ireland
Relevant Act	Regulatory Reform (Fire Safety) Order 2005 (FSO)	Fire Safety (Scotland) Regulations & Fire Scotland Act 2005	Regulatory Fire & Rescue Services (N Ireland) Order 2006	General Application Regulations 2007 under the Safety, Health and Welfare at Work Act 2005. Fire Services Acts 1981 & 2003
Person responsible	Responsible Person	Duty holder	Appropriate Person	Responsible Person (Employer/landlord)
Person to do risk assesment	Responsible person or subcontractor	Responsible person or subcontractor	Responsible person or subcontractor	Responsible person or subcontractor
People affected in building	Relevant persons	Relevant persons	Relevant persons	Employees and persons connected with the workplace
Building Regulations	Building Regulations 2010	Building (Scotland) Regulations 2006	Building (N Ireland) Regulations 2000	Building Control Regulations 1991, 1997 - 2011
Statutory or Supporting Guidance documents	Approved Document B 2006	Technical Handbook B 2010	Technical Booklet E 2005	Technical Guidance Document B 2006
Building Regulation 38/16b equivalent	Yes	No*	No	Fire Services Acts 1981 and 2003
CDM regulations or equivalent	'94 to '97	'94 on	'94 on	No

** Although Scottish Building Standards Officers can apply 'continuous requirements' and fire safety design documents are part of those.*

1.4 Fire risk assessors (FRAs)

1.4.1 Liabilities of the Responsible Person

Under the legislation, the 'Responsible Person' (England, Wales and Ireland), the 'Duty Holder' (Scotland), or the 'Appropriate Person' (Northern Ireland) has to undertake a fire risk assessment for the premises for which they are responsible. Where it is considered that such expertise is not available in-house then the Responsible Person (and equivalent in Scotland and Northern Ireland) may seek to employ a consultant or company to undertake the assessment. Where external professional fire risk assessors are employed, it is important that they are competent, as criminal liability will arise for the Responsible Person (or national equivalents) if the fire risk assessment is inadequate and people are placed at risk of death or serious injury as a result.

The Responsible Person also has to have in place a system for ensuring that the integrity of any PFP measures is not compromised when alterations are carried out on the building e.g. for the installation of new pipes, cables and other services. Records of these should be made available for inspection by the fire risk assessor.

1.4.2 Skills

A competent fire risk assessor will need to have an understanding of the intent, objectives and requirements of the legislation. In terms of the PFP knowledge he will be expected to have knowledge of the design principles and the methods of construction of buildings constructed in accordance with appropriate standards and legislation. In particular, he will need to have knowledge of the relevant fire protection measures, particularly for means of escape and compartmentation of buildings.

1.4.3 Qualifications and experience

There are no formal qualifications required to be a fire risk assessor, so it falls to the Responsible Person (or national equivalents) to ensure that the appointee is competent to address the specific needs of the premises in relation to all passive fire protection measures installed. It is therefore imperative that the risk assessor is able to demonstrate that they have the appropriate expertise to undertake the work in question.

Following discussions between the Department of Communities and Local Government (DCLG), the various bodies registering and certificating fire risk assessors and other stakeholders, a guide to the required competence of fire risk

assessors was published in 2011. The intent is that it be used as the basis of measurement of competency by certification bodies and others who assess persons offering fire risk assessment as a skill. It does not detail every aspect of the required knowledge as the bodies that use the guide and certificate assessors will be expected to have the required detailed knowledge. It can be downloaded from **http://is.gd/7qqHXP** or the Passive Fire Protection Federation website, **www.pfpf.org.uk.**

1.4.4 Evaluation of competence of fire risk assessors

The DCLG has facilitated discussions between all stakeholders in the fire risk assessment arena which has led to the publication of a set of competency criteria for assessors to be judged against. Organisations either certificating or registering fire risk assessors will use these criteria in their respective schemes to judge the suitability of fire risk assessors. Responsible persons employing fire risk assessors should ensure that they are a member of a third party scheme which evaluates the competence of the assessor using the competency council criteria described above.

1.5 What the fire risk assessor needs to do

1.5.1 Structured reasoned approach

The assessor must have a structured reasoned approach to the assessment of PFP in a building. The aim is to ensure that the means of escape is not compromised by deficient PFP and that the spread of fire and smoke is restricted. It is not to ensure that, for example, all the fire-resisting construction on escape routes and all compartmentation complies with Building Regulations; that is the function of building control, although the assessor should have a fundamental knowledge of recognised guidance documents.

1.5.2 Means of escape

The assessor needs to evaluate what is needed for occupants to escape in the event of a fire and then evaluate the PFP accordingly. This may not need to be as comprehensive as that given in AD-B and national equivalents.

To evaluate what is needed for occupants to be able to escape in the event of fire, the assessor needs to look at the

occupancy of a building. Is it a house of multiple occupancy (HMO), a hotel, an office or possibly a block of flats? Each may rely on PFP to a greater or lesser extent and the fire risk assessor should consider the following as examples of how the occupancy and the end use need to be taken into account in his assessment of the PFP:

- A HMO will often be converted from an existing building which was not conceived to have several different families in it at one time. Consequently, the inherent fire-resisting construction may not be as good as one would expect in, for example, a modern block of flats or an office building. Residents may be incapacitated through drink or drugs and any visitors will also be unfamiliar with the layout of the building and the recommended escape routes. Many have defective fire alarms, there will be nobody on duty to raise the alarm and experience has shown that these properties tend to have a higher risk of fire. On the other hand, the occupiers should be familiar with the layout of the building.
- A hotel will usually have well-specified PFP measures (although it too might have been converted) with appropriate fire-resisting construction and some active fire protection. There is also usually somebody on duty at night to raise the alarm and assist with escape. On the other hand, residents may be incapacitated through drink or drugs and will be unfamiliar with the layout of the building and the recommended escape routes.
- An office may have a high occupancy and may, in exceptional circumstances, have a high fire load. Also, it may rely upon phased evacuation, which will put greater reliance on the building's PFP. On the other hand, it is not a sleeping risk; most businesses should have reasonable evacuation procedures and the occupiers should be familiar with the layout of the building and there may be active fire protection measures.
- A tall block of flats may have a stay-put policy where fire resistance of an hour or more may be required. In such circumstances, a fire risk assessor should look more thoroughly at the fire-resisting construction and, in particular, at poorly sealed penetrations and imperfections of fit. PFP should restrict smoke movement more than, for example, in a single story block where everyone can be evacuated quickly. The assessor may also need to investigate ventilation systems e.g. bathroom extract systems and the extent to which they are communal and incorporate fire dampers and/or shunt ducts. Flats converted from older buildings may be particularly deficient in this respect.

- A residential care home may have varying levels of PFP and may have been converted from an existing building. Residents are likely to have impaired awareness and movement. Such a building may require extensive fire safety management procedures to facilitate safe evacuation. The fire risk assessor will need to evaluate the fire-resisting construction, paying particular attention to restricting the movement of smoke.
- A factory undertaking hazardous processes e.g. cooking in a food factory, or in the manufacture and storage of hazardous goods, may have well-specified PFP measures and appropriate active system, but the persons working at or visiting the factory may rely significantly on a high degree of fire safety management procedures.

In other words, the fire risk assessor must decide on what is needed in terms of PFP and then evaluate what is there and see if it is adequate.

The risk assessment needs to be balanced and pertinent taking into account the occupation and purpose of the building, the life safety fire strategy for the building and the extent to which fire-resisting construction on escape routes and fire compartmentation contributes to that. For most low rise buildings a period of 30 minutes' fire resistance is probably sufficient for means of escape. For taller buildings e.g. blocks of flats over six storeys, 60 minutes may be required in certain areas. However, the assessor must be confident that this is adequate (according to occupancy, height of building etc.) and check with the fire strategy document (if there is one). If the building was designed using BS 9999: 2008: Code of practice for fire safety in the design management and use of buildings, this allows justification to reduce the fire resistance periods from those specified in AD-B and national equivalents. If the assessor is not sure then he should use the periods from AD-B (or equivalents) as the default times.

Further guidance to appropriate levels of fire resistance can be found in specific documents referenced in Annex L. Finally, the local fire service Integrated Risk Management Plan may impact on the speed and response of the fire service, as may its policy on unwanted fire alarms.

1.5.3 Building layout

To be able to decide on the appropriate level of PFP and evaluate it, the assessor must familiarise himself with the building layout and escape routes. If a Fire Strategy document exists this should provide the required information and should be considered with the building drawings.

1.5.3.1 Modern buildings

a) Construction Design and Management (CDM) Regulations (UK only)

For a building constructed after 1994 the Construction Design and Management (CDM) Regulations Safety Plan should provide details of the fire safety provisions including the appropriate PFP measures.

b) Building Regulation 38 (formerly Regulation 16b) (England and Wales only)

In addition to the CDM regulations, if the building was constructed after April 2007, Regulation 38 (formerly Regulation 16b) of the Building Regulations applies in England and Wales. This requires that sufficient fire safety information be provided for persons to operate and maintain the building in reasonable safety. An overview of what information is required in terms of PFP measures is provided in the Annex G of Approved Document B, Volume 2. The information, which should have been passed on by the main contractor in compliance with Regulation 38 is vital to ensure that the fire risk assessor is able to carry out an suitable and sufficient fire risk assessment under the FSO.

Such information, whether arising from the CDM Regulations or Regulation 38 will include details of fire-resisting construction on escape routes, fire compartmentation and other PFP information specified to satisfy AD-B and should include the fire test and assessment reports and any third party certification. If the assessor can satisfactorily cross-check the plans with what he finds in the building then, providing there are no other factors that increase risk e.g. a change of occupancy or use of the building since it was constructed, then this should prove sufficient. However, the assessor must be mindful that the fire risk assessment is dynamic and not just an exercise to prove compliance with a plan drawing.

c) Fire Services Acts 1981 and 2003 (Ireland)

Owners of buildings constructed or materially altered since Building Regulations came into force in 1991 will have a Fire Safety Certificate issued by the local authority prior to construction. This approves the design but not the construction and it is the legislative responsibility of the new owner to ensure that the finished building complies with the approved design. It is reasonable to assume that if a building is constructed and maintained in compliance with the Fire Safety Certificate issued by the Fire Prevention Office of the local authority it will meet the requirements of other legislation.

Under the regulations, the responsible person must carry out a fire safety risk assessment and implement and maintain a fire management plan. This will require a thorough knowledge of the approved fire safety design, the details of which are in the Fire Safety Certificate (including conditions) and the approved Fire Safety Certificate application. This documentation should be in the safety file. Copies are available from the local Fire Prevention Office.

1.5.3.2 Older buildings or those with no information

For older buildings, or those where the information is not available, it may be impossible to determine the escape routes and critical compartmentation other than by a survey of the building layout from which the assessor will have to decide what level of PFP/fire-resisting construction is appropriate. From this, he will create a document that lists the escape routes and where fire-resisting construction is required as a basis for checking the PFP as part of the risk assessment.

1.6 Evaluation of PFP in escape routes by the fire risk assessor

1.6.1 General

The type of construction and age of the building are crucial in evaluating the PFP of existing escape routes. In older buildings it is possible that the type of construction and materials used may not perform to current fire test standards. Changes of occupier and/or refurbishment may have led to the creation of cavities and voids allowing the potential for fire and smoke to spread unseen. Damage to or removal of cavity barriers, and breaches in fire-resisting construction may also have occurred due to the installation of new services, e.g. information and communications technology systems cabling. The assessor should investigate fire-resisting construction on escape routes and also note any breaches in fire compartmentation, where appropriate.

In more modern buildings it is likely that there will be fewer voids; cavity barriers should have been installed where appropriate and any breaches in fire-resisting construction on escape routes and compartment walls floors etc. for the provision of services should have been adequately fire-stopped. Irrespective of this, the fire risk assessor should check for breaches in all fire-resisting construction and inappropriate fire-stopping and ensure that it is recorded and remedied as part of his risk assessment.

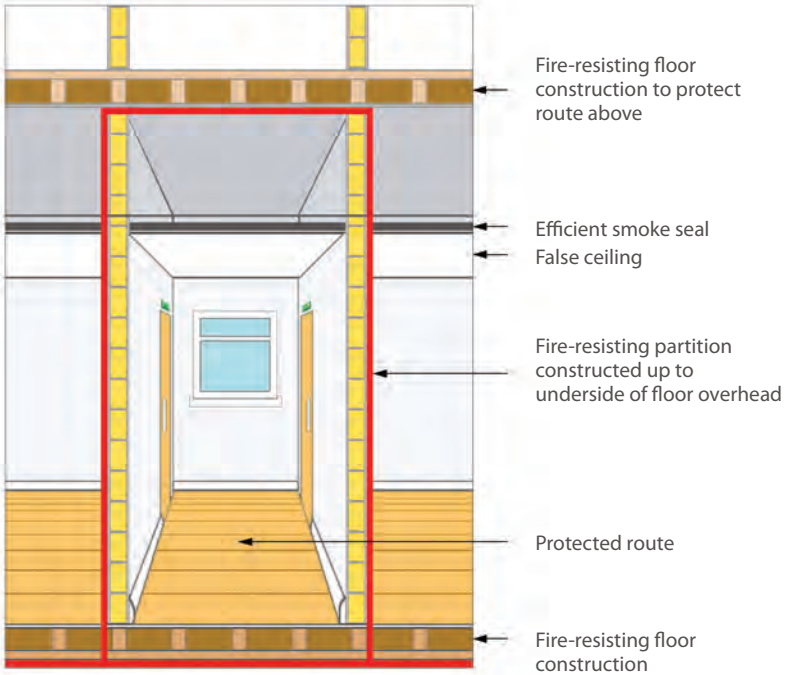
1.6.2 Third party certification

Passive Fire Protection products should be fit for purpose, properly installed and maintained in accordance with the manufacturer's instructions or a relevant standard. Third-party certification schemes for such products and installers are an effective means of providing the fullest possible assurances, offering a level of quality, reliability and safety that non-certificated products may lack. Fire risk assessors should look for certificates of completion by third party certificated contractors in the CDM safety plan or in Regulation 38 information (England & Wales only).

The use of third-party certificated products and installers should confirm to the assessor that all installed penetrations are effective since these installers are regularly audited by the certification bodies, which conduct random inspections of installations, audit the records and evaluate the competence of installation staff. The ASFP strongly advocates the use of third-party certificated PFP products and installers. However, this will not reduce the amount of inspection required as the assessor will need to confirm that additional penetrations have not been made since the PFP was installed.

1.6.3 CE marking

Under the Construction Products Directive it has been mandatory to 'CE' mark construction products placed on the European market, although some Member States, including UK and Ireland, chose not to make CE marking mandatory for products sold within their boundaries. CE marking shows that a product meets the minimum legal requirements to be placed on the market in terms of six Essential Requirements, one of which is 'safety in case of fire'. In 2011, the Construction Products Directive was replaced by the Construction Products Regulation which does not allow any Member State to 'opt out' of mandatory CE marking. Consequently, from 1 July 2013, construction products covered by a harmonised European product standard will have to be CE-marked before they can be sold in the EU. These include: fire doorsets and associated ironmongery, fire-resisting ducts and dampers. Many products can be CE-marked already (for example, fire door ironmongery) and these provide some reassurance that the product has been adequately evaluated.



A typical fire escape route.

1.6.4 Procedure

To evaluate the PFP associated with the means of escape, the fire risk assessor will need to examine:

- Lining materials for wall and ceilings on escape routes
- Fire doors
- Construction of walls, ceilings and floors forming escape routes
- Penetrating services in walls ceilings and floors forming escape routes e.g. ducts
- Other items of PFP, but usually only in the course of examining the items above

These are considered below in appropriate detail. Further detailed guidance on each type of construction can be found in Annexes B to K.

Fire risk assessors should take care when inspecting buildings that they follow all relevant health and safety guidelines. In particular, hazards associated with confined spaces, working at height, protection against dust (which may include asbestos) and vermin should be considered.

2. Lining materials for wall and ceilings on escape routes

The surfaces of any walls and ceilings in escape routes should be inspected to see if the materials forming the linings are satisfactory and that any additions e.g. extensive areas of notice boards, posters, carpets etc. do not cause a hazard by aiding rapid fire spread along a corridor.

The materials and construction of the walls and ceilings themselves should be satisfactory as these should have been checked in the building control process. However, older buildings, or those where there have been recent changes e.g. after occupation will need to be checked. Sometimes the walls may be made of or lined with inherently flammable materials, such as untreated timber, and this would not be acceptable. If the wall linings are found not to be made of suitable materials (see Annex B), consideration should be given to replacing them or adding a flame retardant or coating to upgrade their performance.

The main area of concern is the use of decorative materials on the surface of any linings in escape routes. These include significant overpainting, some heavy textured wallcoverings, and the addition of significant amounts of combustible items e.g. notice boards, posters, carpet etc.

Poor adhesion can lead to rapid flame spread. Courtesy of Exova Warringtonfire.

2.1 Extensive overpainting

Extensive overpainting in communal areas of flats has been responsible for several fire deaths in the UK, including Southwark (1991), Lambeth (1993), Birmingham (1995) and Glasgow (2002). A failure of the paint in an escalator shaft was also implicated in the fire at Kings Cross underground station in 1987.

The traditional solution was to strip off all the old paint and redecorate. This process was impractical and expensive and consequently, the paint industry developed a solution which involved testing paint on a very poorly performing artificial surface representing extensive overpainting. If the paint could work on the artificial surface then it was deemed acceptable for use on overpainted areas.

The assessor should look for excessive overpainting and in particular poor adhesion of the paint to the surfaces of escape routes. If this is apparent, then the risk assessment should recommend stripping back and redecorating or redecorating with a paint that has been shown to work on highly overpainted surfaces.

Flammable carpet on a wall can assist fire spread. Courtesy of Graham Fieldhouse.

2.2 Addition of carpets and other significant wall hangings

Building users like to decorate plain walls with posters, paintings, carpets etc. In reasonable quantities e.g. $1m^2$ of covering per $5m^2$ of wall these do not pose a significant hazard. However, if they are present in large quantities or are highly flammable then they can cause rapid fire spread.

In the Stardust Disco fire in Dublin in 1981, rapid fire spread up and along walls was associated with ordinary carpet tiles stuck to the walls of the building. If these types of items are present in significant quantities, the fire risk assessor should recommend removal or reduction in such material to a suitable level. It may also be possible to flame retard wall hangings, but evidence of the resulting fire performance would need to be obtained.

2.3 Wallcoverings

Most wallcoverings in the types of premises inspected by fire risk assessors will already have been fire tested by the manufacturer on a suitable substrate, such as skimmed plasterboard. The question usually only arises in cases where new wallcoverings have been added which may not have been tested. Such wallcoverings may be heavy weight or have thick and/or heavily textured surfaces. These can assist rapid flame spread in an escape route. Usually, the manufacturer (if he can be determined) will be able to supply sufficient test evidence of fire performance. If not, and if the escape route is critical, the presence of such wall coverings should be noted and considered in the overall risk assessment. This may include a recommendation to replace it or to upgrade the performance by the addition of a fire retardant treatment.

As with the addition of wall coverings, evidence of the application of a suitable flame retardant treatment would need to be obtained. Wallcoverings which have been overpainted should also be assessed because the paint may compromise the fire performance of the wall covering.

Further guidance on lining materials for wall and ceilings can be found in Annex B.

3. Fire Doors

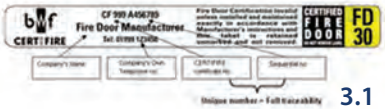
Fire doors are crucial in protecting the means of escape in any building. Not all doors protect against the same hazard and doors serving single direction means of escape and protected stairways are more critical than others in less demanding situations.

Fire-resisting doors are generally only evaluated in respect of their ability to resist the passage of flames; most place no restriction on the temperature rise on the unexposed face. This creates a hazard to occupants which not all risk assessors may be comfortable with. A fire risk assessor should consider whether an uninsulated door is acceptable in the position it is installed.

Regulatory guidance recommends doors which satisfy integrity for 20, 30, 60 or 90 minutes. These times are a good basis for new-build, but are not 'carved in stone'. A risk assessor may consider that for some buildings, existing doors of a lower period of fire resistance are satisfactory or conversely, that doors of a higher performance may be needed to contain the risk. The objective of a 'fire risk assessment' is not to ensure compliance with regulatory guidance, but to maintain tenable conditions for the occupants.

All fire doors in the building should be inspected. These should be easily identified as fire doors and marked accordingly. The following items should be checked.

Door label from LPCB scheme. Courtesy of LPCB.



Door label from BWF CERTIFIRE scheme. Courtesy of Warrington Certification Ltd.

3.1 Is the door a fire door?

Fire doors may have been replaced by non-fire doors because e.g. they have been damaged/worn by heavy traffic, they have become warped or e.g. in a block of flats, residents have simply replaced them for aesthetic reasons. If it is suspected that the doors are not original or are not fire doors, a check will need to be made to verify them.

You should look for a label or plug from a third party certification scheme such as the BM TRADA, BWF CERTIFIRE, IFC Certification or LPCB schemes. The presence of labels/plugs from scheme providers is a reliable indication that the fire door has been certificated. It will also indicate the period of fire resistance that the door should provide and, because in most cases each label is numbered, they can be used to trace the door back to the manufacturer in the event of a problem or failure.

Door label from TRADA Q-mark Scheme. Courtesy of BM TRADA.

Fire Door Inspection Scheme door label. Courtesy of Fire Door Inspection Scheme.

An alternative is the presence of an FDIS (Fire Door Inspection Scheme) label on the hanging stile or the top of the door indicating that the door has been inspected by a third party certificated inspector.

If a label is not apparent then the door may be quite old. If it is of solid, heavy construction and if, for example, it is similar to others in the building in an area where fire doors have been used, it is probably a fire door. A rule of thumb is that a 44mm thick door may have a fire resistance of 30 minutes and a 54mm door may have a fire resistance of 60 minutes. However, in view of the standards of the day, it would probably not afford the same protection as its modern day equivalent. If there is any doubt, the only safe option is to recommend that a professional opinion on the door's performance be obtained or to fit a proven replacement.

Old fire doors and non-fire doors can be upgraded, but unless the upgrading is something relatively simple like the addition of an intumescent strip, special skills are needed to do this, often including taking the door apart and putting it back together again with extra intumescent protection. Such upgrading is not recommended by the ASFP other than in exceptional circumstances where the historical integrity of the door must be retained, and then it should only carried out by a specialist in the field.

3.2 The importance of correct fitting of the door in the frame including door gaps

A fire door that has a large gap around the periphery between the leaf and the frame is unlikely to hold back a fire. In fire tests, the doors are hung with gaps of usually less than 3mm and they should not be significantly more than this in the building, typically 3-4mm.

Large and/or variable gaps can arise due to movement of the frame in the building caused by general building movement or a failure to fix the frame properly to the wall or by warping of the door leaf e.g. due to environmental conditions. However, more usually, this is due to progressive failure of the ironmongery allowing the door to 'drop', thus increasing the gap around the door. In addition, fire doors that drop on their hinges will eventually not close into the frame, so this is something that must be remedied. If the door has dropped, remedial measures such as replacing the hinges with better quality items (CE marked) should be recommended. A black residue on the hinge and the floor beneath it is an indication of developing wear. If the doors are hung on floor pivots, as is often the case with steel doors, the same considerations apply.

3.3 The importance of suitable fire tested ironmongery e.g. self-closing devices, latches

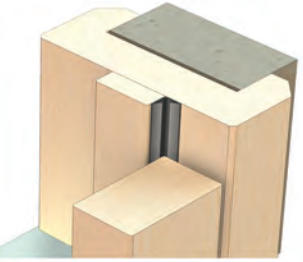
Fire door ironmongery is extremely complex as the combinations of available ironmongery including hinges, latches, locks, bolts, door viewers, push plates etc. are almost infinite. Many are not compatible with each other or particular types of door leaf and frame. You should look for CE marking on the ironmongery. The presence of labels/plugs from these scheme providers is a good indication that the fire door and its ironmongery are compatible.

It is possible that the door could have been modified after it was installed and so you should use the following checks as a rule of thumb:

Worn hinges allow door to drop. Courtesy of Jacky Sinclair.

- The door should be hung on a minimum of three hinges which are not damaged or worn, allowing the door to drop.
- If the door has a latch, it should operate correctly, it should be aligned with the striker plate and the angle of the striker plate should be correct so that the door is closed properly by the door closer.
- The door should be fitted with a self-closing device, such as an overhead or frame fitted door closer. The use of rising butts, while acceptable for older properties, is not recommended now because they will not close a door from every angle or overcome latch resistance
- Any knobs, handles and pull levers should be fire-resisting and securely fitted (through bolts are better than screw fixings)
- The door should be labelled as a fire door
- If the door has a letter plate, consideration should be given to fitting a device which can help prevent arson attack e.g. by items or flammable liquid being passed through the door.

Intumescent seal in door frame. Courtesy of Timber Research and Development Association



Combined acoustic/smoke seal Image. Courtesy of Lorient UK Ltd

3.4 The need for intumescent protection

a) Around the periphery of the door leaf or frame

Without intumescent protection to the periphery of a door leaf, the fire and smoke will simply pass around the perimeter of the door leaf. The fire risk assessor should check for the presence and the condition of intumescent seals at the top and both side edges. Seals may be located in the leaf or in the frame and occasionally behind the door lipping, which will only be apparent if the door is labelled accordingly.

For older buildings, it may be that the doors do not have intumescent strips, in which case only a nominal 20 minutes of fire resistance may be expected. Current recommendations would always be to include an intumescent strip which would usually afford 30 minutes' fire resistance. Metal doors are not usually fitted with intumescent strips.

b) To ironmongery

Normal practice is to include intumescent protection at ironmongery positions, for example, in the form of intumescent pads for hinges and intumescent linings to the lock. Otherwise, excessive heat transfer by the ironmongery can cause premature failure, or even cause the leaf to fall from the frame. Ironmongery protection is especially important for 1 hour fire-resisting timber doors.

3.5 The provision and condition of smoke seals

Many fire doors are now fitted with smoke seals to reduce the amount of smoke leakage through the door. These are very important to protect escape routes and in other situations e.g. the use of 'stay put' strategies in blocks of flats. The seals are usually a wiping polymer blade, a brush or sometimes a 'batwing type' in the rebate of the frame. The assessor should check that the smoke seal is present, that it is in good condition (no missing/damaged blades etc.) and that it fills the gap between the frame and the door. Smoke seals should not be interrupted at ironmongery positions. Threshold gaps greater than 3mm should also be sealed.

3.6 The ability to self-close

A fire door that does not self-close or which is not locked shut (e.g. a cupboard door) is not a fire door. It is crucially important that fire doors close, solely by the action of the self-closing device from any angle. In most cases, failure to close correctly or overcome the resistance of the latch can be rectified by proper adjustment of the door closer and/or striker plate. Recent changes to AD-B (England & Wales only) have relaxed the requirement to fit a door closer to internal fire doors in multi-storey domestic dwellings where hard wired smoke detectors have been fitted.

Overhead door closer with integral release device. Courtesy of Fireco Ltd.

Typical panic exit device.

Air transfer grille operated in conjunction with fire alarm system. Courtesy of Lorient UK Ltd.

3.7 Release of self-closing device

The ability of any door retention device to release correctly on the operation of the appropriate signal from the fire alarm and detection system needs to be regularly checked.

Many fire doors are held open by either an electromagnetic device or an acoustic/radio linked mechanical device operating on the door closer or the leaf. On activation of the fire alarm, these devices should release the door and it should fully shut as indicated above. The records of checks to verify that these devices release on operation of the fire alarm should be audited. If these cannot be verified then a check should be made during the risk assessment.

3.8 Emergency / panic escape doors

Doors used for means of escape (which may not necessarily be fire doors e.g. at the final exit of a building) must be able to be opened easily. The following checks should be made:

- Only one hand movement such as turning a lever or pressing on a push pad or bar should be needed to open an emergency escape door
- A panic escape door should be able to be opened by body contact alone
- Exterior doors may be affected by the weather and not open easily
- Check that the doors are adequately signed
- There should be no extra security ties. A variety of CE marked electronic devices connected to the fire alarm are available for ensuring security of escape doors

3.9 Air transfer grilles in fire doors

If a fire door protecting a means of escape is fitted with an air transfer grille then it needs to be a type linked to a suitable fire detection/alarm system. Thermally triggered dampers e.g. those operated by a fusible link and intumescent dampers are not suitable for these situations.

The fire risk assessor should check that the intumescent matrix is present and that the operation of any such air transfer grille has been regularly checked and recorded.

More guidance is given in Annex C on fire doors.

Section through profiled metal of concrete floor.

A typical fire resisting corridor with fire resisting glazing and doors.

4. Construction of fire-resisting walls, ceilings and floors forming escape routes

4.1 Existing construction

For most buildings, it should not be necessary to extensively evaluate the fire-resisting construction used in escape routes or in compartmentation as these should have been covered by the building control process. For example, in an office building, the number and construction of the floors (which will often be concrete) are unlikely to change. This contrasts with the situation with wall and ceiling linings and to a lesser extent fire doors and suspended ceilings which are likely be changed during the life of the building for aesthetic reasons.

4.2 New construction

The only changes in fire-resisting construction of walls and floors that are likely to occur are those where the internal layout has been changed e.g. by relocating, replacing or demolishing internal partitions (changes due to the inclusion of new services etc. are dealt with in chapter 5). In this case, the fire risk assessor needs to verify that the new construction is still suitable for use as an escape route in two regards; layout and type of construction.

4.2.1 Layout

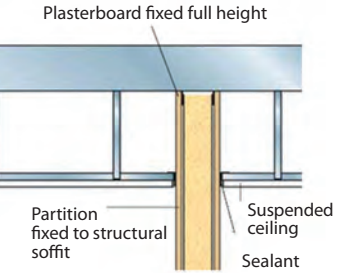
The fire risk assessor needs to check that any modifications have not affected the means of escape, for example, by significantly increasing travel distances, or removing some of the fire doors. Changes in the construction and layout of internal walls may occur during the life of the building and may not be examined by Building Control so it is very important that the fire risk assessor evaluates these. For a new building, it should be easy to check any modifications against what was originally constructed using the CDM file or Regulation 38 information (England & Wales only) and the fire strategy document (if there is one). For both new and old buildings the assessor needs to satisfy himself that any changes result in a building that still provides adequate means of escape.

4.2.2 Types of new construction

a) Fire resistant walls and floors

The assessor will need to check that the type of construction e.g. materials used in any replacement construction are suitably fire-resisting. The new construction may be traditional 'deemed to satisfy' fire-resisting construction (brick/block walls, plasterboard partitions, etc.) or it could be for example a proprietary partitioning system which may include fire-resisting glazing (picture left). In the latter case, the fire risk assessor should be able to obtain

A typical suspended ceiling system.



Vertical compartmentation taken up to underside of floor slab (correct).

evidence that the system (including the glazing) is fire resisting. If evidence is not available, then the assessor needs to take this into account in his overall assessment. For example, if non-fire resisting construction has been used, the fire risk assessor will have to recommend replacement.

If no evidence as to the level of fire resistance can be found then the only way to verify this will be by invasive inspection e.g. by a third party inspection body. If this is not practical, then the assessor may need to consider the use of compensating measures in his assessment. Further guidance is given in Annex D and E.

b) Fire resistant ceilings

Suspended ceilings are often viewed by building occupiers as simply there for aesthetic reasons and it is essential that the fire risk assessor knows exactly the purpose of the installed system in the fire strategy of the building. This is particularly important because it is easy to downgrade a ceiling from the original intended fire rating e.g. by the fitting of untested downlighters.

The first essential of inspection, therefore, is to know exactly the intended performance of the ceiling system. Once this is known and drawings or installation data have been obtained, the inspection should show if the original plans have been adhered to. If this information is not available, then the assessor must assume that the ceiling is not fire-resisting. If this is significant e.g. if it means that fire can spread via the ceiling void over compartment walls which have not been taken floor slab to floor slab, then the assessor should note this in his assessment and recommend inspection by a third party to verify if the ceiling is fire-resisting or not, or alternatively, to recommend replacement.

One of the most common faults found in existing ceilings is that hold-down clips are removed and not replaced when maintenance work has been conducted behind the ceiling. If tiles are a loose fit, the original design should be checked, since pressure increases during a fire condition can remove lightweight tiles. Damage to tiles is common and replacement with tiles from another manufacturer could lead to a premature failure in a fire. Tiles that are damaged should be replaced with ones of the correct type. Further guidance on the construction of ceilings is given in Annex D and E.

Vertical compartmentation not extending up to floor slab above (incorrect). Courtesy of Exova Warringtonfire.

Compartment floor with a hole passing through to the laminate floor in the flat above (incorrect). Courtesy of Sharpfibre Ltd.

4.3 Hidden spaces

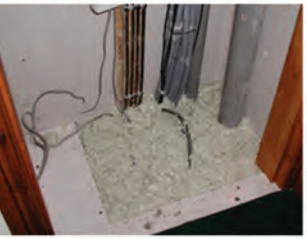
In addition to checking the materials and construction of the walls, floors and ceilings in escape routes, it is crucially important that the assessor ensures that these extend above suspended ceilings to the floor slab (or equivalent) above and below the raised floors to the floor slab below. There are many instances where an 'out of sight – out of mind' mentality results in fire-resisting construction being compromised because it is not extended from 'floor slab to floor slab'.

4.4 Methodology

The assessor will need to inspect all fire-resisting walls, ceilings and floors forming escape routes and evaluate the condition of the fire separating elements. He will also need to look above suspended ceilings abutting walls that bound escape routes – especially at corridor ends. It is unreasonable and impractical to lift every ceiling tile to examine the whole length of such walls, but a selection from each escape route will give the assessor an idea of the condition of the fire-resisting construction. Remote video equipment and/or the use of torches to illuminate any holes will assist. A torch or lamp placed on one side of a wall while the assessor looks at the other side for any light shining through is an indicator of the degree to which the wall is sealed against the passage of smoke. The assessor should to pay particular attention to walls above suspended ceilings at corridor ends (where there will usually be fire-resisting doors) as the wall above the suspended ceiling may not extend fully to the floor slab above. In addition its fire resistance may be compromised by services running through the wall that have not been adequately fire stopped – see chapter 5.

For raised floors, it should be possible to lift a number of floor tiles near the edges of fire-resisting walls and use a torch to look for the installation of suitable cavity barriers.

Correctly installed penetration seals. Courtesy of Siderise Ltd.



Incorrect use of 'foam' as a penetration seal. Courtesy of Siderise Ltd.

5. Penetrating services in walls, ceiling and floors forming escape routes

5.1 General

If a fire separating element is to be effective, every joint or imperfection of fit, or opening to allow services to pass through the element, needs to be adequately protected by sealing or fire stopping so that the fire resistance of the element is not impaired.

The provision of fire-resisting walls, ceilings and floors forming escape routes is most commonly compromised by the installation of penetrating services (pipes, cables, air handling equipment etc.) through the wall or floor.

In new buildings, the Building Regulations address this by requiring the inclusion of suitable fire-stopping. However, this is often compromised by:

- Use of poor quality products. The ASFP recommends the use of third party certificated products
- Poor quality/lack of installation. The ASFP recommends the use of third party certificated contractors
- Addition, removal or modification of penetrating services after the building is completed without correct reinstatement of the fire-stopping.

Because this usually occurs after the building control and handover process is complete, it is often not picked up because it is out of sight. Only a regular inspection and maintenance regime will identify this. In some cases, it will be the fire risk assessor who will be the first person to discover and record this.

5.2 Methodology

The assessor should use the inspection methodology described in 4.4 above and logically, it should be undertaken simultaneously. Again, it is not practical or reasonable to inspect every installation, but a representative sample from each escape route should suffice.

The assessor should look at the condition of cables, pipes, ducts and dampers.

Power cables penetrating a compartment floor with no penetration seal installed (incorrect). Courtesy of Sharpfibre Ltd.

5.2.1 Cables and pipes

The assessor will need to ensure that any services penetrating walls or floors abutting escape routes are adequately sealed where they penetrate the wall or floor. He should pay particular attention to penetration services above suspended ceilings where they might have been installed and not made good afterwards.

The presence of any through holes or gaps is not acceptable and these must be made good with appropriate tested/certificated construction that is compatible with the existing penetration seal.

There are a variety of proprietary materials and products used to seal penetrations including intumescent collars and wraps, fire-resisting mortars, coated mineral fibre batts, fire-resisting pillows etc. The fire risk assessor is not expected to be an expert in all of these, but he should be aware of the limitations of the generic material types. The assessor should be particularly vigilant if he discovers the use of expanded foam as a penetration sealing material. Most of these are tested as narrow linear gap seals and will not work in a large penetration seal. Further guidance is given in Annex G including guidance on PU foams.

5.2.2 Ducts and Dampers

Where air handling ducts pass through fire separating elements the integrity of those elements is maintained by using one of three basic methods:

Method 1: Protection using fire dampers;
Method 2: Protection using fire resistant enclosures;
Method 3: Protection using fire-resisting ductwork

The assessor must understand which method has been used to undertake his risk assessment. Where air handling systems pass through fire-resisting construction on escape routes or compartment walls and floors forming escape routes, particular attention needs to be placed on the following:

Method 1: Protection using fire dampers

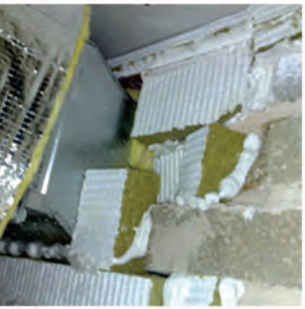
A fire damper is a device which is installed at the point where the duct penetrates the compartment wall or floor. Fire dampers should be situated within the thickness of the fire seperating element and be securely fixed. The fire damper allows the ventilated air in normal conditions to pass through a duct, wall or partition. In a fire situation it closes automatically to prevent the passage of fire for a stipulated time period. Closing of fire dampers can be

effected by fusible links (heat sensitive devices e.g. solders) which release a spring-activated mechanism which closes the damper, or the fire damper itself may comprise a matrix of material coated with intumescent which swells up and closes the opening when heated.

Where a fire damper is installed e.g. where a ductwork system serves more than one part of a sub-divided escape route or the use of the building represents a sleeping risk, the fire dampers need to be of the type that is activated by a smoke detector or suitable fire detection system. Thermally triggered fire dampers are not acceptable for these applications.

The fire risk assessor should examine records to verify that operation of the damper has been checked on a regular basis. If these records cannot be obtained the operation of the fire dampers should be verified by the assessor or a more thorough specialist third party inspection undertaken.

Fire dampers should be provided with adequate means of access to allow inspection, testing and maintenance of both the damper and the actuating mechanism. If there is no access to fire dampers or it is very limited, the assessor should note this in his risk assessment and recommend that access be provided. He should also consider an invasive inspection by a third party inspector.



Poorly installed penetration seal to a damper. Courtesy of Exova Warringtonfire Ltd.

The same considerations with regard to adequately sealing around penetrating cables and pipes also apply to fire dampers. Particular attention should be paid to the penetration seal surrounding the fire damper. Further guidance on fire dampers including the scope of applicability and maintenance requirements is given in Annex H.

Method 2: Protection using fire resistant enclosures

Where fire protection of the air handling system penetrating fire-resisting construction and forming an escape route is provided by fire resistant enclosures e.g. a service duct or protected shaft, the assessor and needs to verify the fire resistance of the construction. Such fire-resisting enclosures may be made from traditional construction, for example, plasterboard shaft wall, or they may be proprietary service ducts and shafts using e.g. calcium silicate, cement-based or other fire-resisting board materials.

A representative sample of protected shaft should be inspected where it is accessible and where it passes through compartment walls abutting escape routes using the methodology given in 4.4. If the assessor is not confident that the enclosure provides adequate separation he should note this in his risk assessment and consider a more thorough invasive inspection by a third party inspector.

In this installation, the dampers are not in the plane of the wall, the duct is not protected and it is unlikely that the dampers have been tested in a cellular beam. Courtesy of Paul White.

Method 3: Protection using fire resistant ductwork

Steel ductwork systems for air movements around buildings are generally constructed to the Heating and Ventilation Contractors Association guide DW/144, which covers construction standards in the manufacture of sheet metal ductwork. However, most general purpose ventilation ductwork systems constructed to this standard offer little or no protection against fire spread and cannot be used or converted into fire-resisting ductwork unless the system has been tested against the appropriate standard.

There are a variety of proprietary tested and certificated fire-resisting ducts which, provided they are adequately supported and sealed where they penetrate the element, obviate the need for fire dampers in fire-resisting walls and floors forming escape routes. If fire-resisting ductwork is used, the assessor will need to verify that it is fire-resisting for the required period. If records of the installation of fire-resisting ductwork cannot be found e.g. from the CDM file or the Regulation 38 information (England & Wales only), a representative sample of fire-resisting ductwork should be inspected where it is accessible and where it passes through compartment walls and those abutting escape routes using the methodology given in 4.4.

The same sealing and supporting of fire-resisting ducts where they pass through the separating element is especially important as these are often large and heavy items and a failure of the supports will significantly breach fire-resisting construction. More information on ducts is given in Annex I.

5.2.3 Support for penetrating services

Penetrating services will need to be supported either side of the wall or floor to ensure that in a fire any drooping or sagging of the service does not damage the penetration seal and thus breach fire-resisting construction. Some types of penetration seal e.g. mineral fibre batt are more susceptible to damage by collapse of the service than others e.g. fire-resisting mortars.

6. Other items of PFP

While the assessor is inspecting the items above, he should be aware of other items of PFP installed in the building and take note of their condition to ensure that there are no obvious significant defects. While these other items (listed below) may not constitute means of escape, they have a role to play in the provision of life safety and, for example, if the assessor uncovers substantial omissions, defects etc., he should note this in his risk assessment and call for a more thorough and, if necessary, invasive inspection by a specialist third party inspector.

6.1 Fire protection to the structure of the building

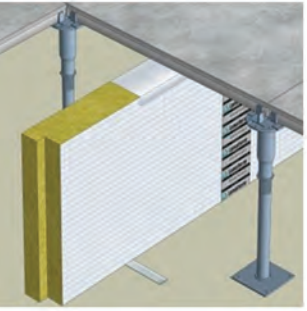
Slumping of intumescent paint on a cellular beam. Courtesy of Exova Warringtonfire Ltd.

If the building is steel-framed there will usually be fire protection applied to some or all elements of the steel structure. Steel will lose approximately half its strength when it is heated to 550°C, a temperature quickly exceeded by most fires and so it is important to insulate the structure to prevent its collapse.

The steel is insulated by a number of proprietary products including: intumescent coatings (which swell on heating to form as protective char), plaster or cementitious-based sprays, cladding systems made from fire-resisting boards or mineral fibre products.

The fire risk assessor does not need to be an expert in such systems, or even to survey the building to evaluate the effectiveness of these products. However, he should, while he is inspecting the other items of PFP covered by this document, be aware of damage to or obvious omissions e.g. removal of fire protection to structural steel work. If he finds any obvious and significant defects, he should note this in his assessment and call for a full and, if necessary, invasive third party inspection.

Further information on fire protection to structural steelwork is given in Annex J.



Cavity barrier below raised floor.

Rainscreen cavity barrier system.

6.2 Cavity barriers

Cavity barriers are used to close a concealed space, such as that in a cavity wall or ceiling void or roof space, against penetration of smoke or flame, or provided to restrict the movement of smoke or flame within such a space. Cavity barriers require special attention from the designer because by their very nature they are usually hidden once installed and are therefore sometimes impossible to inspect after installation, handover and subsequently through the life of the building. Failure of cavity barrier systems have been implicated in a number of fires in, for example, timber-framed construction.

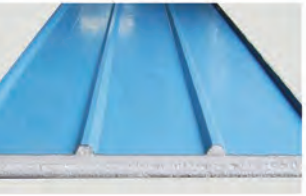
Recommendations on the provision of cavity barriers are given in AD-B and the equivalent guidance for Scotland or Northern Ireland. In most applications they would be expected to have fire resistance of 30 minutes' integrity and 15 minutes' insulation, except in Scotland where certain applications have no insulation requirement.

The fire risk assessor does not need to be an expert in such systems, or even to survey the building to evaluate the effectiveness of these products (apart from those positioned in line with and protecting escape routes (see 4.4) and those in roof spaces. However, he should, while he is inspecting the other items of PFP covered by this document, be aware of damage to or obvious omissions of cavity barriers. If he finds any obvious and significant defects, he should note this in his assessment and call for a full and, if necessary, invasive third party inspection.

6.3 External fire spread

If the building has a discrete external façade, this can provide the potential for significant spread of fire up the face of the building. Several fires resulting in fatalities have been exacerbated by fire spread up the outside of the building, but inside the rain screen cladding. These fires can then re-enter the building e.g. via windows. Consequently, when assessing buildings with any applied rainscreen or external cladding e.g. high rise offices or blocks of flats, particular attention should be given to any rainscreen or other external cladding system that has been applied and to any façades that have been replaced.

It is unlikely that the fire risk assessor will be able to inspect this item himself. Consequently, he should look at the records of the installation of the system provided by the installer. If he is in any doubt, he may require the assistance of a specialist third party inspection organisation to determine whether there is adequate provision of rainscreen cavity barriers.



Examples of sandwich panel construction.

Example of a modern building employing sandwich panel type construction.

6.4 Sandwich panel construction

Many buildings have insulated core panels as exterior cladding or for internal structures and partitions. They normally consist of a central insulated core, sandwiched between an inner and outer metal skin with no air gap. The external surface is coated with a polymeric coating (usually PVC) to improve weather resistance and/or the aesthetic appeal of the panel. The central core can be made of various insulating materials, ranging from non-combustible mineral wool through to highly combustible polymeric foams. Many industries, including the food industry, use insulated core panels because it is relatively easy to make alterations to the panels, for example, for the provision of services and for additional internal partitions to be erected with minimum disruption to business.

A number of fires in buildings where combustible-cored insulated panels have been used extensively in the fabric of the building have highlighted the particular dangers that may be associated with this form of construction. Many of the problems are due to alterations to the panel system by the occupier.

The fire risk assessor should check for the following when inspecting buildings made from or incorporating sandwich panels.

- Installation of heating appliances, e.g. ovens against panels should be prohibited.
- Hot working in the vicinity of panels should be prohibited or supervised extensively
- Storage of highly combustible materials against panels and allowing rubbish to collect against panels should be prohibited
- Ad-hoc repairs or modifications to panels not in compliance with the manufacturer's instructions or recommendations should be prohibited. Particular attention should be given where openings have been made for doors, windows, and other penetrating services that these are effectively sealed and that the core is not exposed.
- That any loads, such as storage and equipment, are only supported by panels which have been designed and installed to perform this function.
- That the panels are correctly secured to the structure, or are designed to be independently structurally secure.

The use of combustible panels in areas of buildings with a high life risk, e.g. where large numbers of people are present and/or sleeping, should be carefully considered in the fire risk assessment.
More information can be found in Annex K.

Annex A: Checklist

The fire risk assessor will need to draw up a checklist related to the PFP he is going to check in the particular building being assessed. The list below identifies what needs to be checked for each type of construction. Guidance on how to check it is given in the chapter reference in the left hand column.

Item & Ref	Description	Findings
Wall & ceiling linings Chapter 2	Reasonable limitation of linings that might promote fire spread ▶ Condition of overpainted walls ▶ Presence of heavy weight/significantly textured wallcoverings ▶ Presence of flammable items e.g. carpets ▶ Suitable records	
Fire doors Chapter 3	▶ Is it a fire door? Is it certificated? ▶ Correct door gaps ~3-4mm ▶ Suitable ironmongery - Labelled (CE marked) - 3 hinges - Operation of lock, latch and striker - Presence of self-closing device - Secure knobs handles etc. ▶ Presence and condition of intumescent/ smoke seals - Around periphery - To glazing - To ironmongery - To threshold (if >3mm) ▶ Automatic release of self-closing device ▶ Panic exit devices ▶ Air transfer grilles – not thermally activated but linked to fire detection in escape routes ▶ Third party certificated products/installers ▶ Suitable records	

Item & Ref	Description	Findings
Walls, floors & ceilings on escape routes Chapter 4	▶ New construction/alteration - Fire-resisting construction - Changes to means of escape - Role of suspended ceilings - Hold down clips present - Extention of fire-resisting construction 'floor slab to floor slab' - Holes/poor firestopping in hidden spaces ▶ Third party certificated products/installers ▶ Suitable records	
Penetrating services (cables & pipes) Chapter 5 (5.1, 5.2.1 & 5.2.3)	▶ All penetrating cable and pipe services - Suitably fire-stopped - Suitably supported - Good condition/undamaged ▶ Third party certificated products/installers ▶ Suitable records	
Penetrating services (air handling equipment Chapter 5 (5.1, 5.2.2 & 5.2.3)	▶ All penetrating ducts and dampers - Suitably fire-stopped - Suitably supported - Good condition/undamaged ▶ Method of air handling understood - Method 1: Fire damper operation checked & linked to detection system - Method 2: Fire-resisting construction - Method 3: Fire-resisting ducts ▶ Third party certificated products/installers ▶ Suitable records	

Item & Ref	Description	Findings
Other PFP items Chapter 6 (6.1 – 6.3)	▶ Fire protection to structural frame (where visible) - Good condition - Records ▶ Cavity barriers (where visible) - Present - Good condition ▶ Third party certificated products/installers? ▶ Suitable records	
Sandwich panel construction Chapter 6 (6.4)	▶ Fire-resisting construction? - Assessment of core material versus end-use - All repairs or modifications undertaken competently - Good condition ▶ Operational considerations - No heating appliances adjacent to walls/floors/ceilings - No storage of highly combustible materials next to walls/floors.ceilings ▶ Any hot working to be extensively supervised ▶ Suitable records	

Annex B: Wall and ceiling linings

The materials used to line walls and ceilings can contribute significantly to the spread of flame across their surface. Most materials that are used as surface linings will fall into one of three classes of reaction to fire.

The following are common examples of acceptable materials for various situations:

Non-Combustible (Euroclass A1-s3, d2); or Materials of limited combustibility (Euroclass A2-s3, d2): Materials suitable for circulation spaces and escape routes

- Such materials include brickwork, blockwork, concrete, ceramic tiles, plaster finishes, mineral wool, mineral fibre tiles or sheets with cement binding.

Class 0 (Euroclass B-s3, d2): Materials suitable for circulation spaces and escape routes

- As non-combustible/limited combustibility above plus rendering on wood or metal lathes, wood-wool cement slabs and mineral fibre tiles or sheets with cement or resin binding.

Note: Additional finishes to these surfaces may be detrimental to the fire performance of the surface and if there is any doubt about this then consult the manufacturer of the finish.

Class 1 (Euroclass C-s3, d2): Materials suitable for use in all rooms but not on escape routes

- As Class 0 above, plus timber, hardboard, blockboard, particle board, heavy flock wallpapers and thermosetting plastics will be suitable if flame-retardant treated to achieve a Class 1 standard.

Class 3 (Euroclass D-s3, d2): Materials suitable for use in rooms of less than 30m

- As Class 1 above, plus those that have not been flame-retardant treated and certain dense timber or plywood and standard glass-reinforced polyesters.

Appropriate testing procedures are detailed in BS 476: Parts 6 & 7 and where appropriate BS EN 13501-1.

Delaminated paint that has burned in a fire. Courtesy of Exova Warringtonfire.

Further guidance

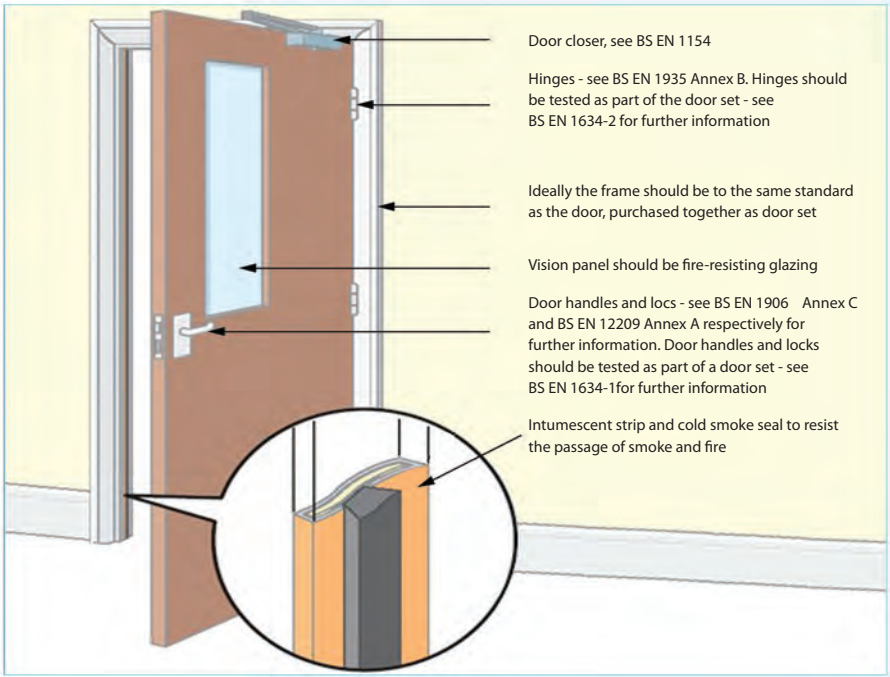
ASFP, Orange Book: Guidance on the classification for reaction to fire performance of fire retardant coating systems; **http://is.gd/XKEabE** or **www.asfp.org.uk**

ASFP, Technical Guidance Document 5: Guide to Class 1 and Class 0; **http://is.gd/NgFyv4** or **www.asfp.org.uk**

Department for Education, Building Bulletin100 (for educational establishment); **http://is.gd/UZXMAU**

Exova Warringtonfire, Code of Practice: Refurbishment of Communal Buildings and the Fire Risk of Multilayer Paints.

Annex C: Fire-resisting doors



Fire-resisting doors are necessary in any doorway located in a fire-resisting structure and are rated by their performance when fire tested to an appropriate standard, usually BS 476: Part 22:1987 or EN 1634-1: 2008. The level of protection provided by the door is measured, primarily by determining the time taken for a fire to breach the integrity (E), of the door assembly, thus allowing the passage of hot gases and flame. It may be possible to upgrade the fire resistance of existing doors, however the skills required to do this are outside the expertise of many installers and it may be cheaper to replace them.

Timber fire doors

Timber fire-resisting doors normally require a gap of nominally 3-4mm between the door leaf and the frame. However, slightly larger gaps may be necessary to ensure that the door closes flush into its frame when smoke seals are fitted. To maintain the fire-resistance the gap is normally protected by installing an intumescent seal, in either the door or the frame. The intumescent seal expands in the early stages of a fire and enhances the protection given by the door.

Additional smoke seals will restrict the spread of smoke at ambient temperatures. Doors fitted with smoke seals, either incorporated in the intumescent seal or fitted separately, have their classification code suffixed with an 'S' or Sa to BS 476: Part 31.1 and BS EN 1634-3, respectively. The principal fire-resisting door categories are:

Description of fire and smoke resistance	British Class	European Class
20 minutes' fire resistance	FD20	E20
20 minutes' fire resistance & smoke resistance at ambient temperature	FD20S	E20Sa
30 minutes' fire resistance	FD30	E30
30 minutes' fire resistance & smoke resistance at ambient temperature	FD30S	E30Sa
60 minutes' fire resistance	FD60	E60
60 minutes' fire resistance & smoke resistance at ambient temperature	FD60S	E60Sa

Replacement hinge badly fitted to door. Courtesy of Guild of Architectural Ironmongers.

Metal fire doors

Although the majority of fire-resisting doors are made from timber, metal fire-resisting doors, which meet the appropriate standard, can often be used for the same purpose. There are situations where they are more appropriate. The majority of metal fire-resisting door manufacturers will require the use of bespoke frames and hardware for their door sets. Metal fire-resisting doorsets are not usually fitted with intumescent strips.

Alternative door hanging

Although the most common method of hanging a door is to use single axis hinges, alternative methods are employed where the door is required to be double swing or mounted on pivots for other reasons, such as finger trap protection and emergency access for normally inward-opening doors. Floor-mounted controlled door closing devices are the most common method regularly found with timber, glass and steel doors, while transom-mounted devices are commonly used with aluminium sections.

Self-closing devices

All fire-resisting doors, other than those to locked cupboards and service ducts, should be fitted with an appropriately controlled self-closing device that will effectively close the door from any angle. In certain circumstances, concealed, jamb-mounted closing devices may be specified and in these cases should be capable of closing the door from any angle and against any latch fitted to the door; spring hinges are unlikely to be suitable. Further information is available in BS EN 1154. Rising butt hinges are not suitable for use as a self-closing device due to their inability to close and latch the door from any angle and the need to remove material from the top of the door.

Automatic door hold-open/release devices for self-closing fire doors

These devices are designed to hold open self-closing fire doors or allow them to swing free during normal use. In the event of a fire alarm, the device will then release the door automatically, allowing the self-closing mechanism to close the door. Such devices are particularly useful in situations where self-closing doors on escape routes are used regularly by a significant number of people or by people with impaired mobility who may have difficulty in opening the doors.

Typical examples of such devices include:

- Electro-magnetic devices complying with BS EN 1155 (low voltage) or BS 5839: Part 3 (mains voltage) fitted to the fire-resisting door, which release when the fire detection and warning system operates, allowing a separate self-closer to close the door. Where such devices are separate from the door closer, they should be fitted in a manner that avoids twisting of the door which may cause damage e.g. by causing warping and preferably on the same level as the closing device.
- Electro-magnetic hold-open devices within the controlled door-closing device (complying with BS EN 1155) which cease to function on the operation of the fire detection and warning system; and
- 'Free swing' controlled door-closing devices, which operate by allowing the door leaf to work independently of the closing device in normal conditions. An electro-magnetic device within the spring mechanism linked to the fire detection and warning system ensures that the door resumes self-closing on the operation of the system.

Automatic door hold-open/release devices fitted to doors protecting escape routes should only be installed in conjunction with an automatic fire detection and warning system incorporating smoke detectors, that is designed to protect the escape routes in the building. In all cases, the automatic device should release the fire-resisting door allowing it to close effectively within its frame (latching securely if a latch is fitted) when any of the following conditions occur:

- the detection of smoke by an automatic detector
- the actuation of the fire detection/alarm system by manual means e.g. operation of break glass call point;
- any failure of the fire detection and alarm system; or
- any electrical power failure.

Acoustically-activated door release mechanisms

An acoustically-activated door release mechanism complying with BS EN 1155 may be installed in some cases. However, this type of hold-open device is not suitable for use where:

- The premises do not have a fire alarm system;
- The door is a fire door serving the only escape stair in the building (or the only escape stair serving part of the building);
- The initial fire alarm warning signal is intended to alert staff only;
- The fire alarm sounders may be muted or the sound level reduced; or
- The fire alarm system incorporates a voice alarm.

This type of device could fail to operate where a single fire alarm sounder failure may result in a drop in sound pressure. It also will not operate in response to electrical mains failure or during an alarm fault or failure condition.

Voids in a fire door. Courtesy of Chiltern Fire/BM TRADA.

Door co-ordinators

Where pairs of doors with rebated meeting stiles are installed it is critical that the correct closing order is maintained. Door coordinators to BS EN 1158 should be fitted and be fully operational in all cases where the doors are self-closing.

Installation and workmanship

The reliability and performance of correctly specified fire-resisting doors can be undermined by inadequate installation. It is important that installers with the necessary level of skill and knowledge are used. Certification schemes for installers of fire-resisting doors are available. Fire-resisting doors and shutters will require routine maintenance, particularly to power operation and release of closing mechanisms.

Emergency exit device on door

Door-fastening devices

Any device that impedes people making good their escape, either by being unnecessarily complicated to manipulate or not being readily operable is not acceptable. However, it is recognised that in many cases the need for security will require some form of access control. Electronic devices must be connected to the fire alarm system, so they fail open in a fire emergency. Mechanical devices such as digital locks should be operated by lever handles, not knobs, and should be the only device requiring manipulation to open the door. In premises where there are members of the public present or others who are not familiar with the building, panic exit devices (i.e. push bars or touch bars) should be used on final exit doors. See BS EN 1125 for further information.

Premises that have limited numbers of staff or others who are familiar with the building and where panic is not likely may use emergency exit devices (i.e. push pads or lever handles with emergency escape locks). See BS EN 179 for further information. In some larger premises, when only staff are on the premises and there is a security issue, it may be acceptable to restrict the number of emergency exits immediately available, e.g. when only security staff are present at night, or prior to opening the premises in the morning. Staff should be made fully aware of any restrictions and the number of exits not immediately available should be limited.

B.W.F. Scheme for identification of fire resisting door leaves in accordance with BS 476 Part 8: 1972.

Fire Resistant Ratings	Intumescent Necessary	Intumescent Not Necessary Green Core
30/20 (White background)		
30/30 (Yellow background)		
60/60 (Blue background)		
With specified Intumescent In frames or doors 30/30	White Background Blue Core	

Remember – Red Core or Blue Core means Intumescent must be fitted in accordance with manufacturers instructions either in the door or frame. Green Core means you can carry on fixing as Intumescent has been fitted under lipping.
TRADA having similar coding system with a tree shape as centre core.

BM TRADA labelling scheme pre-1996. Courtesy of Chiltern Fire/BM TRADA.

Third Party Certification

In addition to the third party certification scheme labels shown in 3.1 operated by BM TRADA and BWF CERTIFIRE, IFC Certification and LPCB also offer schemes. The scheme run by BM TRADA also used the labelling system shown left for doors installed prior to 1996.

Further guidance

BSI, BS 8124: 2008: Code of Practice for Fire Door Assemblies

Door and Hardware Federation and the Guild of Architectural Ironmongers, Code of Practice: Hardware for Fire and Escape Doors; **http://www.firecode.org.uk/**

British Woodworking Federation; **http://is.gd/41xxUa or www.bwf.org.uk**

Passive Fire Protection Federation, Data sheets; **www.pfpf.org.uk**

Timber doors: **http://is.gd/Lz4oh9**
Steel doors: **http://is.gd/RcFGmw**
Industrial and commercial doors **http://is.gd/5DCDyz**

Department for Communities and Local Government, Appendix B of the fire risk assessment guides for each building type; **http://is.gd/peEScR** or **www.communities.gov.uk**

Association for Specialist Door Manufacturers, Best Practice Guide; **http://is.gd/hhGmoi** or **www.asdma.com**

Intumescent Fire Seals Association, Information sheets and Risk Assessment Communiqués on the use of intumescent seals in doors and glazing system; **http://is.gd/gUY7nO** or **www.ifsa.org.uk**

Annex D: Construction of walls and floors forming escape routes

Fire-resisting walls

Common examples of types of wall construction that provide 30 minutes of fire resistance to escape routes if constructed to the above standards are:

- Internal-framed construction wall, non-load bearing, consisting of 72mm x 37mm timber studs at 600mm centres and faced with 12.5mm of plasterboard with all joints taped and filled
- Internal-framed construction, non-load bearing, consisting of channel section steel studs at 600mm centres faced with 12.5mm of plasterboard with all joints taped and filled; and
- Masonry cavity wall consisting of solid bricks of clay, brick earth, shale, concrete or calcium silicate, with a minimum thickness of 90mm on each leaf.

In many buildings proprietary internal partitions (usually, but not always plasterboard based) will be used. These are usually tested to British or European Standards as follows:

- Non-loadbearing walls and partitions: BS 476: Part 22 or EN 1364-1: 1999
- Loadbearing walls and partitions: BS 476: Part 21 or EN 1365-1: 1999

It should be possible for the fire risk assessor to verify if these have been constructed correctly by reference to appropriate supporting information which should reside in the CDM file or Regulation 38 information (England and Wales only).

Further guidance

ASFP, Purple Book: Fire-resisting partitions, 2nd Edition, A guide to internally framed non loadbearing partitions; **http://is.gd/ot8fEN** or **www.asfp.org.uk**

Passive Fire Protection Federation, Data sheet; **http://is.gd/9ctn4b** or **www.pfpf.org.uk**

Typical fire-resisting floor

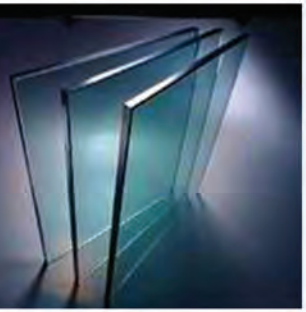
Fire-resisting floors

In larger and/or modern buildings, the fire resistance of the floor is usually provided by a concrete floor on a steel or concrete framework. Older, smaller and timber-framed buildings are likely to have timber joist floors, the fire resistance of which will depend on the existing floor construction, as well as the type of ceiling finish beneath. In older buildings, there may be a requirement to provide fire resistance between beams and joists.

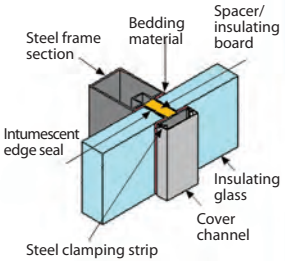
A typical example of a 30-minute fire-resisting timber floor is tongue and groove softwood of not less than 15mm finished thickness on 37mm timber joists, with a ceiling below of one layer of plasterboard to a thickness of 12.5mm with joints taped and filled and backed by supporting timber.

The fire resistance of loadbearing floors is evaluated by testing to BS 476: Part 21: 1987 or EN 1365-2: 1999. Any fire protection to floors will have been approved during the building control process and the assessor only needs to look for breaches or damage whilst checking for other items. If he finds these he should note it in his risk assessment and call for a more thorough third party inspection.

There are other methods and products available which will achieve the required standard of fire resistance. If the fire risk assessor is unsure as to how the building is constructed, then he should ask for an appropriate survey from an independent third party inspection organisation.



Types of fire-resisting glass. Courtesy of Passive Fire Protection Federation.



Typical components of a steel fire resisting glazed screen.

Annex E: Fire-resisting glass

The fire resistance of glazed screens, either as part of a partition or as a separate element, is evaluated by testing to BS476: Part 22: 1987 or EN 1366-1: 1999

Fire-resisting glass must only be used as part of a fire-resisting glazed system. Such a system includes the glass, together with the glazing seal, beads, bead fixings, the frame and the fixings of the frame to the surrounding structure. All these components must be compatible under fire conditions and the full system must have been proven as an integrated assembly. It is never acceptable to mix-and-match components from different fire-resisting glazed systems.

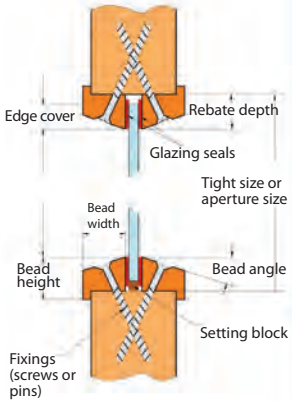
A variety of different technologies can be used for fire-resisting glass. For integrity performance, these include wired glass (where the wire mesh is within the body of the glass), modified toughened soda lime glass, glass ceramic, toughened borosilicate and fire-resisting plastic interlayer laminate (either clear or wired). Both integrity and integrity with insulation performance are provided by gel-filled units and special intumescent laminates.

In all cases, specific performance details should be obtained directly from the manufacturer, since performance differs from one glazed system to another.

Types of framing system

A variety of different framing systems are approved and include timber, steel, aluminium and composite frames which may involve a combination of materials (such as calcium silicate boards with metal covers). Each system must be separately approved, based on test evidence for that particular system.

So-called frameless, or butt-jointed, systems are also available where any framing is reduced to the minimum of top and bottom supporting cills. In these systems, the vertical joints typically contain a fire-rated seal compound. Similar systems are also available with vertical minimal width profiles used to cover the vertical joint, allowing decorative effects to be applied on the profile. In all cases, the application will be governed by the system approval, which will define the frame dimensions, overall assembly size, glazing details and applicable glass pane sizes. Substitutions of components in approved systems must not be made without appropriate approval e.g. an assessment by a UKAS-accredited test laboratory or a fire consultant specialising in that type of construction.



Section through glazing in a timber door

Marking of the glass

Fire-resisting glass should be clearly marked with an indelible and permanent mark, which should, as a minimum, show the glass product name, the safety impact rating, if required, according to BS 6206: 1981: Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings. This applies, in particular, to clear fire-resisting glass types that cannot easily be distinguished from non-fire rated clear glass types.

This mark should be visible and legible after installation so that it can be readily checked, for example, during fire risk assessments. If this is not the case, then the supplier should be asked to confirm the product and its marking.

Note: The marking on the glass, however, should not necessarily be taken as applying to the fire performance of the system as a whole. The fire performance of the system has to be confirmed by reference to the original documentation provided on installation.

Further guidance

Glass and Glazing Federation, Guide to Best Practice in the Specification and Use of Fire-Resistant Glazed Systems; **http://is.gd/T2zbwO** or **www.ggf.org.uk**

Passive Fire Protection Federation, Data sheet; **http://is.gd/iJfQrp** or **www.pfpf.org.uk**

Typical suspended ceiling with removable insulated ceiling tiles

Section through insulated fire resisting ceiling

Annex F: Fire-resisting ceilings

There are various types of fire-rated ceiling and it is essential that the fire risk assessor understands the role of the ceiling in providing fire resistance (if any). Essentially there are three types of fire-resisting suspended ceiling:

- **BS 476: Part 23 compliant:** This test measures the contribution a suspended ceiling can make to the fire performance of steel beams. This test is the least onerous of the BS 476: Parts 20 to 23 tests and is limited solely to evaluating the protection a suspended ceiling can provide.
- **BS 476: Part 21 compliant:** In the Part 21 test, a complete flooring system, including the suspended ceiling, is tested for integrity, insulation and loadbearing capacity. All parts of the construction contribute to this – suspended ceiling, steel or timber beams and the flooring. With the test carried out under a defined design load and with a positive pressure below the suspended ceiling of 18Pa, the Part 21 test is much more severe than that in Part 23. Some ceilings can achieve 60 minutes' fire resistance.
- **BS 476: Part 22 compliant:** The least used part of the British Standard is Part 22, where the ceiling element is non-loadbearing and is required to provide an integrity and insulation performance independent from the supporting floor construction. The ceiling may act as a horizontal partition either suspended from a secondary structure or spanning a corridor to provide fire protection. In some instances, there are recommendations for protection in both directions. The ceiling should protect services in the ceiling void from fire in the room or corridor; equally, fire resistance may be needed to safeguard the corridor from burning electrical cables and other services located behind the suspended ceiling.

The correct rating for a suspended ceiling is particularly relevant when considering areas of public access, such as in retail premises that may be refitted for aesthetic reasons. Should a system tested to Part 21 of BS 476, for example, be replaced with one of a lesser fire rating, such as a Part 23 system, the whole fire strategy may be compromised. Similarly, the removal of an old ceiling system without replacement, due to a change in use of the building, may also materially compromise the fire performance. Ceilings are part of the in-built structural fire protection plans in many instances and must be considered as such when refurbishments or changes of use are planned for buildings.

There are other methods and products available which will achieve the required standard of fire resistance. If the frafire risk assessor is unsure as to how the building is constructed, then he should ask for an appropriate survey from an independent third party inspection organisation

Further guidance

Passive Fire Protection Federation, Data sheet; **http://is.gd/cb61fv** or **www.pfpf.org.uk**

Annex G: Fire-stopping and penetration seals

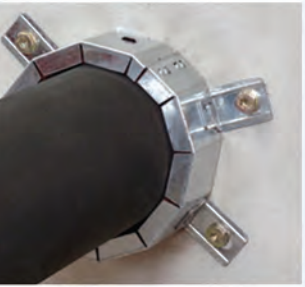
Mechanical and electrical services, by necessity, breach fire-resisting construction on escape routes and compartment walls and floors will allow the passage of smoke and flame if not adequately fire-stopped.

There is a wide range of products that are designed for use as fire-stopping and penetration seals. These include products based upon mineral wool; high and low pressure intumescents, mortars, pillows filled with fire-resisting materials, plugs and blocks, elastomers, putties, foams and mastics.

Evaluation of the fire resistance of fire-stopping and penetration seals has traditionally been undertaken by using ad-hoc procedures based on BS 476: Part 22: 1987 as there was no dedicated British Standard for these. Increasingly, manufacturers are using the European standard EN 1366-3 for penetration seals and EN 1366-4 for linear gap seals. The European standards are more rigorous and contain a wealth of guidance on how to test these products.

The crucial issues for fire-stopping are poor installation and/or the breaching of fire-resisting construction on escape routes and fire compartmentation after installation and handover. Unlike e.g. a fire door where any defective remedial work will normally be readily apparent and easily inspected, defects in fire-stopping and penetration sealing often remain out of sight and consequently often out of mind. The fire risk assessor in checking for the presence and condition of penetration seals in walls forming escape routes will be able to at least perform a 'first-aid' check on service penetrations. However, to evaluate the condition of fire-stopping, inspection other than in areas that are readily accessible, is unlikely to be an option and/or too invasive.

The best solution for ensuring that fire-stopping is installed properly is to use third party certified contractors. These are required to use trained staff, whose competence has been evaluated and whose records are subject to audit by the certification body and whose work is subject to random inspection by qualified inspectors. However, if in the course of his 'first-aid' inspection if fire-stopping, the assessor discovers significant failings, he should ask for an appropriate survey from an independent third party inspection organisation.



Correctly installed pipe penetration. Courtesy of Hilti (UK) Ltd.

This product should only be used to seal linear gaps between walls and walls/ floors/ceilings. It cannot be used to seal pipe or cable penetrations unless tested for that end-use application. Courtesy of Sharpfibre Ltd.

Further guidance

ASFP, Red Book: Fire-stopping - linear joint seals, penetration seals and small cavity barriers; **http://is.gd/HrATV1** or **www.asfp.org.uk**

Passive Fire Protection Federation, Data sheet; **http://is.gd/ZDBPym** or **www.pfpf.org.uk**

ASFP, Advisory Notes: Using polyurethane foams in fire-stopping of combustible pipes with an internal diameter of 40mm or less; **http://is.gd/ldJems** or **www.asfp.org.uk**

Intumescent Fire Seals Association, Information sheets and Risk Assessment Communiqués on the use of intumescent seals in doors and glazing system; **http://is.gd/gUY7nO** or **www.ifsa.org.uk**

Fire damper correctly installed in the plane of the wall with no damage to the penetration seal. Courtesy of Paul White.

Annex H: Fire dampers

Suitability of fire dampers

Fire dampers activated by fusible links are not generally suitable for protecting escape routes unless they are a fire and smoke damper (60 minute ES classification when tested to BS EN 1366-2).

Fire dampers are not generally suitable for extract ductwork serving kitchens because of the likely build-up of grease which can affect their activation.

Fire dampers should be situated within the thickness of the fire separating element and be securely fixed. It is also necessary to ensure that, in a fire, expansion of the ductwork would not push the fire damper through the structure.

Fire dampers should be tested to BS EN 1366-2: 1999 and be classified to BS EN 13501-3: 2005. They should have an E classification equal to, or greater than, 60 minutes. Intumescent fire dampers may be tested to ISO 10294-5. Fire and smoke dampers should also be tested to BS EN 1366-2: 1999 and be classified to BS EN 13501-3: 2005. They should have an ES classification equal to, or greater than, 60 minutes.

Fire dampers tested using ad-hoc procedures based on BS476 may only be used for 'fan-off' situations. It is not possible to obtain an E or ES classification for a damper tested to BS 476, so dampers for sleeping risk areas and escape routes should be tested to EN 1366-2.

Maintenance of fire dampers (BS 9999)

Guidance on the maintenance of fire dampers can be found in:

- BS 9999: 2008: Code of practice for fire safety in the design, management and use of buildings as follows:

  Annex W (normative): Routine inspection and maintenance of ventilation and air conditioning ductwork states: 'All fire dampers should be tested by a competent person on completion of the installation and at regular intervals not exceeding two years, and be repaired or replaced immediately if found to be faulty. Spring-operated fire dampers should be tested annually and fire dampers situated in dust-laden and similar atmospheres should be tested much more frequently, at periods suited to the degree of pollution.'

Annex V (normative): Routine inspection and maintenance of fire safety installations. This requires smoke control systems and their components to be tested as often as weekly, however, these are outside the scope of this publication which concentrates on PFP.

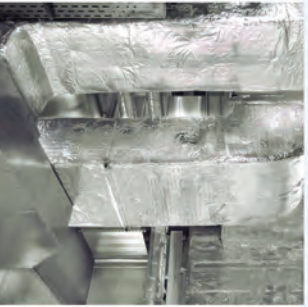
- BS EN 15650, Annex D
  This includes a table of recommended inspections which should be carried out every three months.

Further guidance

ASFP, Grey Book: Fire dampers (European standards), 2nd edition; **http://is.gd/NDJ9pF** or **www.asfp.org.uk**

Building and Engineering Services Association (formerly HVCA), HVCA DW 145: Guide to good practice for the installation of fire dampers; **http://is.gd/2YyERr** or **http://Is.gd/6IUMzm**

Passive Fire Protection Federation, Data sheet; **http://is.gd/1rv6xe** or **www.pfpf.org.uk**



Installations of fire resisting ductwork. Courtesy of StGobain Isover (top) and Fire Protection Ltd (bottom)

Annex I: Fire-resisting ducts

Fire-resisting ductwork may need to pass through fire-resisting construction on escape routes and compartment walls or floors that will have prescribed fire resistance periods in terms of load-bearing capacity, integrity and insulation, for durations of 30 to 240 minutes. It is a requirement that where these walls/floors are penetrated by ducts or other building services, the fire performance criteria for the penetrated wall or floor are maintained, such that fire in one compartment may not spread to other areas. The periods of integrity and insulation, and leakage where required, should in all cases be at least equal to those required for the penetrated element of construction. In certain circumstances, controlling authorities may waive the insulation requirement or allow a reduced period of insulation; for example, in some car parks, where enforcers consider that there is not a possibility of combustible materials being in close proximity to the ductwork. The fire risk assessor will need to verify if this approach has been followed.

The fire resistance of ducts is evaluated by testing to BS 476: Part 24 or BS EN 1366: Parts 1, 5, 8, or 9. From 1 July 2013, all ducts have to be CE-marked and classified to BS EN 13501: Part 3 or 4. The test evaluates the ability of a representative duct assembly to resist the spread of fire from one compartment to another. The performance of the duct assembly is measured in terms of its ability to withstand exposure to high temperatures, by evaluating it against criteria for the fire containment (integrity), the thermal transmittance (insulation) and the leakage rate. Two ducts are tested, one where the fire is outside (Duct A), and one where the fire is inside (Duct B). Both ducts should be tested in horizontal and vertical orientations to cover all end-uses.

Support and sealing

Because the primary reason for providing fire-resisting ductwork is to maintain the fire resistance of a compartment wall or floor, it is critical that the correct method of sealing any gaps around the ductwork is used where it passes through – particularly on fire-resisting construction on escape routes. This detail is one of the most common reasons for the failure of ductwork systems in fire. Maintenance of separation is usually achieved in one of two ways:

- For fire-resisting ductwork a penetration seal is fitted between the duct and the wall or floor. The penetration seal and the ductwork are considered as one integral system and must be the same as that tested or assessed in accordance with the appropriate standard. It is not possible to use a fire-resisting duct with a sealing system that has not been tested or assessed and it is critical that this also takes into account the type of wall or floor the ducts are to penetrate.

- For fire-resisting ductwork a fire damper must be fitted in the plane of the wall or floor. The damper and associated penetration seal must be installed to a procedure substantiated by test. Note that the damper must be mounted in the wall or floor and must be supported/restrained independently of the ductwork (see Annex H on dampers above)

Further guidance

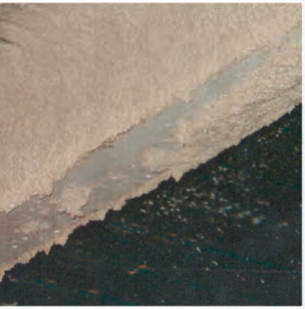
ASFP, Blue Book (BS): Fire-resisting ductwork tested to BS 476 Part 24, 2nd Edition; **http://is.gd/aQiygX**

ASFP, Blue Book (EN): Fire-resisting ductwork classified to EN 13501: Parts 3 & 4, 1st Edition; **http://is.gd/LzCkpB**

Building and Engineering Services Association (formerly HVCA), Specification for sheet metal ductwork; **http://is.gd/0F6oST** or **http://is.gd/6IUMzm**

BRE, Good Building Guide 81: Installing Fire-Resisting Ductwork and Dampers; **http://is.gd/ilcDjr** or **http://www.brebookshop.com**

Degraded intumescent paint. Courtesy of Exova Warringtonfire.



Failure (slumping) of spray applied non-reactive fire protection. Courtesy of Exova Warringtonfire.

Annex J: Fire protection to structural steel

Section B3, Internal fire spread (structure), of the Building Regulations, states that: The building shall be designed and constructed so that, in the event of fire, its stability will be maintained for a reasonable period. Structural steel fire protection is required to preserve the stability of the building in the event of a fire. There are three generic types of fire protection for structural steelwork:

a) Intumescent coatings

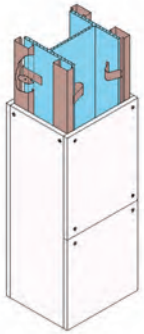
Intumescent coatings (paints) are specially formulated to swell up and form a protective insulating char in the event of a fire. They are usually spray-applied as a thin film and are often available with a range of topcoats in different colours so that the designer can achieve his or her aesthetic needs as well as those of fire protection on visible steel. Unfortunately, this means that intumescents are visibly identical to normal paint and so it is crucially important that records of the installation are maintained. Intumescent coatings are usually used for steel that requires up to 90 minutes' protection.

b) Cementitious products

Cementitious products based on gypsum or Portland cement binders are normally applied by low pressure spray techniques to the profile of the steel section to be protected. These materials contain low density aggregates and rheological aids to help the application characteristics. Fire protection is provided to the steel by these materials in two ways, the first being the 'cooling effect', since the trapped moisture (physically and chemically bound) evaporates as the temperature of the surrounding fire increases. Secondly, once all the moisture has turned to steam, the product then behaves as a thermal insulation material.

c) Board and casing systems

Board and casing systems use materials such as ceramic wool, mineral wool, gypsum-based boards, calcium silicate and vermiculite to provide fire protection to steel. These products provide fire protection in the same way as cementitious products and are dry fixed around the steel using clip, pin, noggin, adhesive and screw systems.



Typical board encasement system.

Cellular beam coated with intumescent paint.

Evaluation of fire protection to structural steel involves fire testing a number of loaded and unloaded sections of varying sizes and then using a number of assessment techniques to predict the amount (thicknesses) of fire protection needed to cover all the different shapes, sizes and section factors (ratio of perimeter area to cross section) encountered in buildings. Traditionally this has been undertaken by testing to BS 476: Part 21: 1987 and then using assessment methodologies used in the ASFP Yellow Book. Increasingly, manufacturers are using the European standards EN 1338-8 (reactive products) and EN 1338-4 (non-reactive products) which includes both the test and assessment methods. Guidance on the use of these is also included in the ASFP Yellow Book.

Cellular Beams

Cellular Beams, or beams with holes in them to allow the passage of services are increasingly being used for architectural (aesthetic and space saving) reasons. Such beams require a more detailed evaluation of their fire protection due to their different mode of failure under load. A new European standard is being developed (EN 13381-9) and guidance on this is also included in the ASFP Yellow Book.

If the fire risk assessor discovers significant damage or omission of fire protection, or has reason to suspect that non-fire resistant materials have been used, he should call for a more thorough and possibly invasive inspection by a third party inspector.

Further guidance

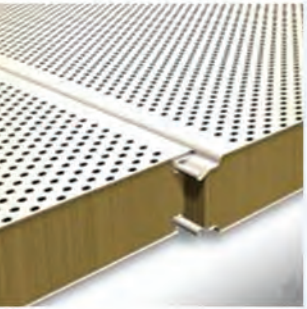
ASFP, Yellow Book: Fire protection for structural steel in buildings, 4th Edition; **http://is.gd/K3NgQs**

ASFP, Technical Guidance Documents: **http://is.gd/NgFyv4** or **www.asfp.org.uk**

TGD 11 – Code of practice for onsite use of Intumescent coatings for fire protectionof structural steelwork
TGD 15 - Code of practice for sprayed nonreactive coatings for FP steelwork
TGD 16 - Code of Practice for off-site applied intumescent coatings

Passive Fire Protection Federation, Data sheet; **http://is.gd/Ude15V** or **www.pfpf.org.uk**

Annex K: Sandwich panels



Mineral wool cored sandwich panel

Insulated core panels are often used as exterior cladding or for internal structures and partitions in buildings. They normally consist of a central insulated core, sandwiched between an inner and outer metal skin with no air gap. The external surface is coated with a polymeric coating (usually PVC) to improve weather resistance and/or the aesthetic appeal of the panel. The central core can be made of various insulating materials, ranging from non-combustible mineral wool through to highly combustible polymeric foams.

Differing fire hazards are associated with common types of insulation, when the panels are subjected to certain temperatures. Typical examples are:

- Mineral wool which is non-combustible and will not contribute at any stage of a fire. Production of smoke and toxic gases is minimal.
- Modified phenolic will produce surface char and little smoke or gaseous combustion products, at temperatures above 230°C.
- Polyisocyanurate (PIR)/polyurethane (PUR) will char and will generate smoke and gaseous combustion products, at temperatures above 430°C PIR and 300°C PUR.
- Expanded polystyrene (EPS) will melt and will generate smoke and gaseous combustion products, at temperatures above 430°C

Insulation charring can lead to panel delamination/collapse, and the gaseous combustion products can quickly fill areas with toxic gases such as carbon monoxide and styrene. A number of fires in buildings where combustible cored insulated panels have been used extensively in the fabric of the building have highlighted the particular dangers that may be associated with this form of construction, i.e. where the fabric of the building can contribute to the fire hazards. In a fire the following may occur:

- Early buckling and falling away of the facing materials.
- Burning of the combustible insulating material.
- Production of large quantities of dense, toxic smoke.

Tall buildings in warehousing/ food factories are often constructed from sandwich panels.

- Rapid heat generation;
- Early loss of structural strength can result if the system has not been properly designed, and this can lead to the collapse of the wall, partition or ceiling;
- There may be cavities in older buildings where the panels are used as an internal envelope, enabling fire to spread unnoticed.

Further guidance

International Association of Cold Storage Contractors, Information on the design, construction, specification and fire management of insulated core panels; **http://is.gd/d7JKE4**

LPCB, LPS 1208: Fire resistance requirments for elements of construction used to provide compartmentation

LPCB, LPS 1500: Requirements for the LPCB Approval and listing of companies installing fire resistant compartment wall systems in buildings; **http://redbooklive.com/lps.jsp**

Passive Fire Protection Federation, Data sheet; **http://is.gd/x2qC77**

Annex L: References and regulatory documents

Building regulation and fire safety legislation in the UK

England & Wales

The Building Regulations 2010 and its subsidiary legislation regulate new building work or material alterations to existing buildings. Guidance on fire safety is given in Approved Document B.

The Regulatory Reform (Fire Safety) Order 2005 (FSO) regulates fire safety of buildings in use.
Further information is available at **www.planningportal.gov.uk**

- Regulation 38 (formerly 16b) of the Building Regulations 2010 requires that where building work involves the erection or extension of a relevant building, or a relevant change of use, then fire safety information shall be given to the responsible person at the completion of the project, or when the building or extension is first occupied.

- 'Fire safety information' means information relating to the design and construction of the building or extension, and the services, fitting and equipment provided in or in connection with the building or extension, which will assist the responsible person to operate and maintain the building with reasonable safety.

Details are provided in Appendix G Approved Document B Volume 2 – Buildings other than dwelling houses.

London Building Acts (Amendment Act) 1939 Section 20

Section 20 is a national Act which is applied to local areas in London. The Act gives power for Local authorities to consider the need for specific requirements relating to fire safety (excluding means of escape) for large buildings. This is principally aimed at assisting fire-fighting. Section 20 has the power to require the following:-

- Fire extinguishing appliances and installations
- Effective means of removing smoke in case of fire.
- Adequate means of access to the exterior of the site of the building for fire service personnel and appliances.
- Requirements for special fire risk areas (as defined in the Act)

An excerpt from the legislation is available from:- **http://is.gd/I1RVOZ** or **www.legislation.gov.uk**

The London District Surveyors' Association has published a guide. Please email any enquiry to: **ldsapublications@ntlworld.com**

The following educational website provides information regarding the areas covered by Section 20 and history of the legislation: **http://is.gd/sUtsLy** or **www.moebuildingcontrol.co.uk**

Scotland

In Scotland the Building (Scotland) Regulations 2004 (Scottish Statutory Instrument 2004 No. 406), regulate new buildings or alterations. The Fire (Scotland) Act 2005 regulates fire safety of buildings in use. Guidance is contained in the Scottish Technical Handbooks which can be downloaded from: **http://is.gd/yqAWnt**. Further information is available at **http://www.firelawscotland.org/**

Northern Ireland

In Northern Ireland the Building Regulations (Northern Ireland) 2000 (Statutory Rule 2000 No. 389, (as amended) regulate new building work or material alterations to existing buildings. Guidance on achieving these requirements is contained in Technical Booklet E. Further information is available at **http://is.gd/qMnjgP** and **http://is.gd/MvEdqr** or **www.dfpni.gov.uk**

Further guidance

Department of Communities and Local Government, Risk Assessment Guides for buildings in different types of occupation; **http://is.gd/peEScR** or **www.communities.gov.uk**

Department for Education: Building Bulletin 100: Designing & managing against the risk of fire in schools; **http://is.gd/7W2nDM**

Department of Health, HTM 05 Series, including

- HTM 05-01 Managing Healthcare fire safety
- HTM 05-02A Guidance in support of functional requirements
- HTM 05-02B Fire engineering provisions
- HTM 05-03 Operational provisions

Local Government Group, Fire safety in purpose-built blocks of flats; **http://is.gd/IMRhbl**

Construction Design and Management Regulations (CDM) 2007

The Construction Design and Management Regulations (CDM) require all concerned in the process from design inception to completion of the building to prepare a file (the CDM file) containing details of all the work undertaken and materials used where safety is concerned. The CDM file can be an invaluable source of information on all aspects of fire safety work in the construction of the building that may be used by the occupant when preparing maintenance plans, modifications to the building or fire risk assessments.

Details are contained in a Code of Practice L144: Managing health and safety in construction; **http://is.gd/BMKhP2** or **www.hse.gov.uk**

Ireland

The building control system is centred on the parent Act, the Building Control Act, 1990, which provides:

- for the making of Building Regulations and deals with issues such as building standards, workmanship, conservation of fuel and energy and access for the disabled
- for making of Building Control Regulations - Commencement Notices, Fire Safety Certificates and Fees- Administration by Building Control Authorities
- powers of enforcement and inspection

Building Control Act 2007 (Ireland)

The Building Control Act 2007 strengthens the enforcement powers of local building control authorities by introducing revised procedures for the issue of Fire Safety Certificates.

Building Control Regulations 1997–2009 (Ireland)

These apply to all new buildings. Their purpose is to promote observance of the Regulations by supplementing the basic powers of inspection and enforcement given to Building Control Authorities by different sections of the Building Control Act, 1990. They do this by requiring a UK Fire Safety Certificate for most buildings, with the exception of houses and individual apartments. The construction of an apartment block is subject to the requirement - to ensure safety of persons in the building.

Building Regulations 1997–2011 (Ireland)

The primary purpose of the Building Regulations is to provide for the health, safety and welfare of people in and around buildings. In general, the Building Regulations 1997¬2002 apply to the construction of new buildings and to extensions and material alterations to existing buildings and to certain changes of use of existing buildings. They are couched in broad functional requirements similar to the UK Building Regulations.
More information can be found at: **http://is.gd/QBvTGc** or **www.environ.ie**

Health and safety legislation

The Safety, Health and Welfare at Work Act 2005 requires under section 19 for employers to carry out a a risk assessment for all Health and Safety issues including emergency egress and for these to be recorded.

The Safety, Health and Welfare at Work (General Application) Regulations 2007 transpose both the EU Framework Directive (89/391/EC) and the Workplace Directive (89/654/EC). These directives resulted in the UK Regulatory Reform (Fire Safety) Order 2005 and much of the guidance written on this is relevant in Ireland.

The Health and Safety Executive has also published HSG 168, Fire Safety in Construction; **http://is.gd/tl78fK** or **www.hse.gov.uk**

Fire Services Acts 1981 & 2003 (Ireland)

This requires the responsible person to carry out a fire safety risk assessment and implement and maintain a fire management plan. In Irish health and safety legislation there are many persons with potential responsibility for fire safety including;

- Employers, e.g. section 8 of the Safety, Health and Welfare at Work Act 2005; **http://is.gd/wYMKCS;** Part 2, Chapter 1 of the Safety, Health and Welfare at Work (General Application) Regulations 2007; **http://is.gd/FLnypR**
- Employees, e.g. section13 of the Safety, Health and Welfare at Work Act 2005; **http://is.gd/qSUMLr**
- Designers, manufacturers, importers and suppliers, e.g. section 13 of the Safety, Health and Welfare at Work Act 2005; **http://is.gd/qSUMLr**
- Persons in control of all or part of a place of work, e.g. section 15 of the Safety, Health and Welfare at Work Act 2005; **http://is.gd/Yn8lma**
- Construction work, e.g. section 17 of the Safety, Health and Welfare at Work Act 2005; **http://is.gd/ndU5Ev**
- Contractors e.g. Safety Health and Welfare at Work (Construction) Regulations 2006; **http://is.gd/Q4Upet**

The term "Responsible person (Employer/ landlord)" may not reflect the broad range of duty holders.

Full regard should be taken of the provisions for a competent person, e.g. under section 2, section 8(2)(l); **http://is.gd/wYMKCS**; section 17; **http://is.gd/D4k6oG** and section 18; **http://is.gd/LaWXMh** of the Safety, Health and Welfare at Work Act 2005. The need to appoint a competent person under Irish health and safety legislation may need to be highlighted.

| www.asfp.org.uk

Association for Specialist Fire Protection 2012
ASFP, Kingsley House, Ganders Business Park, Kingsley
Bordon, Hampshire GU35 9LU, United Kingdom
Tel: +44 (0)1420 471612
Fax: +44 (0)1420 471611
www. asfp.org.uk

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