

FPA Design guide

for the Fire
Protection of
Buildings

PROTECTED
ZONE



This document is one of a number which go to make up the *FPA Design Guide for the Fire Protection of Buildings*, a development from the *LPC Design Guide for the Fire Protection of Buildings 2000*. That development is part of a programme of work being carried out by the Fire Protection Association under the sponsorship of the Insurers' Fire Research Strategy Funding Scheme (InFiRes). The scheme is operated by a group of insurance companies supporting a series of expert working groups developing and promulgating best practice for the protection of property and business from loss due to fire and other risks. The technical expertise for the *Design Guide* is provided by the Technical Directorate of the FPA and experts from the insurance industry who form the InFiRes Passive Working Group.

The aim of the *FPA Design Guide* is to provide loss prevention guidance for those who design, construct and equip industrial and commercial buildings. The *Design Guide* documents continue a long tradition of providing authoritative guidance on loss prevention issues started by the Fire Offices' Committee of the British insurance industry over a hundred years ago and they build upon earlier publications from the LPC and the Association of British Insurers.

Lists of other publications on loss control are available at www.thefpa.co.uk and from the FPA at:

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Copies of publications can be purchased from the FPA at that address or by telephoning 01608 812 500 or e-mailing fpa@thefpa.co.uk.

FPA Design Guide: Essential Principles

The objectives of the Design Guide are:

- to minimise the effect of fire on a business
- to limit the effects of business interruption
- to allow a business to be trading within 24 hours of a fire
- to protect the buildings within a business

by defining essential principles to be espoused in the design and construction of commercial and industrial premises, principles which will result in buildings which are safer from the risk of fire, better able to cope with the effect of fire in the event that it breaks out, and safer for people to work in or visit.

The essential principles are:

1. Use building materials which will not make a significant contribution to a fire at any stage of its growth;
2. Design a building's structure to have resistance to collapse or excessive deflection in the event of a fire;
3. Construct a building in such a way as to minimise the extent of fire and smoke damage in the event of fire;
4. Incorporate all necessary safeguards against the threat of arson;
5. Construct the building in such a way that fire cannot spread in from an adjoining building or other external fire source;
6. Install an appropriate automatic fire alarm system;
7. Ensure that fire protection systems are regularly inspected and maintained;
8. Initiate a comprehensive regime of fire safety management for the premises;
9. Give regard, at the design stage, to the potential damage from firefighting water and plan to minimise any undesired environmental effects that might relate thereto;
10. Specify only third-party certificated fire protection products;
11. Commission competent, specialist installers to fit fire protection products/systems;
12. Ensure that services and related components are designed/constructed/installed/maintained to guard against their becoming accidental sources of ignition.

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1. SCOPE

The FPA *Design Guide for the Fire Protection of Buildings* is made up of many documents, including a number of premises-specific sector guides. Each sector guide is in two parts: part 1 covers the design principles for a particular type of premises and part 2 is concerned with fire safety management.

This present document deals with a single item of technicality, the concept of the protected zone, a design principle which, if adopted, will assist in the design and construction of buildings which are less likely to catch fire. Should fire occur, however, the applied design principle will help limit fire and smoke damage and thus minimise business interruption.

2. INTRODUCTION

The prime objective of the FPA's *Design Guide* is to provide guidance on the general principles of passive fire protection for buildings. Among the design features which help a building better to withstand the effects of a fire is compartmentation, the division of a building into fire-tight compartments by fire-resisting elements of building construction in order to contain a fire within the compartment of origin.

A compartment wall, in *Design Guide* terms, is a loadbearing or non-loadbearing vertical, fire-resisting element of construction designed to contain a fire within an area for a predetermined duration (based on furnace exposure) in order to minimise the risk of fire spread. To be regarded as a compartment wall, the wall shall be continuous to the floor or roof above and achieve the recommended level of fire resistance appropriate to the risk.

But a compartment wall can only be as effective as the adjacent elements of building construction permit. This document deals with the concept of a protected zone in, principally, a single-storey building. It is vital that walls, roofs and supporting frameworks, within a protected zone on one or both sides of a compartment wall, are provided with adequate fire resistance or alternative protection to prevent the early spread of fire from one side to the other. The following guidance deals with the essentials of designing a protected zone.

3. DEFINITION

The protected zone is comprised of sections of the roof, external walls and supporting frame of single-storey building (and where applicable, multi-storey buildings) adjacent to and within a specified distance on each side of a compartment wall. This is illustrated below:

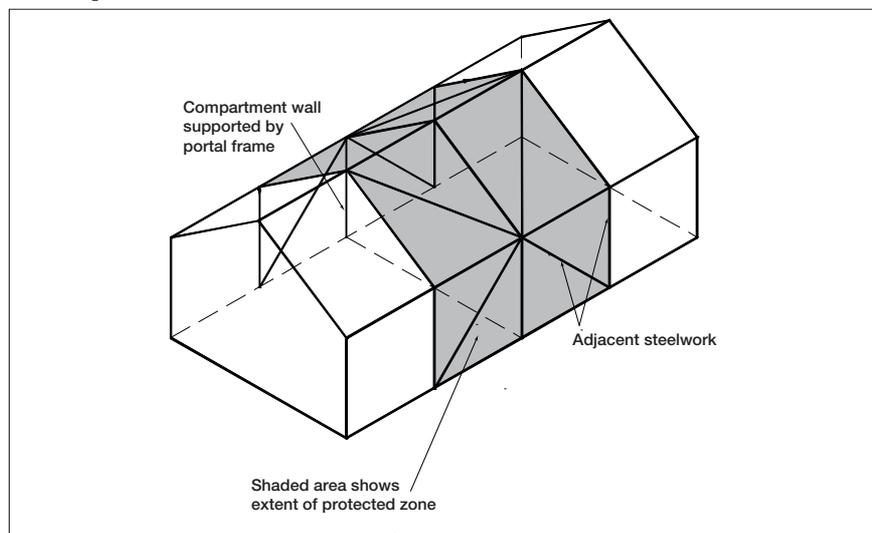


Figure 1. The protected zone.

4. PURPOSE OF THE PROTECTED ZONE

The purpose of the protected zone is to prevent fire from bypassing the compartment wall at a junction with an external wall or roof. In addition, the external wall should not collapse or allow the passage of fire to other parts of the building. This concept is illustrated in Fig.2.

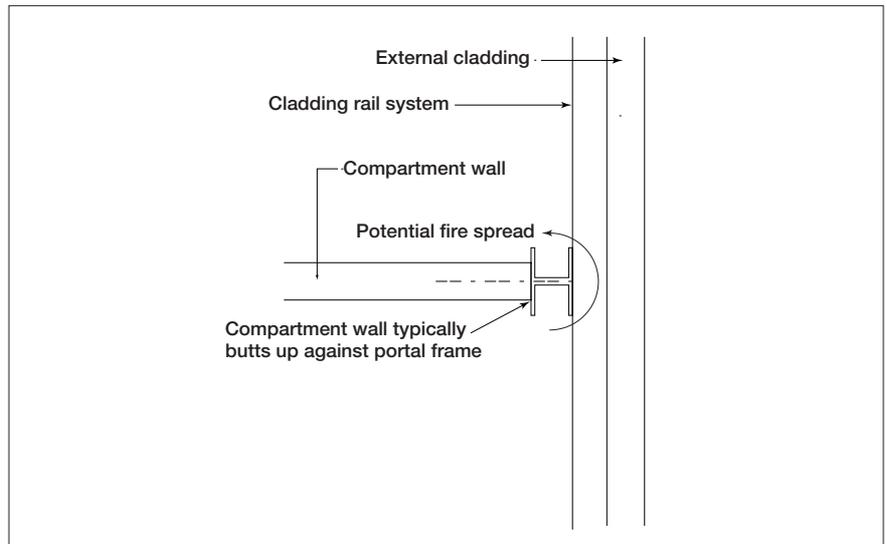


Figure 2. Within the protected zone, potential fire spread must be prevented.

5. FIRE RESISTANCE

The main concern is to ensure that at the junction between the wall, any structural member and the external cladding, no gaps are left that will allow the passage of fire, nor can such gaps develop. Any gaps will allow compartmentation to be breached.

The objective is to provide, at a junction of a compartment wall, structural frame and wall/roof, the same level of fire resistance as the compartment wall. Consideration shall be made to possible gaps forming because of deformation of any structural element and/or the external cladding. Some possible solutions, for guidance are given in Fig. 3.

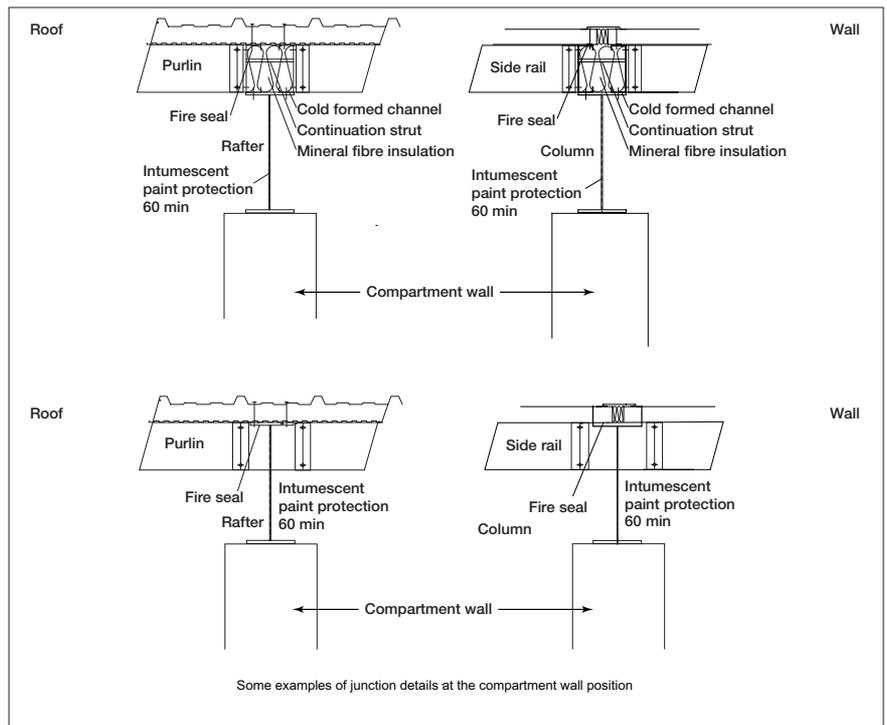


Figure 3. Some examples of compartment wall junction details.

The examples in Fig. 3 show the structural member to be protected by intumescent coating having 60 minutes fire resistance and this should be regarded as the minimum.

An alternative detail is shown (Fig. 4) using fire protection boards and Z section to improve the performance of the portal frame in a fire and thus minimise distortion at the compartment wall junction.

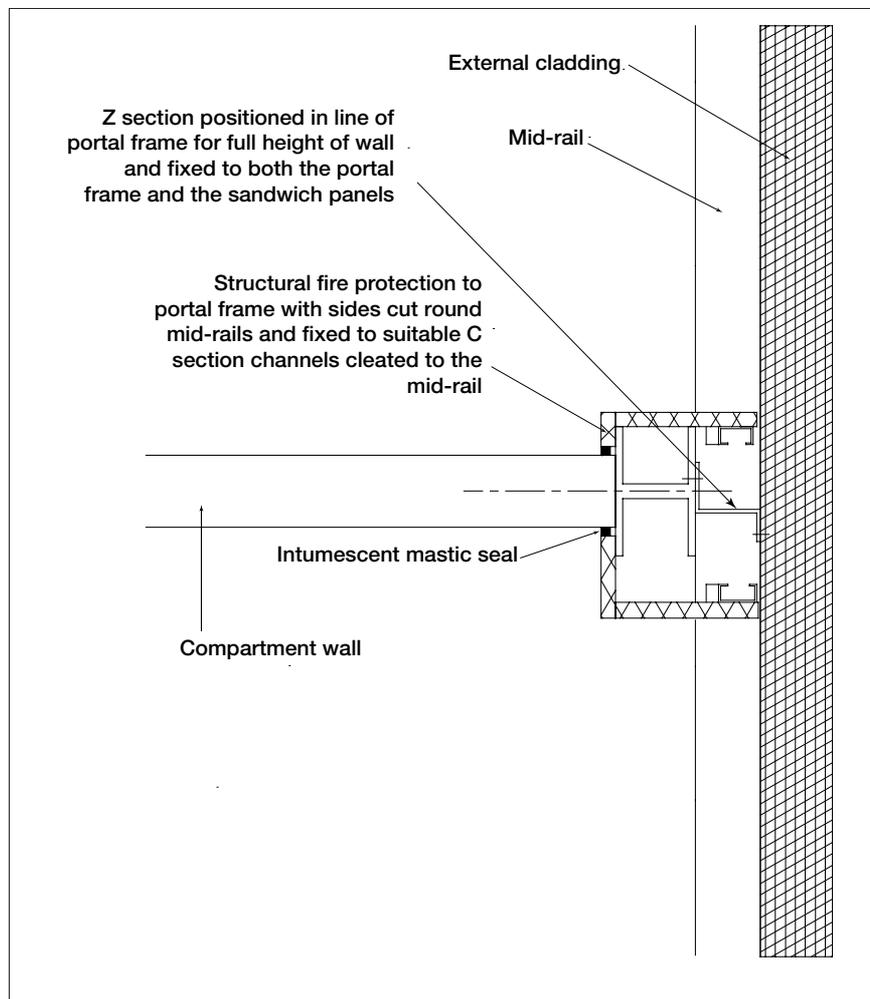


Figure 4. Steel framework is protected by fire-resisting boards. Z section is fixed to portal frame and external cladding to minimise distortion at the line of the compartment wall.

FIRE GROWTH

The first essential principle of the FPA *Design Guide* is to promote the use of internal and external construction elements that are either non-combustible or have been shown by appropriate fire testing to possess satisfactory fire performance properties.

It is recognised that sandwich panels are the building material commonly chosen for a number of applications in commercial buildings and designers should obtain general guidance on the choice of sandwich panels which have been tested to a relevant standard (for example, the Loss Prevention Certification Board's Loss Prevention Standard 1181: 2003: Part 1 for cladding for the external envelopes of buildings) (ref. 1) and also tested by an accredited test laboratory (for example, FRS tests to Loss Prevention Certification Board standards).

6. EXTENT OF PROTECTED ZONE

The protected zone shall extend not less than 2.5m from each side of the compartment wall and if external cladding is used it shall have fire resistance of not less than 60 min integrity (E60) and have insulation not less than 15 min (EI 15) from each side, as verified under test. No openings or service penetrations whatsoever will be permitted in the protected zone.

OCCUPANCY TYPE*	Minimum fire resistance (min)	
	Not sprinklered (or sprinklered on one side only or walls between different occupancies whether sprinklered or not)	Sprinklered ¹
1a Residential (domestic) Flat/maisonette	Not covered in this <i>Design Guide</i>	
1b/1c Residential Dwelling house		
2a/2b Residential Institutional and other residential including hotels ⁵	120	90
3 Office ⁵	120	90
4a Shop and commercial	120	90
4b Retail warehouse and superstore ^{2, 4}	240	120
5 Assembly and recreation ⁵	120	90
6a Industrial - Ordinary hazard groups I and II ^{3, 4}	120	90
6b Industrial - Ordinary hazard groups III and IIIs and High hazard process ^{3, 4}	240	120
7a Storage and other non-residential	240	120
7b Car park for light vehicles	Not covered in this <i>Design Guide</i>	

* More information on occupancy types is given in Appendix 2A of this Part. This is based on the purpose groups given in Table D1 of Approved Document B, The Building Regulations 1991.

¹ The reduced level of fire resistance is permitted where sprinkler protection is installed both sides of the compartment wall or floor. This must be designed and installed in accordance with the *LPC Rules for Automatic Sprinkler Installations* (incorporating BS 5306: Part 2). This concession should not be permitted where control of the sprinkler protection either side of a compartment wall is in different ownership or rests with a different occupier.

² 'Retail warehouse and superstore' is not specifically defined, but refers to buildings containing storage arrangements similar to those encountered in storage occupancies.

³ For details of hazard groups see Tables 3 and 4, BS 5306: Part 2: 1990, *Specification for sprinkler systems*.

⁴ These additional subdivisions in occupancy types depart from those given in Appendix 2A, but are considered necessary for property and business protection aspects.

⁵ With respect to occupancy types 2, 3, and 5, less than 20m high, compartment walls provided to comply with the floor areas specified in Table 2.3 should have fire resistance not less than that specified for elements of construction in Table 2.1.

From the *LPC Design Guide for the Fire Protection of Buildings 2000*.

Where the compartment wall is built parallel to the ridge line, the length of the protected zone for occupancy types 4b, 6b and 7a given in Table 2.2 of the *LPC Design Guide for the Fire Protection of Buildings 2000* (ref. 2) shall not be less than 5m. This distance may be reduced to 2.5m if other acceptable measures are taken, for example, if sprinkler protection is provided.

7. ROOF LIGHTS

Unless they have fire resistance to the levels given above, roof lights shall not be located closer than 2.5m from each side of any compartment wall (see Fig. 5).

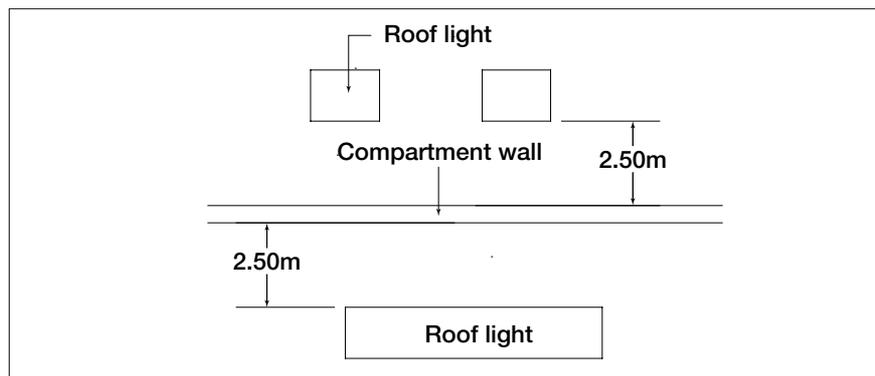


Figure 5. Recommended spacing of roof lights from compartment walls.

8. EXTENSION OF PROTECTED ZONE ABOVE FLAT OR SLOPING ROOF TO PROTECT ADJACENT BUILDING

Where there are two adjoining buildings, a protected zone shall be located around the perimeter, as shown in Fig. 6.

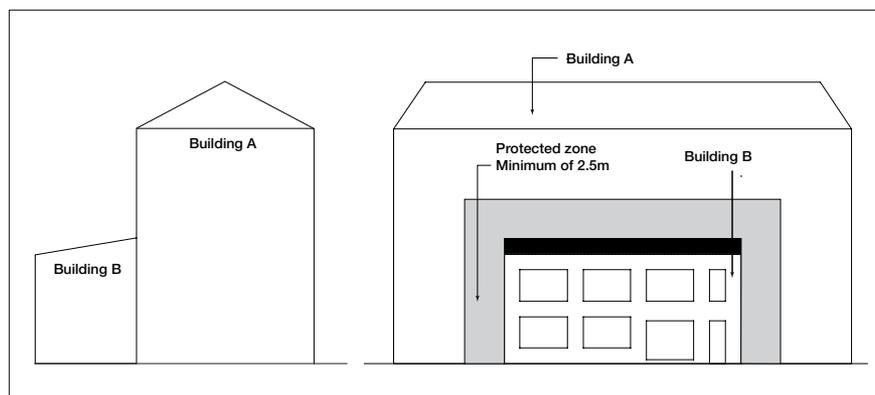


Figure 6. A protected zone around the junction of two buildings.

9. JUNCTION DETAILS WHERE PROTECTED ZONE ENDS

Manufacturers shall provide details to the designer on how a fire-resisting cladding which has been approved to an appropriate standard by an independent third-party certification body and is used for the protected zone is to be joined to a non-fire-resisting cladding. (It shall be assumed that the fire-resisting cladding has test approvals for its fire-resisting and reaction-to-fire characteristics.)

This shall be without detriment to the appearance or weatherproofing function, nor shall it create a potential path for fire to enter the building from an external fire.

REFERENCES

1. LPS 1181: *Series of Fire Growth Tests for LPCB Approval and Listing of Construction Product Systems: Part 1: 2003: Requirements and Tests for Built-up Cladding and Sandwich Panel Systems for Use as the External Envelope of Buildings*, BRE Certification.
2. *LPC Design Guide for the Fire Protection of Buildings 2000*, Fire Protection Association, 1999.