

FPA Design guide



for the Fire
Protection of
Buildings

ESSENTIAL
PRINCIPLES



InFiReS



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 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:

Fire Protection Association

London Road
Moreton in Marsh
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Copies of publications can be purchased from the FPA at that address or by calling +44 (0)1608 812 500 or emailing sales@thefpa.co.uk.

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Section 1

USE OF GUIDANCE

1.1 FPA Design guide

1.1.1 Introduction

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 (FPA) under the sponsorship of the Insurers' Fire Research Strategy (InFiReS) Funding Scheme. 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 that form the InFiReS Passive Working Group.

The aim of the *FPA Design guide* is to provide loss prevention guidance for those that design, construct and equip industrial and commercial buildings (Diagram 1.1). The *FPA 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 build upon earlier publications from the LPC and the Association of British Insurers.

The format of the *FPA Design guide* is a collection of discrete documents which address specific areas of relevance.

The *essential principles* on which the guide is based are contained within this document.

Table 1.1 Sector specific guides of *FPA Design guide*

Title	Availability
Stand-alone cold stores	Published
Warehouses and storage buildings	Published
Food processing factories	Published
Education establishments	Due 2008
Catering establishments	Due 2008
High-rise buildings	Due 2008
Assembly and recreation buildings	Due 2008
Industrial buildings	Due 2008
Shops and commercial buildings	Due 2008
Sleeping accommodation (other than single dwellings)	Due 2008
Offices	Due 2008

Following on from the essential principles, is a series of 'sector specific guides' which describe in detail how to achieve the principles within particular building types. (See Table 1.1).

The sector specific guides describe the application of measures to mitigate the effects of fire. While some of these measures will be familiar to users of the guides, others will not. The sector specific guides are therefore supported by a series of 'core documents' which explain in more detail the measures which are called for by the sector specific guides (See Table 1.2).

The last group of documents which comprise the *FPA Design guide* are intended to address very specific issues of construction detail. These 'construction design and data sheets' give data on a broad range of building product types and give guidance on their application and use (See Table 1.3).

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Table 1.2 Core documents of *FPA Design guide*

Title	Availability
Protection of openings and service penetrations	Published
Compartmentation	December 2007
Building materials and their contribution to fire	2008
Preventing structural collapse	2008
Firefighting and fire service facilities	2008
External fire exposure and arson prevention	2008
Quality workmanship	2008

Table 1.3 Construction design and data sheets of *FPA Design guide*

Title	Availability
Structural frames	www.thefpa.co.uk
Roofs	www.thefpa.co.uk
Compartment walls	www.thefpa.co.uk
External walls	www.thefpa.co.uk
Compartment floors	www.thefpa.co.uk
Fire doors	www.thefpa.co.uk
Service sealing	www.thefpa.co.uk
Fire-resistant glazing	www.thefpa.co.uk
Protection of air distribution systems	www.thefpa.co.uk

Table 1.3 shows the general headings of the construction design and data sheets. A more detailed description of their contents is available from the FPA.

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1.1.2 Objectives

National building regulations are intended to ensure that a reasonable standard of life safety is provided in case of fire. The protection of property, including the building itself, may require additional measures.

It is the objective of the *FPA Design guide* to describe aspects of fire safety in buildings which will both reduce the risk of fire and make them better able to cope with the effect of fire in the event that it should break out. The aims are to:

- reduce the likelihood of fire, either accidental or malicious;
- minimise the effect of fire on a business and the consequential loss;
- protect the buildings within a business; and
- maintain the health and safety of those in and around the building (including firefighters).

This objective will be achieved by addressing essential principles which are to be achieved in the design and construction of commercial and industrial premises.

This document describes and explains the essential principles.

1.1.3 Limitations

The essential principles are not directly intended to deliver life safety. For this, appropriate advice should be obtained from the local building control authority and reference made to the relevant parts of documents approved for the purpose of national building regulations for the design of buildings. Also, advice should be obtained from the local fire authority and reference made to relevant legislation and regulation for the fire safety management of buildings.

1.1.4 Fire safety engineering

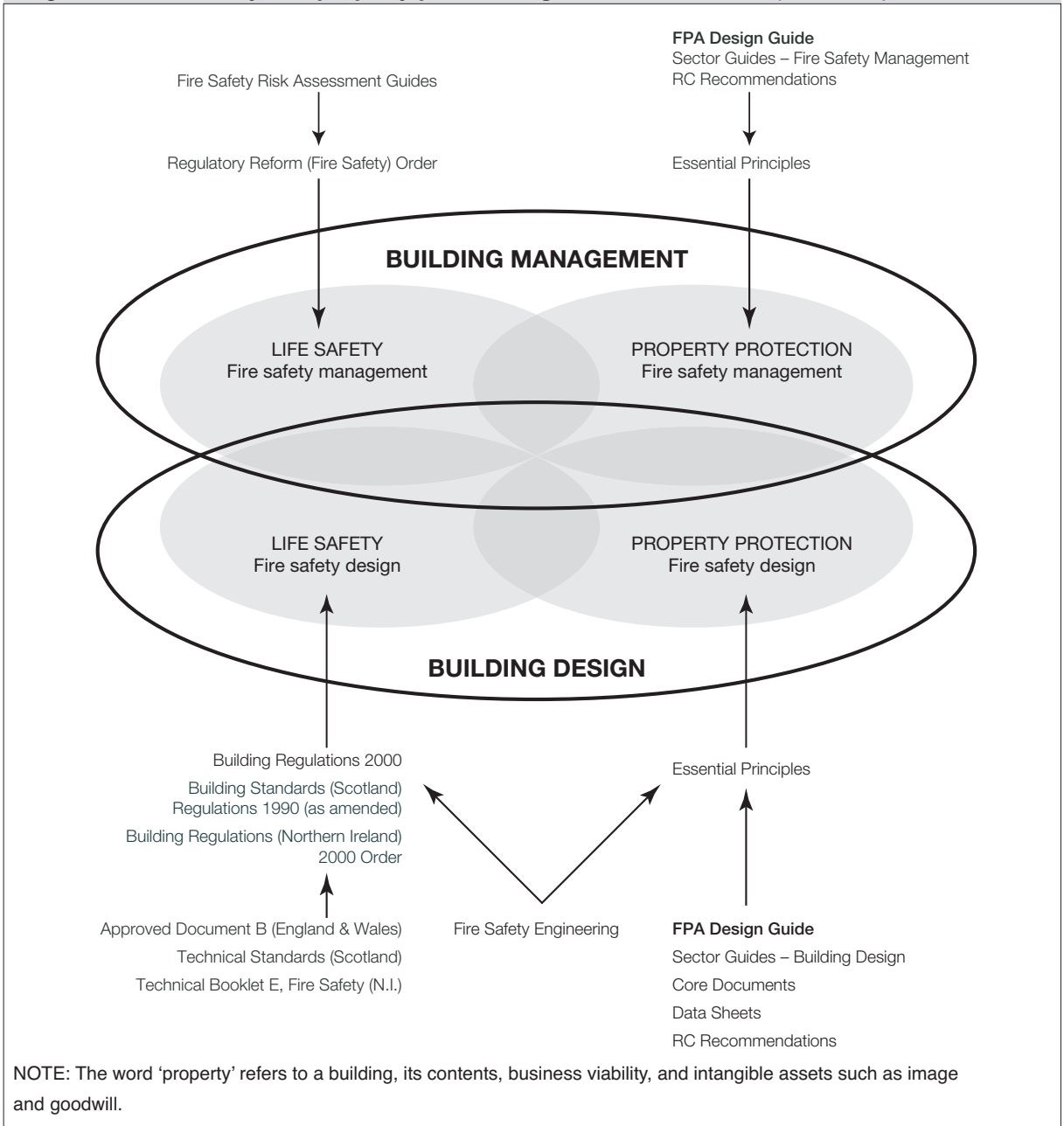
One way of meeting the essential principles in the design of a building is to follow the guidance contained in the *FPA Design guide*.

Fire engineering may be used as an alternative route, but:

- a. it is important that early consultation with insurers during the building design phase is carried out. This should ensure that the most

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Diagram 1.1 Life safety and property protection guidance framework (See 1.2.2)



- b. an appropriate fire engineering standard must be followed in full. BS 7974 is recommended, although CIBSE Guide E is also acceptable;
- c. the essential principles must be achieved to the extent that they would be if the *FPA Design guide* was followed in full (when assessed as a comparative approach); and

- d. the fire engineering must be based on the following fire safety objectives:
 - i. the structure and fabric of the building;
 - ii. the building contents;
 - iii. the ongoing business viability; and
 - iv. the corporate image.

1.1.5 The audience

The purpose of this document is to provide a property protection equivalent of the basic fire safety objectives – the functional requirements –

Section 1

which are contained in national building regulations.

This document is intended for designers and owners of buildings which are (for the most part) industrial and commercial premises, consultants working in the field, construction companies and insurers.

1.2 Essential principles

1.2.1 Scope

This document contains measures which are applicable to all buildings except residential buildings under 20m in height (but does include commercial hotel buildings). It is applicable to new buildings and to major refurbishment and upgrading of existing premises.

1.2.2 Guidance for building designers and fire safety managers

The route to achieving adequate levels of property and business protection is compared with the regulatory system in Diagram 1.1.

Building design involves the mandatory incorporation of life safety-fire safety design, but it should also involve the incorporation of property protection fire safety design. Note that Diagram 1.1 shows that there is a certain amount of overlap between these two areas.

Building management similarly involves the mandatory application of life safety-fire safety legislation and regulation, but it too should incorporate property protection fire safety management to protect property and to prevent business interruption. Again, Diagram 1.1 shows that there is an overlap between these two areas.

Diagram 1.1 also shows that there is overlap between building design and building management. Good fire safety design must take account of the needs of ongoing fire safety management

Life safety-fire safety design is delivered through national building regulations. This may be achieved either by following approved codes of practice, or by way of fire safety engineering.

In exactly the same way, **property protection fire safety design** is delivered through the essential principles described in this document. These may be achieved either by following the *FPA Design guide*, or by way of fire safety engineering.

Life safety-fire safety management is delivered through risk assessed standards via the Regulatory Reform (Fire Safety) Order.

These mandatory standards are supported by guidance in the form of government published documents.

From the perspective of property protection fire safety management, the essential principles still outline the standards which should be achieved. Guidance on achieving property protection fire safety management is presented in sector specific guides, and in RC Recommendations documents.

1.2.3 Status of essential principles document

Whilst the detailed recommendations of the *FPA Design guide* are not mandatory, the essential principles shall be regarded as being of vital importance and need to be considered in detail by building designers, fire safety engineers, consultants, occupiers or building owners.

It is essential that insurers are consulted at the earliest possible stage of design, so that factors that influence the ability of the building owner to secure insurance at the most attractive terms can be identified.

Section 2

ESSENTIAL PRINCIPLES TO BE FOLLOWED FOR ADEQUATE PROPERTY AND BUSINESS PROTECTION

Reaction in the event of fire

Principle 1

The building shall be constructed in such a manner that if a fire starts, the extent of fire and smoke damage will be minimised and confined as close to the source of fire outbreak as is practical/feasible.

This will be deemed to have been satisfied if:

- *the building is subdivided by fire resisting compartment walls and/or floors which have a minimum fire resistance of not less than 90 minutes (see table 2.2 of the LPC Design guide for the fire protection of buildings) and are suitably constructed to prevent the passage of smoke. The number of openings shall be kept as few as practical and they shall be constructed to minimise the passage of heat and the flow of hot and cold smoke;*
- *hidden voids are adequately protected by cavity barriers suitable for the purpose (see 4.5 of LPC Design guide for the fire protection of buildings);*
- *no compartment floor area exceeds the limits given in Table 2.3 of the LPC Design guide for the fire protection of buildings; and*
- *the building is fully sprinkler protected in accordance with the LPC Rules for automatic sprinkler installations.*

Consideration may also be given to the provision of smoke ventilation to assist in fire brigade operation.

All of the above may require implementation, depending on the outcome of the risk assessment, which will include the level of financial exposure, estimated maximum loss (EML), risk of ignition, fire load, level of fire safety management etc.

Principle 2

With the exception of joinery products, the building shall be constructed from building materials/products that will not make a significant contribution to the early stages of a fire or contribute to the spread of fire.

Compliance with this principle will be deemed to have been satisfied if:

- *the materials/products used are non-combustible, Euro-class A1 or A2 or are approved by LPCB to the requirements of the appropriate part of LPS 1181 (see 2.2 of the LPC Design guide for the fire protection of buildings); and*
- *no more than 10% of the construction products used in the construction of the building are combustible.*

Principle 3

Suitable measures will be taken for the prevention of premature structural collapse and excessive deflection.

- *The building structure shall have fire resistance sufficient to prevent collapse or partial collapse and shall ideally exhibit restricted deflections (see 3.2.1 of the LPC Design guide for the fire protection of buildings).*

Principle 4

Consideration should be given at the design stage regarding potential damage from firefighting water and to ensure as far as practical that the effect on the environment of the fire effluent will be minimised.

- *The most efficient way of achieving this is to use products (materials) that do not give off toxic fumes in a fire situation and fully sprinkler the risk, combined with a good standard of fire safety management. Convenient drainage for sprinkler water should be provided if possible.*

Section 2

Workmanship

Principle 5

As a minimum, all fire protection products shall be third party certified to an appropriate product or performance based standard (attestation level 1 for CE marking).

- *Designers or their consultants shall ensure that the scope of certification granted by the certification body is appropriate for the end use application in the specific building, taking due regard of processes, fire load and anticipated fire inception hazards (fire risk assessment).*
- *Where a change in use occurs, the suitability of the fire protection product/system shall be re-assessed by a fire safety engineer having sufficient knowledge of the product(s)/system in question.*
- *A fire protection product CE marked to the appropriate CEN product standard or ETAG standard, whilst demonstrating evidence of its ability to meet the appropriate essential requirements of the CPD (Construction Products Directive), may not necessarily be adequate to meet insurer needs in all cases.*
- *Where possible, all products/systems shall be of a 'robust' nature.*

Principle 6

All fire protection products/systems shall be installed by adequately trained specialist installers.

- *Installers shall be third party certified to install the specific product/system when an appropriate scheme is available (eg FIRAS or LPCB).*

Response to fire

Principle 7

The building shall be fitted with an appropriate automatic fire alarm system.

- *Alarms installed to BS 5839 levels P1 or L1, linked to alarm receiving centre, BS 5839: Part 4: 1988 may be regarded as being suitable.*

Principle 8

The fire protection systems shall be regularly maintained so that they are able to perform their intended function throughout the life of the building.

- *Designers shall ensure that the building owner is provided with all necessary listings of fire protection measures, details of the manufacturer and installer and recommendations for maintenance.*

Fire prevention

Principle 9

There shall be adequate provision to prevent an arson attack.

This may be achieved by an appropriate combination of:

- *controlled access to the external fabric of the building;*
- *perimeter security;*
- *specific provisions being made in the fire safety management system;*
- *security alarms;*
- *security cameras;*
- *external storage being kept well clear of the building; and*
- *the external fabric (including the eaves) being capable of resisting an arson attack.*

Section 2

Principle 10

The building shall be so constructed that fire cannot spread into the premises from an adjoining building or other external fire source.

This principle will be facilitated if:

- *for compartment walls separating adjoining buildings of different occupancy, the fire resistance shall not be less than 120 minutes (see Table 2.2 of the LPC Design guide for the fire protection of buildings);*
- *provision shall be made to house skips etc in enclosures well away from the external fabric of a building (see part 5 of LPC Design guide for the fire protection of buildings); or*
- *the external fabric has adequate fire resistance (see guidance on protected zone in part 5 of LPC Design guide for the fire protection of buildings).*

In relation to separation between buildings, provided that combustibles are kept well away, it is reasonable to follow the recommendations given in documents supporting building regulations.

Fire safety management

Principle 11

The building owner shall ensure an adequate standard of fire safety management throughout the life of the building.

- *Insurers are normally able to provide advice on fire safety measures that are appropriate for the specific risk. Insurance availability and terms may be linked to an adequate standard of fire safety management being maintained, with suitable documented evidence.*
- *Building owners shall therefore maintain documented fire safety management procedures and provide adequate proof that such systems are being complied with on a continuing basis.*

Principle 12

Any fuel burning appliance and services or electrical appliance and services shall be designed, constructed and installed in a manner that reduces their potential as an accidental source of ignition.

Section 3

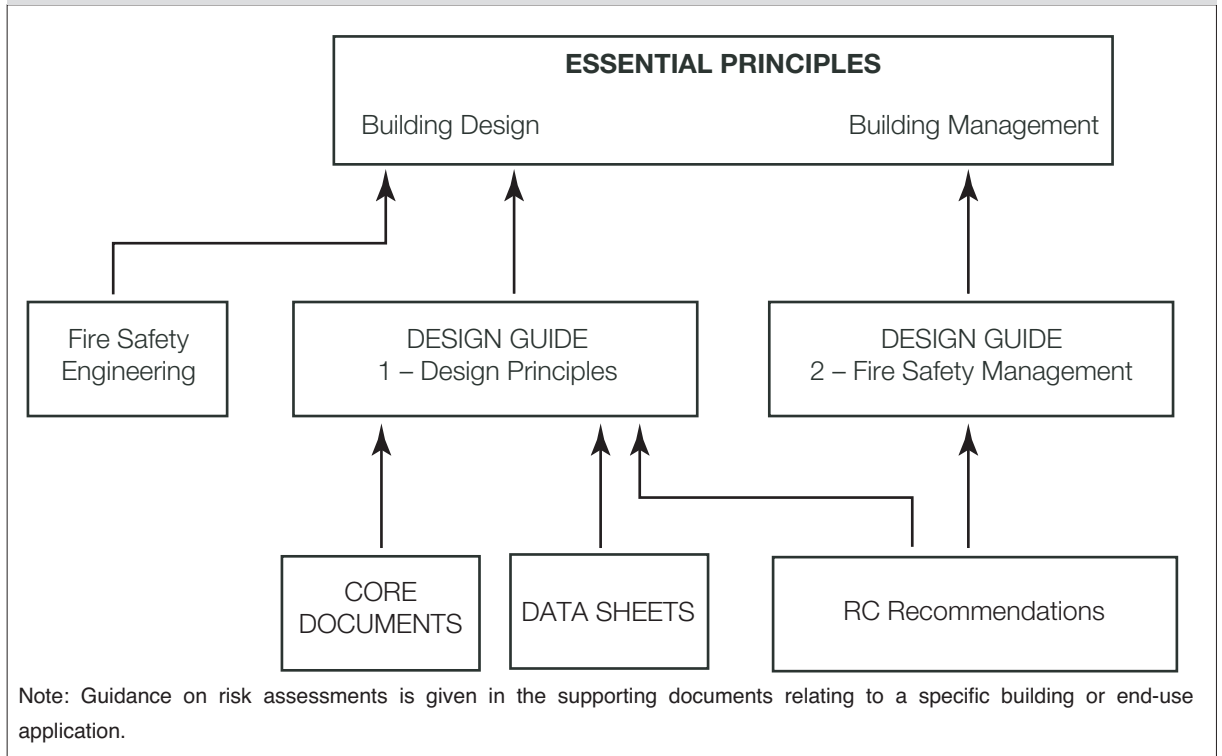
CONCLUSIONS

This document should be read in conjunction with the *FPA Design guide for the fire protection of buildings* and appropriate supporting documents. It outlines the basic principles that all designers and their supporting consultants shall consider during the design process, when they are taking either a prescriptive or fire safety engineering approach (or a combination of both). The principles should be followed for major extensions and upgrades.

APPENDIX

APPENDIX A ESSENTIAL PRINCIPLES AND THE FPA DESIGN GUIDE

Diagram A.1 Essential principles and the *FPA Design Guide*





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