FPA Design guide

for the Fire Protection of Buildings

FOOD PROCESSING FACTORIES 1: DESIGN PRINCIPLES

Fire Protection Association

InFiReS

Insurers' Fire Research Strategy funding scheme

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 Asssociation
Bastille Court
2 Paris Garden
London SE1 8ND

Copies of publications can be purchased from the FPA at that address or by calling 020 7902 5300 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 and better able to cope with the effect of fire in the event that it breaks out.

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 to guard against their becoming accidental sources of ignition.

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The Fire Protection Association
Bastille Court
2 Paris Garden
London SE1 8ND
Tel: 020 7902 5300
Fax: 020 7902 5301
e-mail: fpa@thefpa.co.uk
website: www.thefpa.co.uk

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FPA Design Guide for the Fire Protection of Buildings

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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 the design principles for passive fire safety in food processing factories. It describes measures and makes recommendations which, if adopted, will assist in the design and construction of food factory buildings (or extensions thereto) which are less likely to catch fire. Should fire occur, however, the applied design principles will help minimise fire and smoke damage and thus minimise business interruption.

In addition, this guide may also help in identifying ways to reduce fire risks in existing food factories and/or similar food processing activities. It is recommended that reference is also made to the *Code of Practice for Fire Protection in the Food and Drink Industry* (ref. 1), which will assist in understanding the need to protect the material assets of a food industry premises.

> This document contains a number of references to the *LPC Design Guide for the Fire Protection of Buildings 2000*, which was published by the FPA in 1999. A new Design Guide, a multi-part work (see inside front cover) is in preparation by the FPA and when completed will cover more ground than the original. While the new version is under development, references continue to be made to relevant information in the 2000 version.

The audience

This advice is addressed mainly to those professionals - architects, developers, fire engineers and builders - who need to understand and apply the principles of fire safety in the design and construction of food processing factories. It will also be of value to those who survey and assess the fire safety attributes of such premises on behalf of insurance companies.

Since its approach is based on essential principles it should also be of help to the owners of, and fire safety managers in, food factories.

What kinds of buildings?

The advice contained in this sector guide:

- assumes that a food factory is a single-storey premises; and
- is applicable to both existing buildings and proposed new buildings.

This document does not cover the following types of buildings:

- a stand-alone refrigerated or temperature-controlled storage building;
- a single refrigerated unit not exceeding 250m^3 or not more than 5% of the volume of the food factory building in which it is located.

The design of multi-storey food factories shall comply with recommendations contained in the *LPC Design Guide for the Fire Protection of Buildings 2000* (ref. 2), including those relating to vertical and horizontal compartmentation.

2. RISK ASSESSMENT

A variety of factors will play a part in the specification of the fabric of a food factory building and its internal structures. These include:

- the types of processes to be carried out;
- the nature of, and fire hazards represented by, the equipment and goods in the building, and in particular their likelihood to catch fire;
- the fire load within the building
- the financial exposure.

In food processing factories ('food factories' from here onwards), there are a number of areas, such as:

- cooking areas
- packaging areas
- storage areas
- electrical switchrooms
- plant rooms
- external yards,

which will normally be considered to be of high risk. Fire containment measures shall need to be specified and maintained accordingly in such locations.

Areas used for chilled storage (these may include rooms constructed from sandwich panels) may also be considered as high risk. The insurer's surveyor is likely to inspect such locations very closely and pass verdict on the risk they represent.

Thus, bearing in mind the general and specific fire hazards that may be encountered in food factories, it is necessary to carry out an assessment of the likely hazards so that they are properly understood before embarking upon the design and construction of a food factory.

2.1 Existing buildings

In existing buildings, the replacement of the external fabric (if it is felt to be hazardous) or of the sandwich panels used internally to build envelopes for temperature-controlled environments, may not be practicable. It is important to identify the higher risks and upgrade (if necessary) as quickly as possible to the recommendations given in this document. (See also *Fire Performance of Sandwich Panel Systems*, ref. 3.)

Fire prevention in a building is achieved through a combination of measures, including the passive fire safety recommendations in documents such as this and the installation of appropriate active fire safety systems and equipment. Continuous monitoring of fire safety management procedures, including staff training, is also very important and may well improve the risk before other measures are implemented.

2.2 New factories

For new buildings, the recommendations of this document, subject to the risk assessment, shall be followed. The essentials of the risk assessment are:

- identify the potential fire hazards
- remove or replace hazards where possible
- reduce remaining hazards if possible
- design the building and its equipment, contents and fire protection systems to cope with the fire hazards that remain

The subject of risk assessment will be dealt with in greater depth in the accompanying fire risk management document.

3. FIRE SAFETY MANAGEMENT

3.1 General

There is always a risk that the construction of the building and its internal structures (in particular, in food factories, insulated temperature-controlled enclosures) may contribute to the spread of fire; disproportionate damage may be significantly reduced by maintaining a good standard of fire safety management. This subject is covered in more detail in the fire safety management document that augments these design principles, but the following sections survey topics of particular relevance and may help identify improvements of safety standards in existing buildings.

3.2 Processes and inception hazards

- Food preparation processes, if they include a known fire hazard, shall not be carried out near to any combustible materials. In particular, at no time shall they be within 2.5m of sandwich panels except in circumstances deemed safe under the risk assessment and agreed with the property insurer.
- Modified Atmosphere Packaging (MAP) involves the inclusion of additional oxygen into wrapped meat, for example, and brings with its food packaging benefits a range of associated process hazards (for example, oxygen storage and potential for leakages) which food factory management needs to review with the property insurer.
- Combustible materials shall be kept away from ignition sources.
- Combustible materials stored outside buildings shall not be stored near (within 10m of) structures. See also Arson prevention, 3.6, below.
- Forklift truck battery charging shall be located well away from any identified inception risks and combustible materials and/or construction and preferably outside the building or, if inside, then within a fire-resisting enclosure of not less than 60 minutes' fire resistance or such other duration that shall be agreed with the property insurer.
- Automatic fire suppression systems, appropriate for the process, shall be fitted to all heating and cooking equipment.

3.3 Flues

- Flues used to extract hot gases shall not pass through, in or close to combustible sandwich panels or linings unless adequately protected to prevent the transmission of heat.
- Oil and grease can build up quickly in and around flues which carry the products of combustion away from cooking. Such a build-up is a significant fire hazard and sections of flues may need to be cleaned several times a day, including those parts of flues not directly in the food processing areas. The cleaning intervals shall be determined by reference to the risk assessment.
- The entire length of the internal surfaces of flues shall thus be cleaned to a frequency and extent determined by risk assessment.

BSRIA, with support from the ABI, has produced a document which helps identify fire risk hazards associated with kitchen ventilation (ref. 26).

3.4 Services

Electrical and/or other services are a potential inception risk and a competent and suitably qualified person shall regularly check all equipment on a schedule established under the risk assessment.

Services' pipework/ducting etc have the potential to cause fire safety problems when entering/leaving walls, especially those of structures made from sandwich panels:

- As far as possible, services' penetrations through sandwich panels shall be avoided.
- If this is not possible, any gaps shall be adequately sealed to prevent fire attacking the core. These filled gaps shall be examined at regular intervals and, if defective, made good by a competent specialist contractor. Guidance from the sandwich panel system manufacturer design/installation manual should be followed.
- Electrical cables passing through sandwich panels used in temperature-controlled areas shall be enclosed in an appropriate conduit (for example, PVC rather than metal) to prevent thermal bridging, but a risk assessment shall be undertaken to ensure that this does not increase the fire risk.
- Care shall be taken when installing/locating high temperature electrical fittings such as halogen lamps, with reference being made to the risk assessment.
- Electrical equipment located near sandwich panels shall be examined and tested at least annually per the appropriate Standard (ref. 4).

- Attaching items to sandwich panels shall be avoided as far as practical. Where this is not possible, care shall be taken to ensure that the core is not left exposed or damaged.

3.5 Vehicles

Delivery vehicles can constitute a fire hazard.

- Petrol and diesel vehicles shall never be allowed inside a food factory, but design provision needs to be made for them to come close to the building for unloading via fork lift truck.
- All vehicle parking areas shall be designed to be located well clear of the food factory and, for reasons of security, visiting drivers shall not have free access to the building.

There is a range of recommended loss control measures related to the use of fork lift trucks (see *Recommendations for the use of fork lift trucks*, ref. 5). These include:

- The need for adequately protected entrances, with fire roller shutters, for transit by fork lift trucks.
- Facilities for battery recharging for electrically powered fork lift trucks in a location well away from any identified inception risks and combustible materials and within a fire-resisting enclosure of not less than 60 minutes' fire resistance or such other duration that shall be agreed with the property insurer.

3.6 Arson prevention

A perception of the problems and occurrence of arson is vital for the company fire safety manager, who should be aware that, in industry and commerce, more than 50 per cent of fires are started deliberately, some of them by members of the workforce. The FPA's book, *The Prevention and Control of Arson* (ref. 6) deals fully with the subject and includes a chapter called 'Designing against arson'. It is a major topic to be considered in the risk assessment, particularly if the location of the factory is an area where arson is common. Those designing and building food factories need to be aware of the gravity of the problem and to bear in mind at least the following so that a new factory will be better protected against the prospective arsonist.

- Potential arsonists should be kept at bay by properly organised physical and electronic security measures.
- Features like boundary fences and secure doors and windows have a part to play.
- Factories in the food industry are likely to have large numbers of pallets (plastic and wooden) on the premises. These are favourite targets of the arsonist and provision shall be made for secure storage areas outdoors and not within 10m of the outer walls of the factory building or plant or adjacent premises' buildings or within 2m of the perimeter fence.
- Arsonists exist within the workforce, so provision shall be made to prevent the storage of pallets and other combustible materials within 10m of sandwich panel structures in a food factory.
- Waste materials are attractive to the arsonist and a code of practice for dealing with commercial and industrial waste is included in the FPA's book *Fire Safety and Waste Materials* (ref. 7).

3.7 Maintenance programmes

- All equipment, particularly any that is identified as a potential source of ignition or inception risk, shall be regularly maintained by suitably qualified staff or by competent subcontractors and a maintenance record shall be available for inspection by the insurer or regulatory body. The use of thermal imaging cameras to inspect machinery and equipment for overheating, as part of routine maintenance, can detect problems which other inspection might miss.
- Electrical equipment shall be inspected and maintained by a competent and suitably qualified person working for an appropriately qualified contractor.

(Suitable individual qualifications are, for example, City and Guilds courses 2381 (16th edition IEE Wiring Regulations: BS 7671 and current legislation) or 2391 (Inspection, testing and certification of electrical installations). Maintenance companies should qualify for membership of NICEIC or ECA or (in Scotland) SELECT.) The National Association of Professional Inspectors and Testers (NAPIT) and the Safety Assessment Federation (SAFed) are two UKAS accredited inspection bodies for companies which do not carry out electrical installations/alterations but do perform independent inspection and testing in accordance with the IEE Regulations.

- Hot work processes such as welding are a common cause of fire and shall only be undertaken when no viable alternative method is available. A hot work permit scheme shall be enforced and hot working precautions shall be taken, whether the hot work is being performed by suitably qualified staff or by competent subcontractors. They shall operate in compliance with an appropriate hot work permit scheme (see, for example, *FPA Hot Work Permit Scheme* (ref. 8), and see also sample forms in the Appendix, below).

3.8 Fire-resisting compartmentation

- Where fire-resisting compartmentation is installed, the importance of designing to allow for 'hot state' movement, as outlined in the *LPC Design Guide for the Fire Protection of Buildings 2000* cannot be overemphasised, since it will reduce the possibility of early failure of compartment walls.
- If sandwich panels (see section 4.5) constitute the compartment wall then the panels shall also meet the fire resistance requirements of, for example, a standard such as LPS 1208 (ref. 17) (and see Table 10).
- Compartment walls shall be maintained in good condition. All fittings installed shall be able to maintain the prescribed level of fire resistance
- Any doors or services shall have the same fire resistance (integrity) as the wall (see *LPC Design Guide for the Fire Protection of Buildings 2000).*

3.9 Cavity barriers

- Cavity barriers, particularly those installed within the roof space above temperature controlled areas, shall be regularly checked for any breach that will affect their performance under fire conditions.
- It shall have been proved by test that, if services are to pass through a cavity barrier, the barrier is suitable for the passage of services.

3.10 Roof space and roof void walkways

Much of the plant used in food factories is located high up on specially constructed structures, above and independent of the insulated envelopes below. Conditions of cavity barriers in such areas need regular checking and any damage shall be rectified. It is considered important, in the design of a food factory, and as an aid to inspection, to include walkways at this higher level.

3.11 Refrigeration defrost systems

Electronic defrost systems could pose a potential fire risk. Other systems (e.g. off cycle/reverse cycle/hot gas/saturated discharge vapour) present little or no potential fire risk. However, it is essential to carry out frequent routine maintenance (which shall include annual calibration of thermostat controls) as stipulated by the manufacturer, on all these systems.

3.12 Documentation of fire safety management procedures

Log books or equivalent records shall be maintained to demonstrate to insurers and other bodies that fire safety management procedures, including maintenance routines, are being carried out properly. The *FPA Workplace Fire Safety Log Book* (ref. 9) provides a comprehensive set of record sheets (on paper and on CD-ROM) for the fire safety manager.

3.13 Improving fire risks in existing food factory buildings

The information in the risk assessment and fire safety management sections (above) will assist in identifying some of the areas where attention may be needed. Recommended actions are given below in Tables 1 and 2. These are not exhaustive lists and are intended as examples. The adoption of measures such as shown in Tables 1 and/or 2 may allow a lower risk category to be achieved.

Table 1. Recommended measures for reducing risks in existing food factory buildings - cooking risks.

Item	Action	Remarks
Unprotected cooking risk	Subject to the risk assessment, install suitable automatic extinguishing system.	Check that the system is suitable for the particular cooking risk.
	Ensure that cooking risk is enclosed in a fire-resisting enclosure.	Fire resistance not less than 60 minutes integrity and insulation.

Table 2. Recommended measures for reducing risks in existing food factory buildings.

Item	Action	Remarks
Services passing through sandwich panels	Ensure any gap sealed by suitable method.	For small gaps use intumescent mastic.
	All electrical cables to be enclosed in PVC conduit or trunking.	
Services vulnerable to mechanical damage	Protect by suitable conduit or enclosure.	
Badly installed or maintained electrical equipment	Rectify immediately.	Ensure work carried out by a suitably qualified electrician/engineer.
Cavity barriers	Where not fitted above temperature enclosure, arrange for suitable barriers to be installed if deemed necessary by risk assessment.	Check that system has required fire resistance including insulation appropriate to the risk.
	Damaged barriers to be replaced.	Use specialist installers.
Sandwich panels lacking third-party certification	Subject to the risk assessment, consider replacement or upgrading by applying additional linings that are shown to be capable of preventing the sandwich panels from contributing to the fire growth or disproportionate damage or loss of stability. Expert advice shall be sought from suitably qualified organisations or person.	Some systems exist that allow joint system to be improved to reduce risk of fire spread. Adequate support to sandwich panels vital.

4. DESIGN CONSIDERATIONS

4.1 Basic principles

In general, the larger the area and volume of a building, (1) the greater is the risk to the property and the people within it in the event of fire and (2) the more difficult is the task of finding and fighting the fire. Food factories will contain fire hazards directly related to their particular activities, but it is possible to include in the design of any factory features which will help to control the spread of fire and smoke within such a premises. The following topics are of importance.

Internal space separation

The walls, floors and ceilings used to subdivide buildings shall be designed to withstand fire for the periods required by Table 10.

Compartmentation

This is the principle of the subdivision of a building's volume into smaller, fire-resisting compartments each likely to withstand and contain a fire occurring within it for a specified period of time, the time depending on a variety of factors, including the risks represented by and within particular compartments.

Protection of openings

Openings in compartment walls need to be protected in such a way as to offer resistance to fire (for example, by suitable doors or shutters). Openings in compartment floors for stairways, lifts or escalator shafts need to be protected.

Fire stopping

Wall and ceiling cavities, and openings around service ducts, pipework and conduits, need to be fire-stopped where they pass across or penetrate compartment boundaries and the stopping shall extend for the full thickness of the wall.

Ducts/ducting

Air conditioning and other ducting needs to be provided with fire dampers (see below) where it passes through compartment boundaries, so as to control the spread of fire and smoke.

Fire-resisting ductwork will maintain compartmentation in situations where it is necessary for ducting to pass through compartment walls or floors but where fire resisting dampers are not used. Such ducts shall provide the same fire resistance in terms of integrity (and, if necessary, insulation) as the walls or floors of a compartment.

Fire-resisting ducts are tested for compliance with the requirements of BS 476 (ref. 13): Part 24, *Fire tests on building materials and structures: Method for determination of the fire resistance of ventilation ducts.*

Cooking equipment ductwork shall always be of fire-resisting design (not less than 60 minutes fire resistance). Such ductwork will not contain dampers. See also the start of 5.1.

Fire damper

Such a damper in a duct is designed to close completely as soon as a fire is detected. Its purpose is to maintain compartmentation where an air distribution duct passes through the wall or floor of a compartment and to provide the same fire resistance as required for the wall or floor.

Fire venting

Single-storey buildings and, to an extent, some multi-storey buildings can be provided with a limited degree of fire protection by properly designed and installed roof venting. Such a system, by venting smoke and hot gases, can help limit the spread of fire and smoke and facilitate firefighting. Where a sprinkler system is installed then the venting and sprinkler systems shall be designed so as to be mutually compatible.

Other features

(a) The ability of a food processing factory to perform its function can be impaired by the effect of fire on the building services, including electrical power and light supplies, equipment fuelled by gas and oil, and air conditioning systems.

(b) Heating, lighting and power services can act as sources of fire, which is why service ducting and voids above suspended ceilings and the like need to be protected to limit their capacity to act as a pathway for fire spread.

(c) Internal construction elements (such as temperature-controlled storage rooms) made from sandwich panels with combustible cores have been known to contribute substantially to the fire load within a food factory and have aided rapid fire development. This hazard receives particular attention in this document.

(d) Stored quantities of combustible materials – packaging materials are a good example – will also aid rapid fire spread in the event that fire breaks out.

4.2 Surveying the potential risks: a quantitative assessment

Guidance on: (1) restricting the use of building products that make a contribution to a fire; (2) requirements for fire-resisting compartmentation; and (3) sizes of compartment areas, is given in the *LPC Design Guide for the Fire Protection of Buildings 2000*. What follows is intended for application specifically to food factories and permits a type of quantitative fire risk assessment

Figure 1 plots the steps in carrying out the assessment. Table 3 provides a risk matrix which relates levels of hazards to certain aspects of risk and looks at opportunities for making improvements.

In order to provide for some flexibility in fire performance, the risk-based approach which is employed uses three degrees of risk, low, medium and high.

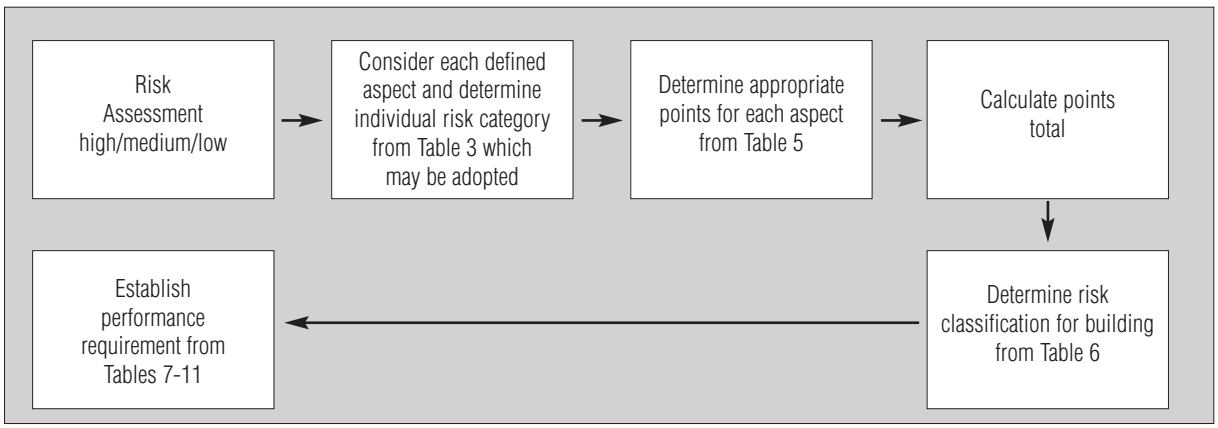


Figure 1 Risk based approach to arrive at appropriate requirements
Note: All aspects listed in Table 3 shall be considered.

4.3 Planning essentials

Table 3 and subsequent tables may be used to undertake a basic, quantitative fire risk assessment, a survey which will help to establish suitable fire performance levels within the food factory which is being planned. It does not provide, however, a definitive solution to the design problem and is not intended to take the place of, or equate to, the kind of thorough risk assessment which a fire surveyor would undertake for an insurer. Nor does it compare with the kind of full fire risk assessment which an employer may be required to make under existing fire legislation.

It is imperative that, from the outset, and in the interest of achieving a factory design in which fire protection is a high priority, the most comprehensive possible consultation takes place among all interested parties, in particular architects, any fire safety engineers involved with the project, the architects' clients, the building owners or occupiers, their fire safety managers, the insurers of the premises, and any risk managers called upon for advice.

Table 3. Risk matrix. Hazards that may be reduced via risk improvements.

	Risk category		
Aspect	**High**	**Medium**	**Low**
Financial exposure	⟷		
Fire brigade response (It is recommended that food factories are fitted with automatic fire detection and alarm systems in the interest of aiding an early response from brigades. See 4.10.)	⟷		
Cooking process	Hot cooking process (see High category in Table 4).	All hot processes protected by a suitable automatic extinguishing system and/or separately compartmented by adequate fire-resisting elements. See Figures 2 and 3.	Steam heating with double thermostatic control (subject to the risk assessment).
Vulnerability to fire spread and disproportionate damage	Construction/ compartmentation standard not in accordance with *LPC Design Guide for the Fire Protection of Buildings 2000*. Inadequate fire protection.	Adequate standard of fire protection following fire risk assessment.	Sprinklered risk (or appropriate equivalent). Fire-resisting compartmentation in accordance with *LPC Design Guide for the Fire Protection of Buildings 2000.*
Standard of fire safety management (Includes good housekeeping; fire drills; arson control measures; electrical safety inspections; general maintenance routines; review of risk assessment.)	No evidence of a suitable standard of fire safety management.	Adequate standard of fire safety management.	Risks controlled by a well-documented fire safety management system. Risk of ignition minimised by appropriate specification of refrigeration equipment.
Fire load	Significant quantity of combustible goods with no active fire protection system. Storage risks not fully sprinklered.	Storage risks fully sprinklered in accordance with LPC *Sprinkler Rules* (ref. 10).	No ignition source or inception risk present. Suitable automatic extinguishing system for racked storage systems. Low fire load. Although this could be applied to areas such as those used for washing vegetables, the risk of malicious ignition of combustible materials cannot be entirely eliminated.
Possibility of arson attack	Poor site security. Uncontrolled waste build-up in yard areas Area has high incidence of arson attack.	Some public access to external fabric but good standard of fire safety management. The 10m rule is enforced.	Secure site. (All physical and electronic systems fully operational and maintained. Perimeter secure. Visitor access strictly controlled.)

Table 4. Types of cooking processes and associated risks levels.

Risk level	Example of type of cooking (equipment)
Light	Boiling operations without sudden bursts of vapour (cooking pots, Bain Maries, steam ovens etc).
Medium	All hot processes protected by a suitable automatic extinguishing system and/or separately compartmented by adequate fire-resisting elements.
High	Conventional frying, doner frying and similar processes emitting a steady flow of vapours (flat top grills, chip fryers, salamanders etc).
	Open flame grilling, flame processes and processes emitting sudden surcharges of hot vapours (charcoal, gas fired open grills, broilers, eye level grills etc).
	Processes whereby oil and grease gets superheated, for example, through the use of catalytic burners and the distance between the catalyst and the grease filters is less then 1m.
	Conveyor belt deep-fat fryer.

Table 5. Points rating from risks identified in Table 4.

The points ratings given in this table are not untypical but note that all property insurers are likely to operate their own points systems and that some variations are to be expected.

	Risk category		
Aspect	**High**	**Medium**	**Low**
Financial exposure	50	30	20
Fire brigade response	30	15	5
Cooking process	80	25	0
Vulnerability to fire spread and disproportionate damage	100	30	15
Standard of fire safety management	50	30	5
Fire load	50	15	5
Possibility of arson attack	100	30	10

Table 6. Risk classification based on total points from Table 5.

	High risk	Medium risk	Low risk
	Greater than 180	180-91	90-60

4.4 Construction materials and fire spread

Section 4.1 drew attention to some of the principal considerations faced by the designer, in terms of building configuration, to restrict the spread of fire and smoke in, for example, a food factory. The purpose of section 4.4 is to emphasise the need to specify materials which will make the minimum contribution to a building's fire load in the event of a fire.

Legislation and guidance

Part B of Schedule 1 to the Building Regulations 2000 (Statutory Instrument 2000, No.2531) (ref. 11) deals with fire safety and paras B2 to B4 of the Schedule deal with fire spread inside and outside a building and the need to employ methods of construction and building materials which will inhibit fire spread. Approved Document B (ref. 12) presents (for England and Wales) possible technical solutions for fire safety problems in various types of buildings to aid compliance with the Building Regulations. Documents similar to Approved Document B exist in respect of building control legislation in Scotland, Northern Ireland and the Republic of Ireland.

Traditional materials

Traditional building elements/materials such as brick, concrete, timber, steel and plaster do not usually make a significant contribution to the fire load of industrial premises compared to the contents of such buildings. British Standard 476: *Fire tests*

on building materials and structures (ref. 13) is cited frequently in Approved Document B and those who supply materials to the construction industry will make reference to this and other Standards with which their products comply. Architects and builders will have established sources of reference, such as online information services, for the specification of materials and products that are appropriate for particular purposes, including fire safety, but if they are in doubt they should consult the insurer for guidance.

Sandwich panels

In recent times there has been much more concern attached to the use of insulated composite panels (sandwich panels), either in the form of: (1) claddings (built-up systems or sandwich panels) used for the external envelope of most types of industrial buildings; or (2) sandwich panels or wall and ceiling lining systems used internally in a building in the construction of internal elements of the building. Section 4.5 concentrates on sandwich panels.

4.5 Insulated composite panels (sandwich panels)

One of the key objectives of this document is to promote the use, in food processing premises, 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 food factories and the following subsections provide general guidance on the choice of sandwich panels which have been tested to a relevant standard (in the example, Loss Prevention Standards 1181: 2003: Part 1 for the external envelopes of buildings, Part 2 for use within buildings) (refs 14 and 15) and also tested by an accredited test laboratory (in the example, FRS tests to Loss Prevention Certification Board standards).

4.5.1 External fabric

In consideration of the use of sandwich panels for either the external walls or the roof of a food factory building which is also subject to building regulations' requirements, Table 7 lists categories of sandwich panels which pass LPS 1181: Part 1 tests and are suitable for particular risk designations.

Table 7. Choice of sandwich panels for the external fabric of food processing factories, with reference to degrees of risk.

	High risk	Medium risk	Low risk
	LPS 1181:Part 1 EXT A30	LPS 1181-3 Grade A	LPS 1181:Part 1 EXT B
	LPS 1181:Part 1 EXT A60 (protected zone applications)		LPS 1181-3 Grade B

Note: LPS 1181:Part 1 is based on LPS 1181-3 (ref. 16) and panels supplied for test are supported by roof purlins and mid-rails.

4.5.2 Temperature controlled areas

Tables 8 and 9 relate to the choice of sandwich panels for the construction of temperature controlled areas within the envelope of a food factory and list categories of panels which comply with LPS 1181: Part 2 tests. The tests for these panels require the panels to be supported from outside (as they would be in practice). Two thermal exposures are provided to represent different risk levels.

Table 8. Choice of sandwich panels for use for constructing temperature controlled areas within food processing factories, with reference to degrees of risk.

	High risk	Medium risk	Low risk
	LPS 1181:Part 2 INT-1	LPS 1181:Part 2 INT-2	LPS 1181:Part 2 INT-3
			LPS 1181-3 Grade B

4.6 Compartmentation using sandwich panels

It is important to follow the detailed advice for compartmentation given in the *LPC Design Guide for the Fire Protection of Buildings 2000*. Loss Prevention Standard 1208, *Fire performance requirements for metal-faced fire-resisting insulated panels* (ref. 17),

Table 9. Fire resistance requirements for sandwich panels used for temperature controlled areas within food processing factories.

Grade of panel	Fire resistance		Wall and ceiling lining test Thermal exposure	
	Integrity (minutes)	Insulation (minutes)	Level	Source
INT-1	60	60	Enhanced	Gas burner
INT-2	30	30	Standard	Timber crib
INT-3	Not applicable	Not applicable	Standard	Timber crib

supports the fire resistance requirements given in the *LPC Design Guide* and the LPCB has approved products to that Standard, subject to the stated field of application. Some such panels are included in the LPCB's *List of approved fire and security products and services* (ref. 18) and may be specified as appropriate.

Table 10 deals with the suitability of sandwich panels for food factory use. Fire resistance levels are based on the European classification adopted in prEN 13501-2 (ref. 19). The tabulated values for fire resistance are for guidance only and may be modified subject to an insurer's risk assessment.

Table 10. Fire resistance durations (in minutes) for compartment walls in food factories.*

Application	Recommended fire resistance durations (minutes)		
	High risk	**Medium risk**	**Low risk**
Compartment wall separating main storage area from food processing area	240 EI	120 EI	Not applicable
Compartment wall separating food preparation area from cold store area	90 EI	60 EI	30 EI
Fire-resisting enclosure around cooking process	90 EI	60 EI	Not applicable
Compartment wall separating chilled area from cold store	Not applicable	60 EI	60 EI
Compartment walls used to reduce compartment floor areas within a food processing area	90 EI	60 EI	60 EI

* E = Integrity
I = Insulation
R = Load-bearing capacity (applicable to load-bearing elements only)

Notes:

- Where any door, window or the passage of services pierces insulated enclosures, the advice given in Part 4 of the *LPC Design Guide for the Fire Protection of Buildings 2000* shall be followed.
- It is important to recognise that such elements, i.e, doors, windows, services, etc. may only have been tested in a conventional masonry or dry-lining construction and not in conjunction with a food safe panel construction. In such circumstances, further assessment and/or testing shall be undertaken by a suitably experienced fire safety engineer.
- The required fire resistance (integrity) given in LPS 1208 shall be maintained when doors, windows and services are installed in or pass through panels designated as requiring fire resistance.
- Where uninsulated doors or windows are fitted, it is important to maintain safe distances from combustible goods so as to prevent ignition from thermal radiation. Guidance is given in Part 4 of the *LPC Design Guide for the Fire Protection of Buildings 2000*.
- Large voids between the roof of the food factory building and the ceiling of the envelopes for temperature controlled environments shall as far as practicable be compartmented by fire barriers/cavity barriers having fire resistance of not less then 30 min (see 2.4.2(k), 4.1.3.5 and 4.5 of the *LPC Design Guide for the Fire Protection of Buildings 2000*).

Some recommended performances for various applications in a food factory are shown in Figure 2. A section through the building is given in Figure 3.

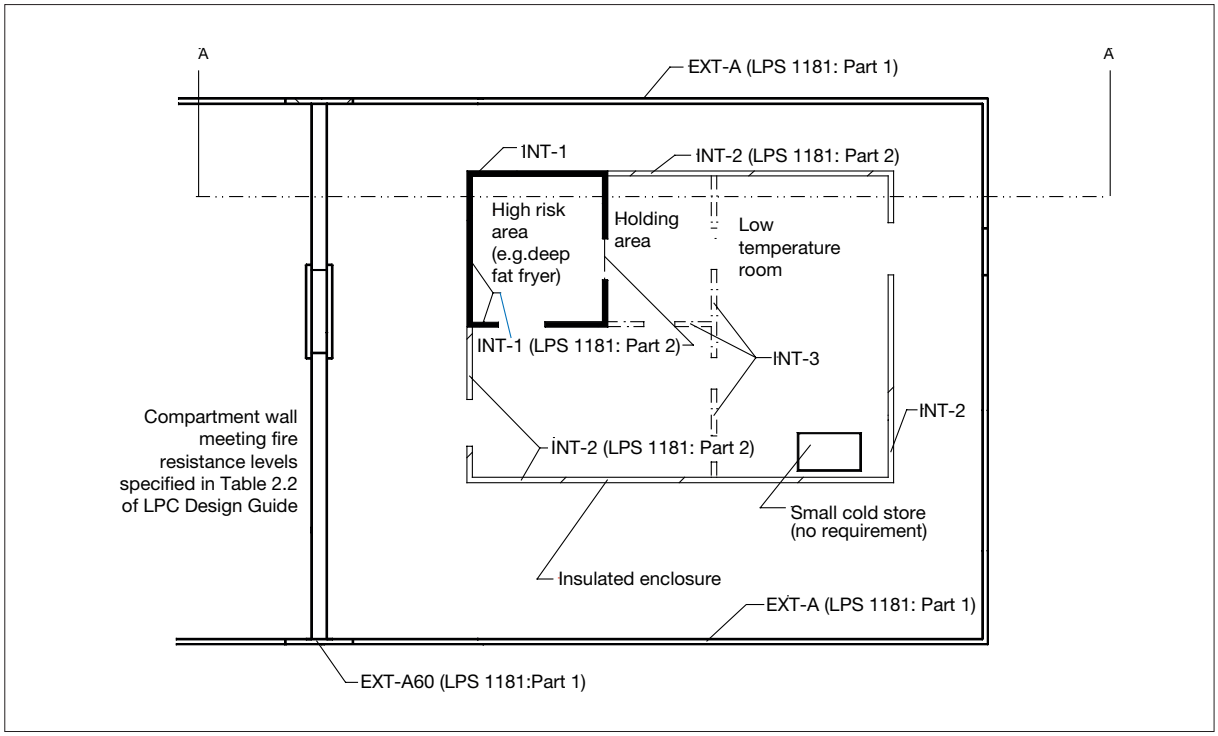


Figure 2. Example of recommended compartment wall performance applied to a food factory.

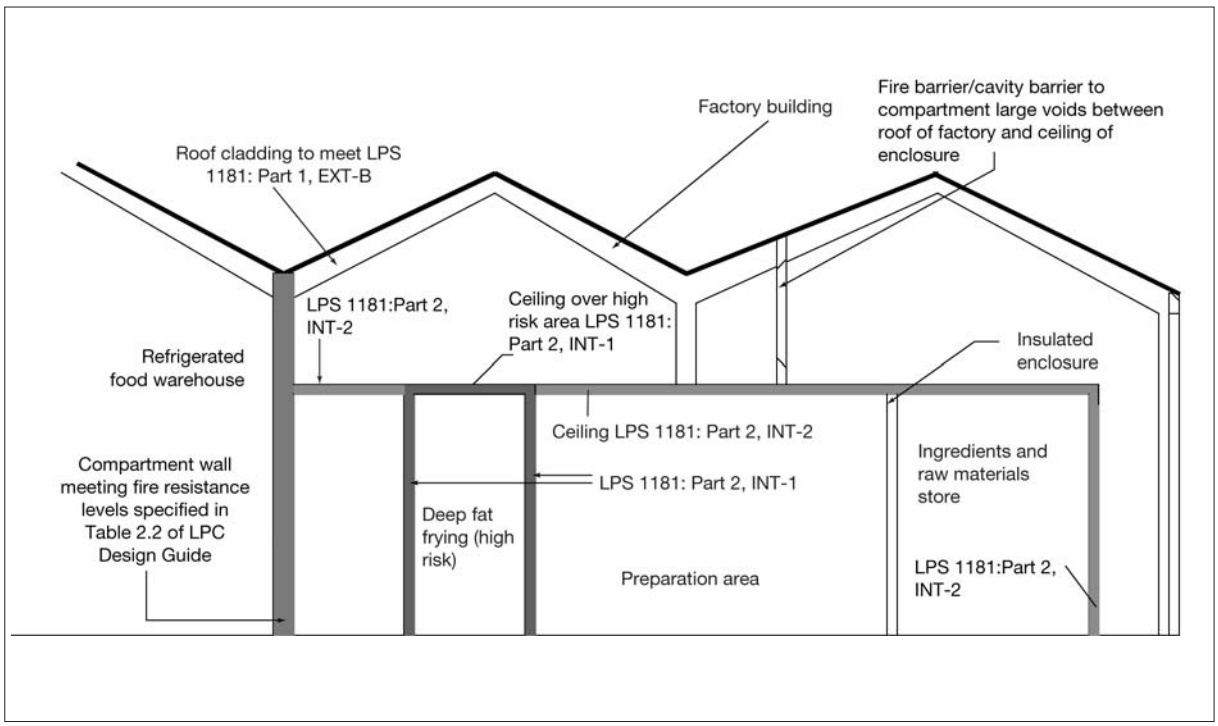


Figure 3. Section through food factory shown in Figure 2.

4.7 Recommended maximum floor areas for compartments

If the anticipated risk within a planned compartment is considered high, it is recommended that the floor area specified shall be less than allowed for in relation to a lower risk. It should be noted, however, that the risk of flashover being reached in a small compartment may be greater than in a large compartment. Table 11 provides examples of recommended maximum floor areas, on the assumption that such areas are enclosed by fire-resisting elements.

Table 11. Recommended maximum floor areas for specific applications in food factories.

Application	Recommended floor areas		
	High risk	**Medium risk**	**Low risk**
Cooking area	150m^2	500m^2	Not applicable
Food processing area not involving hot processes	1000m^2	2000m^2	4000m^2

Notes:

- Recommended floor areas may be increased if a suitable automatic extinguishing system is provided (but this must be agreed by the insurer).
- Not all production areas will need to be enclosed by fire-resisting elements but where fire resistance is a requirement such elements shall at least meet the requirements for fire resistance shown in Table 10.

4.8 Protection of services

Detailed guidance is given in Part 4 of the *LPC Design Guide for the Fire Protection of Buildings 2000.*

Where services pass though designated fire-resisting elements, than the penetration seals/fire stops specified shall provide the same level of fire resistance as the element of construction, in terms of integrity, and if at all possible, insulation.

Even when services pass though partitions and ceilings that are not designated as fire resisting, they shall still be adequately sealed to prevent fire from attacking any combustible core inside sandwich panels. Care shall be taken to ensure that the type of seal specified is appropriate for the specific application.

Apertures cut into panels containing combustible cores for services to pass through shall be protected by a suitable non-combustible lining material

Combustible services such as cables shall be kept well away from hot processes or potential ignition sources or be suitably protected.

Electrical cables shall always be placed in an appropriate and suitable conduit when passing through sandwich panels used in temperature controlled areas.

Some guidance on the selection and specification of suitable sealing systems may be obtained by reference to the Code of Practice of the Intumescent Fire Seals Association (IFSA) (ref. 20).

Where conveyor belts pass through apertures made in walls designated as fire resisting then these need protecting by a suitable fire-resisting conveyor closer. More guidance may be found in the *LPC Design Guide for the Fire Protection of Buildings 2000.*

4.8.1 Third-party certification

In all cases it is necessary to use suitably certificated products (certificated by a nationally accredited, independent, third-party certification body) and such products shall be installed and maintained by an appropriately assessed and qualified, competent contractor.

In the case of the United Kingdom, for example, the United Kingdom Accreditation Service (UKAS) bears responsibility for assessing and accrediting the competence of organisations in a number of related fields, including not only testing but, also, the certification of systems and products.

UKAS maintains a directory of accredited UK test laboratories and also lists such information on its web site, www.ukas.org/testing. By pursuing its 'single search' option and, as examples, the choices 'Construction', 'Fire resistance and protection, reaction to fire' and 'Extinguishers, hydrants and extinguishing systems', the visitor will be presented with a small number of test laboratories with competence in that combination of features.

4.9 Resistance to external fire exposure

A good standard of fire safety management and adequate site security will reduce the possibility of an arson attack or accidental ignition of combustible goods around the site perimeter. Care in the specification and detail design of the external fabric of the

building is an essential factor in improving the risk. Refer to *The Prevention and Control of Arson*, for a wealth of fire safety management advice about arson control (in industrial and commercial premises) which is of value to the developer and architect. See Part 5 of the *LPC Design Guide for the Fire Protection of Buildings 2000* for more information and guidance.

4.10 Active fire protection methods

When fitting fire detection or suppression systems, it is necessary to use suitably certificated components (certificated by a nationally accredited, independent, third-party certification body) and such systems shall be installed and maintained by an appropriately assessed and qualified, competent contractors. See 4.8.1.

Detection

Early detection of a fire is essential and, as a minimum, all areas shall be fitted with an appropriate fire alarm installation, which incorporates a monitored remote signalling system to a permanently manned alarm receiving centre (ARC).

The detection and alarm system itself shall comply with BS 5839: *Fire detection and alarm systems for buildings:* Part 1: *Code of practice for system design, installation, commissioning and maintenance:* 2002 (ref. 21). The installation shall be installed in accordance with category P1 as defined within BS 5839: Part 1: 2002 unless a risk evaluation has been undertaken and agreed with the property insurer to reduce the level of coverage within the protected building. Alarm receiving centre elements of an alarm system shall be installed in accordance with an approved standard, for example, BS 5979: 2000: *Code of practice for remote centres receiving signals from security systems* (ref. 22), or an equivalent.

Suppression

All hot processes that involve a flame or high surface temperatures shall be protected by a suitable automatic extinguishing system approved by the property insurers. Such automatic systems may use gaseous, water mist, foam or wet chemical extinguishants.

If sprinkler protection is a design requirement then always consult with the insurers of the property as early as possible in the design process. Different areas of a food factory may place different demands on a sprinkler system.

Where sprinklers are installed to protect food factories, particularly when the construction does not conform to the recommendations in this document, care is required in locating the sprinkler heads to give maximum coverage of walls, ceilings and roof/ceiling and other voids. Sprinkler systems shall comply with BS EN 12845: 2003: *Fixed firefighting systems – automatic sprinkler installations – design, installation and maintenance* (ref. 23) and, where appropriate, with the additional requirements contained in the Technical Bulletins in the *LPC Rules for Automatic Sprinkler Installations incorporating BS EN 12845* (ref. 10).

4.11 Smoke control

Smoke control systems (equipment such as dampers in ductwork) can facilitate the escape of occupants and can assist firefighters if fire breaks out. Some passive systems will significantly reduce the amount of smoke that can spread into other compartments by providing effective sealing of gaps around doors and service penetrations.

With the current development of European design and product standards and appropriate test requirements, more use of such systems may be made in the future.

4.12 Measures against arson

Arson prevention has already been discussed as a fire safety management topic (3.6, above). As well as acting to minimise its incidence, by good building security and by measures such as security fences, CCTV and controlled access, attention shall also be given to design features of sites and building features to repel the arsonist. It is important, for example, that doors and windows cannot be breached and that all relevant aspects of design, even so far as eliminating places outside a main building that might be used as hiding places by the arsonist, are taken into consideration.

5. SPECIFIC CONSTRUCTIONAL CONSIDERATIONS

5.1 Flues/ducts passing through sandwich panels

For the purposes of this document: the route by which the products of combustion are removed from cooking equipment or appliances involving the generation or application of heat is a flue; the route by which contaminated air is removed is a duct (or ducting or ductwork).

Extract ducts should be as short as practicable and the design should comply with any local byelaws. The duct should preferably pass directly to the open and should not pass through, or be contained within, floor or ceiling voids, or roof spaces where exposed combustible materials are present.

It is important to ensure that fire cannot spread via flues which convey hot gases away from cooking equipment/areas.

Single-walled flues shall never be used. Insulated double skin flues shall always be specified. Even these shall never come into direct contact with combustible materials and the instructions provided by the manufacturers of the insulated flues shall be followed. The basic principle is shown below:

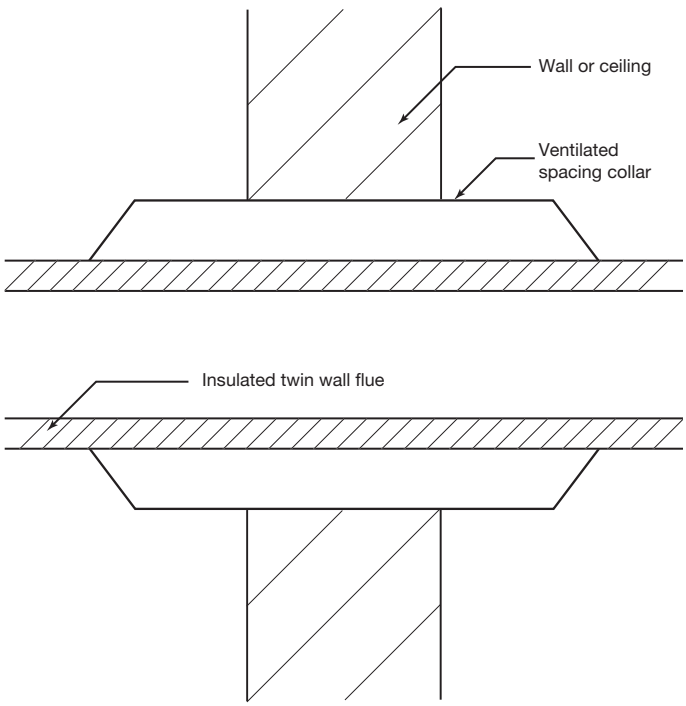
See also the IACSC guide (ref. 24, page 85) for a suitable design.

Design of flues shall be such as to allow for cleaning and removal of oil and grease deposits. Joints between each section of the flue shall be tight to prevent escape of grease-laden vapours. Designers shall ensure adequate space is provided for access for cleaning.

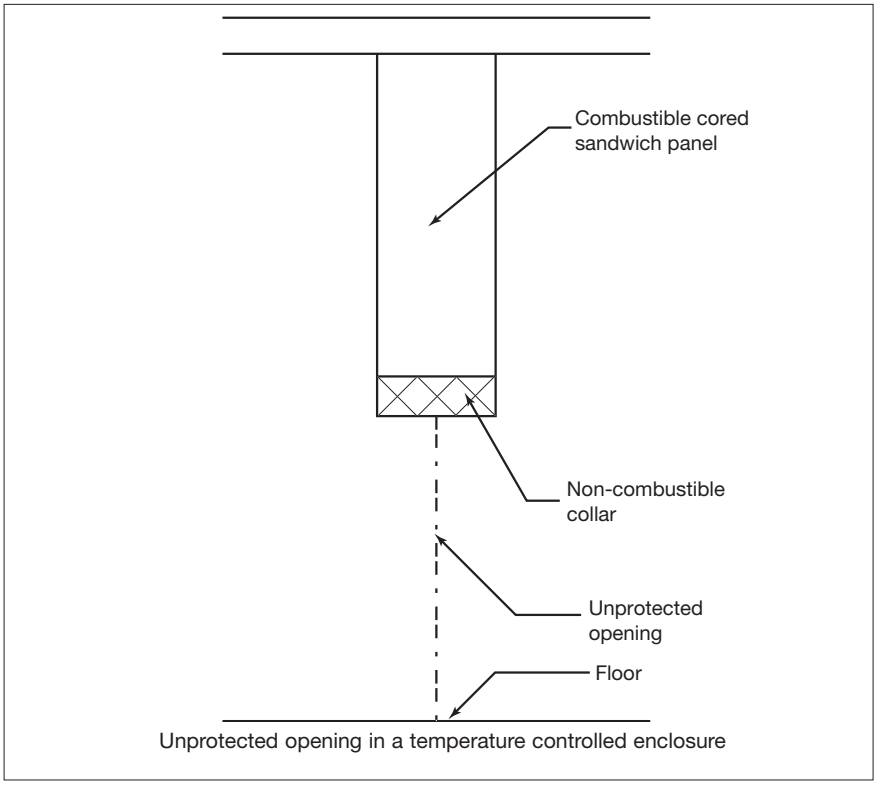
Note: It seems a sound recommendation that one flue shall serve only one item of cooking equipment. No flue or duct shall connect to flues or ducts serving another piece of cooking equipment.

5.2 Unprotected openings

An unprotected opening shall not be allowed in any wall that is designated to be fire resisting. In other applications, a non-combustible collar or other product that can be shown to be suitable, intended to prevent fire spreading to any combustible core, shall surround the opening.



Principle of flue/duct from cooking area passing through insulated enclosure



Unprotected opening in a temperature controlled enclosure

A wall approved to LPS 1208 which contains a non-fire-resisting door can no longer be regarded as being fire resisting unless the door is protected by a secondary fire-rated shutter.

5.3 Grease filters

These shall be tested and approved to a standard like LPS 1263: *Requirements for the LPCB Approval and Listing of the Fire Performance of Kitchen Extract Systems:* Part 1 (ref. 25) (this uses two established test standards). This standard provides for a range of risks and cooking processes.

5.4 Location of cooking equipment

Cooking equipment shall be located within a fire-protected zone conforming to LPS 1181: Part 1 : INT. Subject to the risk assessment, walls insulated with combustible materials shall not be nearer than 2.5m to cooking areas.

Risk level	Example of type of cooking (equipment)
Light	Boiling operations without sudden bursts of vapour (cooking pots, Bain Maries, steam ovens etc)
Medium	All hot processes protected by a suitable automatic extinguishing system and/or separately compartmented by adequate fire resisting elements.
High	Conventional frying, doner frying and similar processes emitting a steady flow of vapours (flat top grills, chip fryers, salamanders etc) Open flame grilling, flame processes and processes emitting sudden surcharges of hot vapours (charcoal, gas fired open grills, broilers, eye level grills etc) Processes whereby oil and grease gets superheated, for example, through the use of catalytic burners and the distance between the catalyst and the grease filters is less then 1m. Conveyor belt deep-fat fryer

6 DEFINITIONS

For the purposes of this document, these definitions apply:

Active fire safety

The combination of fire protection measures fitted in a premises which react in the event of fire. For example, automatic fire detection and alarm systems, automatic sprinkler systems, local application suppression systems.

Automatic fire suppression system

A system of fixed fire protective apparatus in a building which will automatically detect a fire, cause an alarm to sound and discharge an extinguishant to suppress (or extinguish) the fire.

Built-up systems

The external fabric of a building assembled on site from individual components and materials.

Cavity barrier

A construction which maintains fire separation in roof spaces or floor voids where such voids run past compartment walls or which subdivides voids above or below floors or within walls to restrict unseen spread of fire and/or smoke.

Chilled storage area

Part of food factory that is enclosed by an insulated envelope where the temperature is maintained typically in the range 0°-10°C.

Cladding

An external, non-loadbearing covering to a structure.

Cold storage area

Part of a food factory that is enclosed by an insulated envelope where the temperature is maintained typically at -25°C.

Compartment floor area

The recommended, fire-resisting floor area that will be bounded by fire-resisting elements such as compartment walls. Such elements will provide adequate fire resistance for the specific risk.

Compartment wall

A loadbearing or non-loadbearing vertical fire-resisting separating element of construction designed to contain a fire within an area for a predetermined duration 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.

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.

Composite panel

This term covers sandwich panels (see below) but also includes non-metal faced insulated panels.

Cooking area

This will include any area of a food factory using any hot process involving the cooking of food or food sources.

Cooking equipment

This will include deep fat fryers, baking ovens, roasting ovens, grills, boilers, heat sources for steamers, blenders, brat pans (big heated pans) and smoking cabinets, and all flues, ductworks, grease filters, hoods and canopies associated with this equipment. (See Table 4.)

Double thermostatic control

On a deep fat fryer, a separate high-temperature limit control, of a non-self-resetting type, to shut off the heat source should the temperature of the fat exceed 230°C. This high temperature limit device shall not operate the same gas valve as any automatic temperature control.

Ductwork (or Duct)

A lightweight sheet metal tube, of circular or rectangular cross section (sometimes of large area), for conveying air (sometimes contaminated air) in ventilating or air-conditioning systems.

Electrical switchroom

A room which houses a building's basic electrical controls and related electrical equipment.

External envelope

The external elements of the structure of a building together with the brickwork, concrete, glass or other constructional panels that combine to form the building's external faces.

External fire exposure

The propensity of a building to ignite by exposure to fire from adjacent buildings, vehicles or material.

Financial exposure

The likely aggregate cost which a business might incur if its premises and/or contents are damaged by fire and the business is interrupted for any period of time.

Fire brigade response

The time which elapses between the report of a fire to the brigade and the arrival of the first appliance at the fire.

Fire damper

Strictly, a fire-resisting damper, a movable flap within a duct which will operate, in the event of fire, to seal the duct and prevent the passage a fire through it, for a specified period of time.

Fire hazard

Anything that might contribute to the risk of fire breaking out. Thus, fire hazards include, among other things, combustible and flammable materials and all potential or actual sources of ignition.

Fire load

The aggregate of the combustible contents of a building, including its furnishings, equipment and stored products but excluding the fabric of the building.

Fire resistance

The ability of an element of building construction to withstand the effects of fire for a specified period of time without losing its structural integrity or insulation or suffering reduction in any fire-separating capacity it may possess.

Fire stopping

A sealing material which has been designed for use to make good any gaps (for example, around pipework passing through a wall) such that the required fire resistance of the element of building construction to which it is applied (for example, the wall) maintains its required fire resistance. Also used to mean the application of such sealing material.

Fire venting

The conveyance of smoke and hot gases out of a building in a controlled manner via smoke vents and outlets, a method of improving visibility within a burning building which can help both occupants and firefighters.

Flue

For the purposes of this document, a flue is the route by which the products of combustion are removed from cooking equipment or appliances involving the generation or application of heat.

Food preparation area

An area of food preparation but excluding the higher risk, cooking areas.

Good housekeeping

In relation to fire prevention, the maintenance of a combination of fire safety measures which are calculated to keep a premises safe from the risk of fire breaking out. Such measures will embrace: cleanliness and tidiness; regular clearance of wastes; safe storage of flammable and combustible materials; maintenance of buildings and machinery in safe conditions; supervision of subcontractors; inspection of heating and lighting; the prohibition of smoking in inappropriate areas.

Grease filter

A filter in a flue or canopy which conveys gases from cooking equipment; such filters require regular inspection and replacement/cleaning.

Hazard see Fire hazard

Hot state movement

The movement which is induced when fire weakens an element of a building and causes, for example, a wall to deflect and/or collapse as a result.

Hot work permit scheme

A scheme under which hot work is monitored and supervised by the issuing and checking of permits issued to workers, to ensure that all such processes (for example, welding, plumbing, cutting, tar boiling etc) are carried out under specified conditions and in the safest possible manner as a precaution against fire.

Ignition hazard

Any cause that leads to ignition of material, goods or process.

Insulated composite panel

See Composite panel *and* Sandwich panel.

Lining or Lining system

Non-structural boards/sheets/slabs of material used to line or insulate internal surfaces of a building envelope.

Packaging area

The area(s) within a food processing factory where packaging processes are carried out and where packing machinery and some stocks of packaging materials are housed.

Passive fire safety

The planning of a building in such a manner that its layout, structural design and constructional elements all contribute to its fire resistance.

Plant room

A room which houses equipment dedicated (usually) to one or more of the building's services, such as air conditioning or lifts.

Risk

Risk is the chance that damage or injury will arise from one of the hazards that exist within a premises. *See* Fire hazard.

Sandwich panel

A building product consisting of two metal faces positioned on either side of a core of a thermally insulating material, these three elements being firmly bonded together so that they act compositely when under load (for example, wind load, access load etc).

Services

Services within a building are generally composed of the systems and equipment that deliver water, gas and electricity in the form in which they are needed to different parts of the premises.

Stand-alone building

A building not directly attached to another building.

Storage area

Storage area may be part of a building which is designed as a warehouse or a compartment or compartments or a nominated floor area within a building used for the storage of goods.

Third-party certification

The testing, approval and certification of suitability of a product or system or company for a specified purpose, such certification being bestowed by an accredited, independent, third-party certification body.

Unprotected opening

Any opening in a wall or ceiling which is not protected by a fire-resisting element.

7 REFERENCES

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2. *LPC Design Guide for the Fire Protection of Buildings 2000,* 1999, Fire Protection Association.
3. ABI Technical Briefing, *Fire Performance of Sandwich Panel Systems,* May 2003, Association of British Insurers.
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6. Adair Lewis, *The Prevention and Control of Arson,* 1999, Fire Protection Association.
7. Adair Lewis, *Fire Safety and Waste Materials,* 2003, Fire Protection Association.
8. Michael Gale and Howard Passey (eds), *FPA Hot Work Permit Scheme,* with CD-ROM which includes electronic versions of hot work permit and checklist, 2002, Fire Protection Association.
9. *FPA Workplace Fire Safety Log Book,* 2003, Fire Protection Association.
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11. Building Regulations 2000, Satutory Instrument 2000, No. 2531, HMSO.
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15. LPS 1181: *Series of Fire Growth Tests for LPCB Approval and Listing of Construction Product Systems:* Part 2: 2003: *Requirements and Tests for Wall and Ceiling Lining Systems for Use as Internal Constructions in Buildings,* BRE Certification.
16. LPS 1181: *Series of Fire Growth Tests for LPCB Approval and Listing of Construction Product Systems:* Part 3: this has been replaced by LPS 1181: Parts 1 and 2, see refs 14 and 15.
17. LPS 1208: *Fire Performance Requirements for Metal-faced Fire-resisting Insulated Panels,* BRE Certification.
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19. EAPFP, prEN 13501-2, Reaction to Fire classification document, European Association for Passive Fire Protection.
20. IFSA, Code of Practice, *Sealing Apertures and Service Penetrations to Maintain Fire Resistance,* 1999, Intumescent Fire Seals Association.
21. BS 5839: *Fire Detection and Alarm Systems for Buildings:* Part 1: 2002: *Code of Practice for System Design, Installation, Commissioning and Maintenance,* British Standards Institution.
22. BS 5979: 2000: *Code of Practice for Remote Centres Receiving Signals from Security Systems,* British Standards Institution.
23. BS EN 12845: 2003: *Fixed Firefighting Systems – Automatic Sprinkler Installations – Design, Installation and Maintenance,* British Standards Institution.
24. IACSC, *Design, Construction, Specification and Fire Management of Insulated Envelopes for Temperature Controlled Environments,* International Association of Cold Storage Contractors (European Division).
25. LPS 1263: Part 1: *Requirements for the LPCB Approval and Listing of the Fire Performance of Kitchen Extract Systems,* BRE Certification.
26. BSRIA, *Fire Risk Assessment: Catering Extract Ventilation,* 2002.

8 OTHER SOURCES OF REFERENCE

- Some useful checklists are provided in the *Fire Risk Minimisation Guidance* of the Fire Industry Panels Group.
- CSFD, *The RFIC Guide to the Management and Control of Fire Risks in Temperature Controlled Structures of the Refrigerated Food Industry,* Cold Storage and Distribution Federation.

APPENDIX: HOT WORK FORMS

HOT WORK PERMIT CHECKLIST

The following checks should be carried out prior to commencing Hot Work.
The person carrying out these checks should consider each of the following statements. The box alongside each statement needs to contain a Y (Yes) be left blank (if the matter is not relevant) if a Hot Work Permit is to be issued. An N (No) may result in refusal of a permit.

THIS CHECKLIST RELATES TO PERMIT NO. _____

GENERAL

Wherever practicable the use of Hot Work should be avoided and a safer way employed.

If you cannot comply with the following points, do not go ahead with the hot work.

FIRE PROTECTION

Where sprinklers are installed they are operative. ☐

Where an automatic fire detection system has been installed, it will be kept operative. Only the zone where the Hot Work is being carried out will be isolated for the period whilst the Hot Work is in progress. ☐

A trained person not directly involved with the work will provide a continuous fire watch during the period of Hot Work. Following completion of each period of the work, the fire watch will continue for at least 30 minutes, with further checks at regular intervals, up to 60 minutes after completion, to ensure that the working area and all adjacent areas, including the floors below and above, and areas on the other sides of walls, screens and partitions and above false ceilings are free of smouldering materials and flames. ☐

At least two suitable extinguishers or a hose reel are immediately available. The personnel undertaking the work and providing the fire watch are trained in their use. ☐

Personnel involved with the work and providing the fire watch are familiar with the means of escape and method of raising the alarm/calling the fire brigade. ☐

PRECAUTIONS WITHIN 10 METRES (MINIMUM) OF THE WORK

Combustible materials have been cleared from the area. Where materials cannot be removed, protection has been provided by non-combustible or purpose-made blankets, drapes or screens. ☐

Flammable liquids have been removed from the area. ☐

Floors have been swept clean. ☐

Combustible floors have been covered with overlapping sheets of non-combustible material or wetted and liberally covered with sand. All openings and gaps (combustible floors or otherwise) are adequately covered. ☐

Protection (non-combustible or purpose-made blankets, drapes or screens) has been provided for:

- walls, partitions and ceilings of combustible construction or surface finish ☐
- all holes and other openings in walls, partitions and ceilings through which sparks could pass. ☐

Where work is being carried out on building panels, an assessment has been made of insulating or other materials behind or forming the core of the panels. ☐

Combustible materials have been moved away from the far side of walls or partitions where heat could be conducted, especially where these incorporate metal. ☐

Enclosed equipment (tanks, containers, dust collectors etc.) has been emptied and tested, or is known to be free of flammable concentrations of vapour or dust. ☐

EQUIPMENT

Equipment for Hot Work has been checked and found to be in good repair. ☐

Gas cylinders have been properly secured. ☐

HOT WORK PERMIT

A copy of the completed permit should be retained/saved for auditing purposes.

ISSUING COMPANY _____ PERMIT NO. _____

A PROPOSAL *(To be completed by the person responsible for carrying out the work)*

BUILDING _____

EXACT LOCATION OF PROPOSED WORK

_____

NATURE OF WORK TO BE UNDERTAKEN

_____

I understand the scope of work and precautions to be undertaken.

SIGNED _____ BLOCK CAPITALS _____

DATE _____ POSITION _____

CONTRACTOR COMPANY (WHERE APPLICABLE) _____

B AGREEMENT *(To be completed by the Company Safety Officer or other nominated person (the 'Issuer of the Permit'))*

This Hot Work Permit is issued subject to the following conditions:

ISSUE OF PERMIT: DATE _____ TIME _____

EXPIRY OF PERMIT*: DATE _____ TIME _____

*It is not desirable to issue permits for protracted periods. Fresh permits should be issued where, for example, work extends from morning to afternoon.

A FINAL CHECK OF THE WORK AREA SHALL BE MADE, NOT BEFORE (TIME) _____

ADDITIONAL CONDITIONS REQUIRED:

_____

The above location has been examined and the precautions listed on the attached checklist have been complied with. I have carried out a risk assessment and consider that there is no reasonably practical alternative to doing the job using Hot Work. I have been provided with evidence of appropriate Public Liability Insurance.

SIGNED _____ BLOCK CAPITALS _____

DATE _____ POSITION _____

C FOLLOWING COMPLETION OF WORK *(To be completed by member of staff or contractor responsible for the work. The permit should then be returned to the Issuer)*

The work area and all adjacent areas to which sparks and heat might have spread (such as floors below and above, and areas on other sides of walls) have been inspected and found to be free of smouldering materials and flames. ☐

Paint strippings, stub ends of welding rods and other hot waste materials have been removed and disposed of safely. ☐

All equipment, including gas cylinders, has been removed to a safe area. ☐

TIME INSPECTION COMPLETED _____ *(This must be at least 60 minutes after work was completed)*

SIGNED ☐ _____ NAME OF SIGNATORY _____

DATE _____ POSITION _____

CONTRACTOR (WHERE APPLICABLE) _____

D SIGN OFF BY ISSUER OF PERMIT

The Hot Work has been completed. Any zone of the fire alarm system that was isolated has been fully reinstated.

SIGNED ☐ _____ NAME OF SIGNATORY _____

DATE _____

FPA Design guide

for the Fire Protection of Buildings

FOOD PROCESSING FACTORIES 1:

DESIGN PRINCIPLES

FPA
Fire Protection Association

InFiReS
Insurers' Fire Research Strategy funding scheme