

# Loss Prevention Standards

## Fire Compartmentation

### Introduction

Fire compartmentation is an essential part of an effective fire safety design of a building. The primary objective of fire compartmentation or passive fire protection is to prevent a building from collapse and/or to contain the spread of fire, heat and smoke to the compartment of fire origin for a set period of time. Compartmentation is achieved by the provision of a fire resistant building frame, and the subdivision of the building into fire compartments using fire resisting materials and assemblies, specifically designed and tested for their resilience against fire.

The benefits of compartmentation are:

- Reduction in risk to the building occupants, and providing adequate means of escape, by slowing the spread of fire, heat and smoke, protecting the building structure and hopefully preventing early building collapse.
- Subdivision of the building into manageable areas of risk.
- Containing the fire size and spread which will assist in fire fighting operations.
- Minimising the heat, smoke, acid gases and water damage to the building and contents, together with the resultant disruption caused to the business.

Compartmentation principles will vary according to whether compartmentation is between:

- Common walls of different adjoining buildings/areas.
- Walls and floors within an individual building divided into separate parts and/or occupancies.
- Construction around places of special hazard or operational areas which are critical to the organisation.

Additional considerations include the fire load/occupancy and size of the building; insured values of the building/contents; sensitive nature of the occupancy; importance and value of the business; height of the building (top storey); provision of automatic sprinkler systems, etc. which could control a fire or slow its spread.

In the UK, the Building Regulations detail the legal requirements covering the construction and extension of buildings, although this focuses primarily on life safety and means of escape. This should always be the absolute minimum standard provided although it is not discussed within this document. However, it is important to recognise that this can be inadequate in satisfying the needs of property owners, businesses and insurers in the protection of assets, and ensuring business resilience. It is therefore important that additional measures are considered which may include:

- Increasing the fire resistance rating of a compartment.
- Reducing fire compartment size or increasing the number of fire compartments.
- Providing additional fire compartmentation specifically for high valued or sensitive assets, or for key production equipment or processes.

- Providing additional fire compartmentation specifically for equipment or stock susceptible to the effects of fire or its by-products, e.g. smoke damage to a multi-storey building, food or pharmaceutical risk.
- Providing automatic sprinkler or automatic fire suppression protection.
- Providing appropriate heat and smoke venting systems.

## Fire Resistance

Fire resistance is the ability of the materials of construction such as walls, beams and columns, floors and doors etc. to resist the effects of fire in one or more ways, for a period of time. There are three primary elements each dependent on the purpose of the compartment within the building:

- **Structural resistance:** the ability of the material to resist structural collapse.
- **Integrity:** the ability to resist the passage of fire, hot gases and smoke, etc.
- **Insulation:** the ability to resist conduction of heat.

It may be that all three elements are necessary, for example, a structural floor may require all three elements; a steel frame may require structural resistance; and a compartment wall within a building may require integrity and insulation.

## Compartmentation

When designing a new building or making alterations to an existing building, as well as when changing the occupancy or operations, full consideration should be given to the effects of fire, heat and smoke spread. Each fire compartment must be treated as a fire resistant sealed box with no gaps or openings through which heat or smoke can traverse.

Effectively installed fire compartmentation will:

- Increase the fire resistance of a structure.
- Provide physical resistance against flames.
- Provide insulation against heat conduction to adjacent areas.
- Limit the effects of smoke/acid gas/fire water/condensation contamination to other areas of the building.

## Fire Compartmentation Elements

The main elements for consideration to provide adequate compartmentation include:

- Fire protection of structural framework.
- Fire resistant walls.
- Fire resistant floors.
- Fire and smoke doors, shutters, dampers etc.
- Fire resistant glazing.
- Provision of fire stopping to penetrating services, both around and within the penetrations.
- The protected zone.
- Smoke/draft curtains.

Fire resistance can be significantly compromised by any weaknesses or omissions of the above elements. Particular care needs to be taken where mechanical and electrical services etc. breach compartments, and where there are junctions within fire resisting compartments and openings. Openings and service penetrations through fire compartment walls and floors should be kept to a minimum. This includes ventilations systems; ductwork; utilities; cables; piping systems; drains/waste; service risers; conducting solid elements (e.g. metal beam) traversing a compartment wall or floor, etc.

**Note:** Special attention should be paid to any floor or ceiling voids directly adjacent to a fire compartment wall.

## Structural Framework

This typically can be steel but may also be other materials such as reinforced concrete or timber. As steel buckles at relatively low temperatures (loses mechanical integrity at around 565°C) resulting in the possibility of early building collapse, it may be essential to protect a steel frame with suitable fire resistant coatings or materials.

## Walls

These may separate different adjoining buildings or be walls within an individual building divided into separate parts and/or occupancies, or be around a special or specific hazard. A compartment wall may be loadbearing, non-loadbearing or could be considered free standing, and it must maintain the fire integrity and insulation for a specified duration. They should be constructed of materials which are sufficiently robust to resist damage.

Depending on the exposure the wall may need to be parapetted vertically extending above a roof, or horizontally extending beyond or within a perpendicular wall.

## Floors

These may separate different horizontal areas within an individual building divided into separate parts and/or occupancies or around a special hazard. A compartment floor must maintain the structural fire resistance, fire integrity and insulation of the floor for a specified duration.

## Fire Doors and Shutters

Doors, shutters and dampers installed within fire compartment walls must have a fire resistance rating for both insulation and integrity, commensurate with the rating of the fire compartment wall.

**Note:** All devices kept normally open should be automatically closing based on actuation of a form of automatic fire detection. This actuation device and mechanism should be based on the risk and appropriate fire signature. Ideally this should be by the site automatic fire alarm and also from actuation manually by the manual break glass alarm system.

See the Aviva Loss Prevention Standard: *Fire Doors, Fire Shutters and Fire Dampers* for further guidance.

## Fire Resistant Glazing

Fire resistant glazing and framing installed within fire compartment walls must have a fire resistance rating for both insulation and integrity, commensurate with the rating of the fire compartment wall.

## Provision of Fire Stopping to Penetrating Services

Services may include such items as ducting, electrical cabling, gas and water pipes, etc. Again, the fire stopping fire resistance should be consistent with the fire compartment wall, which may be achieved by the use of fire dampers, fire resistant ductwork and fire resistant enclosures. However, more often used are approved fire stopping products such as mineral fibre batts, intumescent pillows, fire resistant sealants, mortars, plugs, pipe closures etc., where there are openings or gaps created externally or internally to the penetration. Fire-rated, certified/approved foam products forming part of a fire barrier should only be used in small linear gaps, and are not suitable for larger openings in fire compartment walls.

## The Protected Zone

The purpose of the protected zone is to prevent fire from bypassing the compartment wall at a junction with the building's external wall, roof, and/or compartment floor in multi-storey buildings. 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 or roof, and typically applies where there are lightweight roof, wall or window claddings. Fitting of mineral board or other fire resistant materials helps prevent fire leaping from one compartment to another.

## Smoke or Draft Curtains

These are designed to help prevent heat and smoke spreading at high level from one area to another. They may be rigid barriers or a heat resistant fabric, fixed to the ceiling or roof deck. They can be located permanently into position, or be manually or automatically operated. Typically, a smoke curtain has a 'drop' from a ceiling or roof of a metre or two, but does not reach the floor.

## Installation and Maintenance

It is important to ensure that when planning new buildings, alterations or changes that the materials used for fire compartmentation are suitable for the stated purpose. Reference should be made to the Building Regulations and/or fire test reports as appropriate. In addition, all passive fire protection systems, products and installers should be selected who are approved or listed by internationally recognised certification schemes.

It is also advisable to consult with your insurers and other interested parties.

When a building is constructed or completed, details of the building and fire compartmentation, including plan layouts etc. should be retained for future reference and maintenance purposes. The fire compartmentation should be formally recorded, as should any subsequent alterations including doors, glazing, services, etc.

It is essential to have a documented maintenance programme for all elements of fire compartmentation, and this may take the form of regular visual examinations through to more formal inspection and testing, which should be undertaken by a competent person, i.e. someone who has the required level of knowledge, experience and training to carry out the required duties. A thorough audit and test, where appropriate, should be completed formally at least annually, and more regularly where there are issues, damage or changes taking place.

Where damage or deterioration has occurred to any elements of the fire compartmentation, due to accidental damage, wear and tear, or through the actions of own maintenance or third party contractors during alteration works or installation of new services etc. such defects should be repaired as a matter of urgency. This should be considered as a Fire Protection System Impairment.

## Aviva Recommended Fire Compartmentation

The following are Aviva’s recommended fire compartmentation fire resistance ratings between occupancies. For property insurance purposes Aviva does not recognise 30 minute fire rated barriers. These are in place essentially for life safety to assist with safe personnel evacuation. In a fire scenario, by the time the public fire brigade are contacted, respond, complete their risk assessments, set up and start actually the fighting fire, 30 minutes could have easily passed. In addition, if everyone is evacuated from the building, their manual fire fighting efforts will be undertaken largely from outside the property and concentrated on exposure management.

IT, server, control room to surrounding areas	At least 1 hour, depending on risk up to 2 hours
Kitchen/cooking facilities to surrounding areas	At least 1 hour, depending on risk up to 2 hours
Utility and plant rooms to surrounding areas	At least 1 hour, depending on risk up to 2 hours
Offices to warehouse	At least 2 hours, depending on risk up to 4 hours
Offices to production	At least 2 hours, depending on risk up to 4 hours
Production to warehouse	At least 2 hours, depending on risk up to 4 hours

**Note:** As mentioned earlier, doors, shutters and dampers installed within fire compartment walls must have a fire resistance rating for both insulation and integrity, commensurate with the rating of the fire compartment wall.

The fire resistance rating within a particular occupancy to subdivide say a multi-storey office; a large manufacturing area/multiple production lines; a large warehouse, should be based on the exposure but not less than the minimum recommended above.

For food processing risks refer to Table 10 – Fire resistance duration (in minutes) for compartment walls in food factories - within the following publication:

[FPA Design Guide for the Fire Protection of Buildings FOOD PROCESSING FACTORIES 1: DESIGN PRINCIPLES](#)

## Summary

Based on formal fire risk assessments for property and business needs, a properly designed and joined up fire compartmentation strategy, consistent with the building occupancy and installed fire protections, and at a minimum meeting any building regulatory requirements, will help prevent or minimise the loss due to the effects of fire, heat and smoke. Appropriately installed and maintained fire compartmentation forms an essential part of the fire risk management strategy and will add an immense value to any site.

## Checklist

A generic Fire Compartmentation Checklist is presented in Appendix 1 which can be tailored to your own organisation.

## Additional Information

- [Approved Document B: Fire Safety \(Volume 2 - Buildings other than dwelling houses\) Incorporating Insurer's Requirements for Property Protection](#)
- Insurer Resources: [FPA Design Guide for the Fire Protection of Buildings – Core Document Compartmentation](#)
- Insurer Resources: [FPA Design Guide The Fire Protection of Buildings – Core Document – Protection of Openings and Service Penetrations from Fire](#)
- Insurer Resources: [FPA Design Guide for the Fire Protection of Buildings – Protected Zone](#)
- [FPA Passive Fire Protection Handbook](#)
- [Passive Fire Protection Federation](#)
- [Details of LPCB approved installers and products](#)
- Aviva Loss Prevention Standard: *Smoke Contamination*

Further risk management information can be obtained from [Aviva Risk Management Solutions](#)

### Please Note

*This document contains general information and guidance and is not and should not be relied on as specific advice. The document may not cover every risk, exposure or hazard that may arise and Aviva recommend that you obtain specific advice relevant to the circumstances. AVIVA accepts no responsibility or liability towards any person who may rely upon this document.*

## Appendix 1 – Fire Compartmentation Checklist

<b>Location</b>	
<b>Date</b>	
<b>Completed by (name and signature)</b>	

	<b>Fire Compartmentation Checklist</b>	<b>Y/N</b>	<b>Comments</b>
1.	Has a formal fire risk assessment been completed that considers property damage and business impact?		
2.	Is the fire compartmentation and use of fire doors consistent with the needs of the site? <ul style="list-style-type: none"> <li>• Life safety?</li> <li>• Property values?</li> <li>• Business impact/interruption?</li> <li>• Smoke sensitivity?</li> </ul>		
3.	Are there accurate fire compartmentation wall/floor drawings for the site? Including: <ul style="list-style-type: none"> <li>• Materials of construction?</li> <li>• Fire resistance in minutes?</li> <li>• Structural resistance: ability of the material to resist structural collapse?</li> <li>• Integrity: ability to resist the passage of fire, hot gases and smoke?</li> <li>• Insulation: ability to resist conduction of heat?</li> </ul>		
4.	Are all the following identified on the fire compartmentation drawings: <ul style="list-style-type: none"> <li>• Ventilation systems?</li> <li>• Extraction systems?</li> <li>• Service risers?</li> <li>• Cable tray runs?</li> <li>• Utility runs?</li> <li>• Pipe runs?</li> <li>• Drainage and waste systems?</li> <li>• Floor and ceiling voids?</li> <li>• Fire/smoke doors?</li> <li>• Fire/smoke dampers?</li> <li>• Fire/smoke shutters?</li> <li>• Intumescent devices?</li> <li>• Draft/smoke curtains?</li> <li>• Heat and smoke vents?</li> </ul>		

	Fire Compartmentation Checklist Contd.	Y/N	Comments
5.	Are all fire and smoke doors, shutters and dampers formally listed with a unique identifier?		
6.	Are all penetrations through fire compartments sealed with appropriately approved/listed fire stopping materials?		
7.	<p>Are formal and documented fire compartment inspections and checks completed by a competent individual?</p> <ul style="list-style-type: none"> <li>• Weekly?</li> <li>• Monthly?</li> <li>• Quarterly?</li> </ul> <p>Are issues raised tracked through to completion?</p> <p>Is the return frequency of these inspections based on issues found?</p>		
8.	Are formal annual fire compartment audits completed by a competent individual?		
9.	Is a formal fire compartment audit completed by a competent person following any changes/projects?		
10.	Are ceiling and floor voids included in the fire compartment inspections and audits?		
11.	<p>Are any of the fire walls parapetted?</p> <p>If so are these areas considered as part of the annual fire compartment audits?</p>		
12.	<p>Is there any damage, deterioration, wear and tear or breaches to the fire protection of the structural framework?</p> <p>If so what remedial works are planned?</p>		
13.	<p>Is there any intumescent paint to any structural steelwork?</p> <ul style="list-style-type: none"> <li>• Is this included in the fire compartmentation audits?</li> <li>• Does this need reapplication?</li> <li>• Is this near to the end of its effective life?</li> </ul>		

	Fire Compartmentation Checklist Contd.	Y/N	Comments
14.	Is there damage, deterioration, wear and tear or breaches to the fire resistant walls?  If so what remedial works are planned?		
15.	Is there damage, deterioration, wear and tear or breaches to fire resistant floors?  If so what remedial works are planned?		
16.	Is there damage, deterioration, wear and tear or breaches to fire doors and shutters, including fixings and framework?  If so what remedial works are planned?		
17.	Are all normally open fire doors, shutters and dampers reviewed by a competent person to check they automatically close with an appropriate interlock to an automatic fire detection system?		
18.	Are all normally open fire doors, shutters and dampers closed when the premises are vacated/at the end of the working day?		
19.	Are all fire door, damper and shutter closure devices visually and formally checked periodically by a competent person?		
20.	Are the automatic closure actuation elements of every normally open fire door, damper and shutter trip tested on an annual basis?		
21.	Are any fire doors propped open at any time, e.g. using wedges etc.?		
22.	Is there damage, deterioration, wear and tear or breaches to the fire resistant glazing, including fixings and framework?  If so what remedial works are planned?		
23.	Is there damage, deterioration, wear and tear or breaches to the fire stopping to penetrating services such as air handling equipment, electrical services, piping breaches, etc.?  If so what remedial works are planned?		

	Fire Compartmentation Checklist Contd.	Y/N	Comments
24.	<p>Are there any fire dampers within ducting?</p> <p>If so are they securely fixed, inspected, maintained and tested?</p>		
25.	<p>Is there damage, deterioration, wear and tear or breaches to the protected zone?</p> <p>If so what remedial works are planned?</p>		
26.	<p>Is there damage, deterioration, wear and tear or breaches to any smoke/draft curtains?</p> <p>If so what remedial works are planned?</p>		
27.	<p>Are any smoke/draft curtains automatically operated and if so are they maintained and tested by competent individuals?</p>		
28.	<p>Are there any heat and smoke vents?</p> <ul style="list-style-type: none"> <li>• Are these automatically actuated?</li> <li>• Are these in sprinkler protected areas? If 'yes' do they only open via manual actuation?</li> <li>• Are they maintained and tested?</li> </ul>		
29.	<p>As part of any regular fire alarm test, are all automatically interlocked operating devices, e.g. doors, dampers, vents, etc. verified as operating as intended?</p>		
30.	<p>After any regular fire alarm test are all devices verified as being returned to their 'normal' position, e.g. heat and smoke vents not left open etc.?</p>		
31.	<p>Is the building ventilation interlocked to immediately shut down upon actuation of the fire alarm system?</p> <p>N.B. Smoke contamination can be exacerbated if the ventilation is allowed to continue.</p> <p><i>See Aviva Loss Prevention Standard on Smoke Contamination.</i></p>		
32.	<p>Are any flammable or combustible liquids used in buildings that if released could pass beneath a closed fire door?</p> <p>If 'yes', are appropriate measures taken to prevent this and maintain the fire compartmentation strategy?</p>		

	Fire Compartmentation Checklist Contd.	Y/N	Comments
33.	Is fire compartmentation considered as part of the Management of Change process?		
34.	Are method statements obtained for own staff and contractors who undertake work which could damage or breach the fire compartmentation?		
35.	Where work has damaged or breached the fire compartmentation is the repair work and its time frame clearly specified?		
36.	Are only approved and accredited contractors and products used for any new or compartmentation projects or repairs to compartmentation?		
37.	After any change or work on site is the fire compartmentation integrity formally signed off as being consistent with the fire compartmentation drawings or risk assessments?		
38.	Additional comments:		

