

# Compartmentation principles and fire stopping installation in buildings

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Fire Safety, BRE Global



## Introduction

- Compartmentation principles
- Fire Stopping installation
  - Cavity barriers
  - Penetration seals
  - Examples
- Fire doors

## Compartmentation principles

### Requirement

#### Internal fire spread (structure)

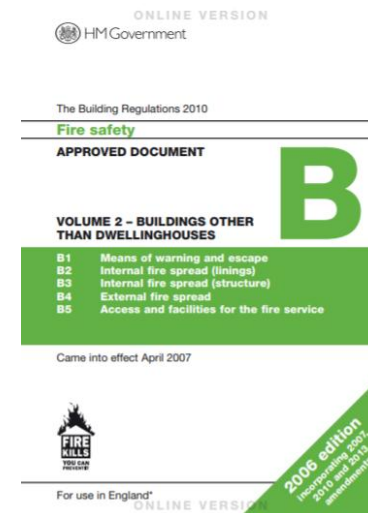
**B3.** (1) The building shall be designed and constructed so that, in the event of fire, its stability will be maintained for a reasonable period.

(2) A wall common to two or more buildings shall be designed and constructed so that it adequately resists the spread of fire between those buildings. For the purposes of this sub-paragraph a house in a terrace and a semi-detached house are each to be treated as a separate building.

(3) Where reasonably necessary to inhibit the spread of fire within the building, measures shall be taken, to an extent appropriate to the size and intended use of the building, comprising either or both of the following –

- (a) sub-division of the building with fire-resisting construction;
- (b) installation of suitable automatic fire suppression systems.

(4) The building shall be designed and constructed so that the unseen spread of fire and smoke within concealed spaces in its structure and fabric is inhibited.

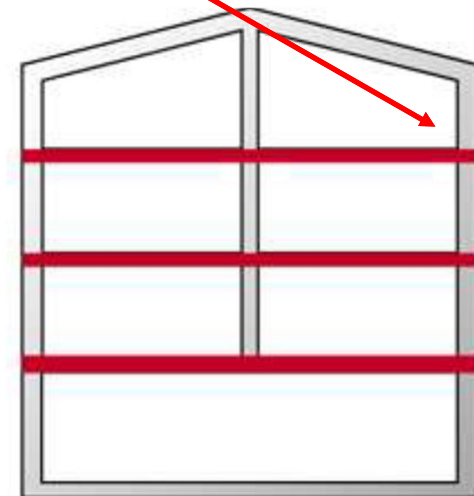
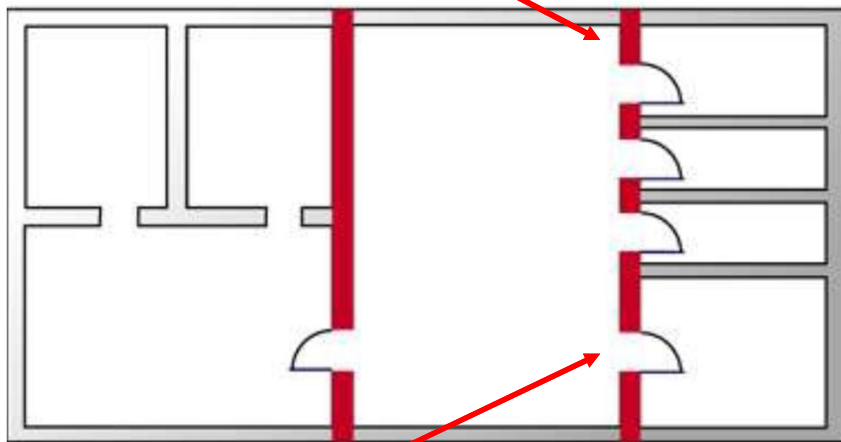


## Compartmentation principles

- Is achieved by dividing the *building* into a series of fire *compartments* which will form a barrier to the products of combustion, smoke, heat and toxic gases.

Compartment walls

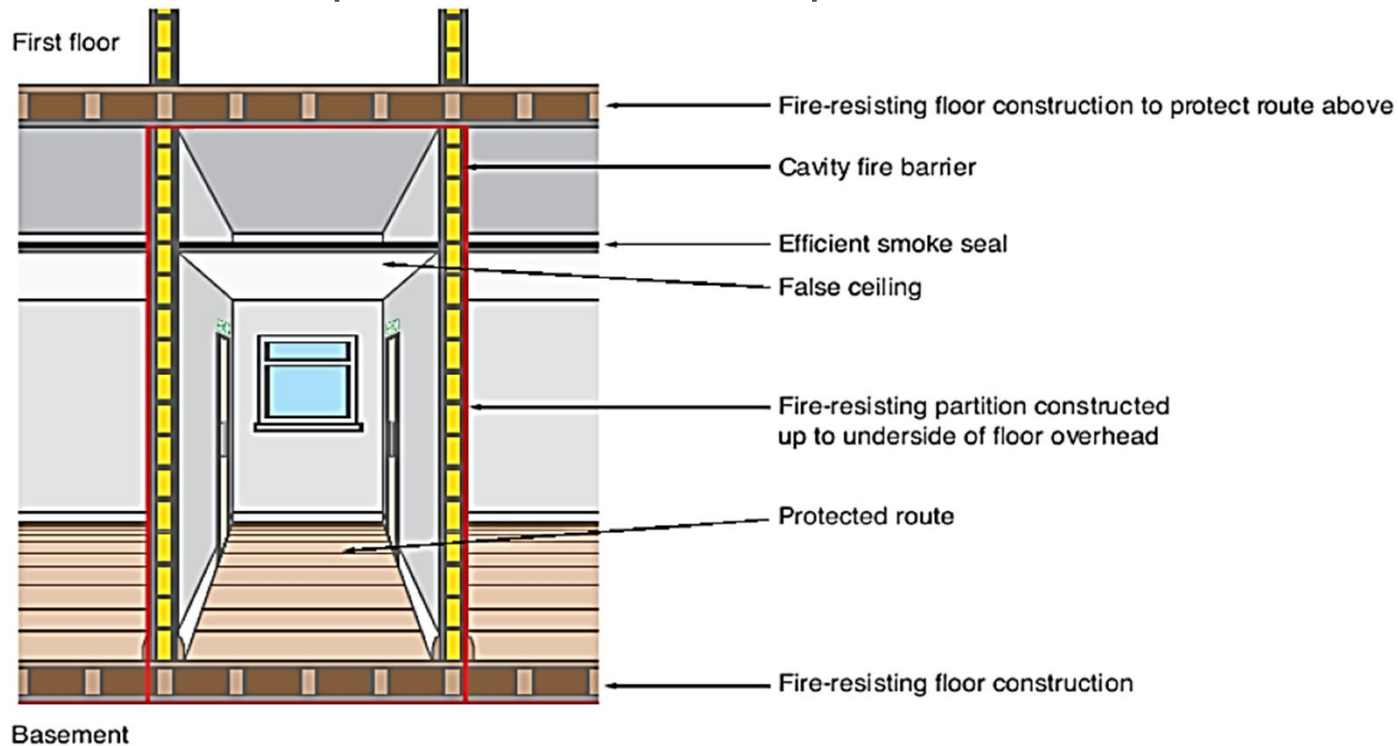
Compartment floors



Fire doors

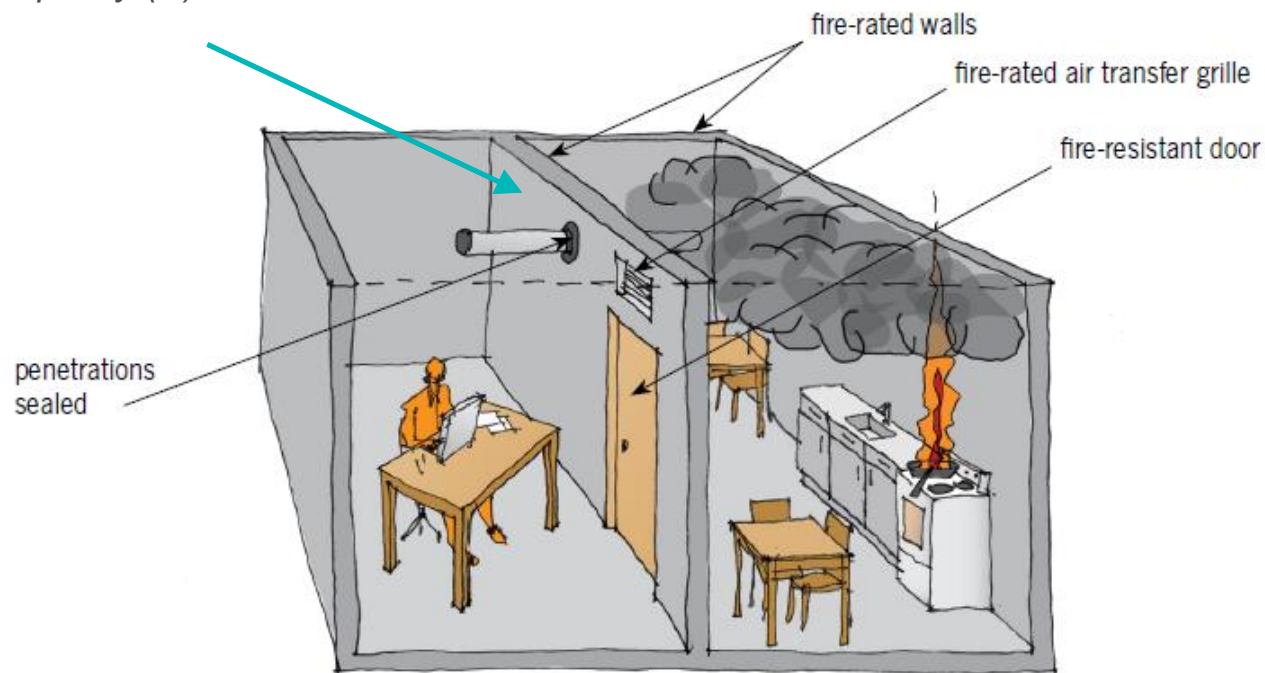
## Compartmentation principles

- Prevent the spread of fire and smoke
- Subdivide buildings into manageable areas of risk
- Provide adequate means of escape



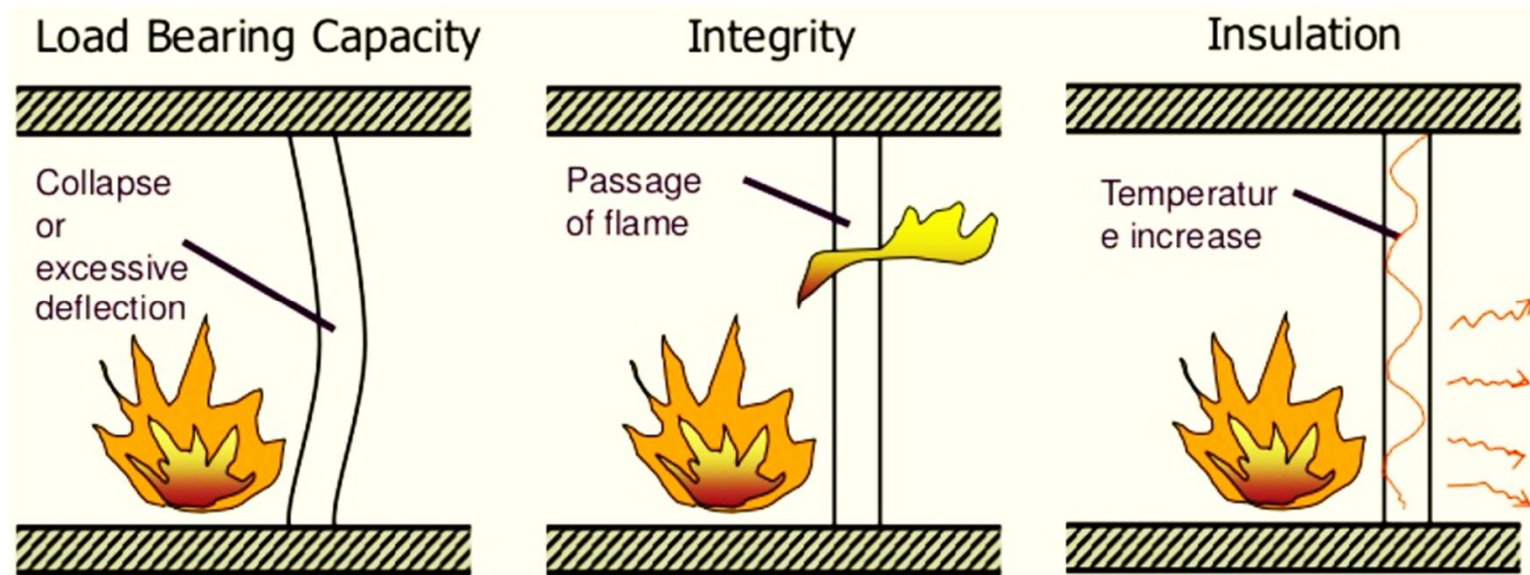
## Compartmentation principles

- Prevent the spread of fire and smoke
  - Subdivide buildings into manageable areas of risk
  - Provide adequate means of escape
- *Loadbearing capacity (R)*
  - *Integrity (E)*
  - *Insulation (I)*



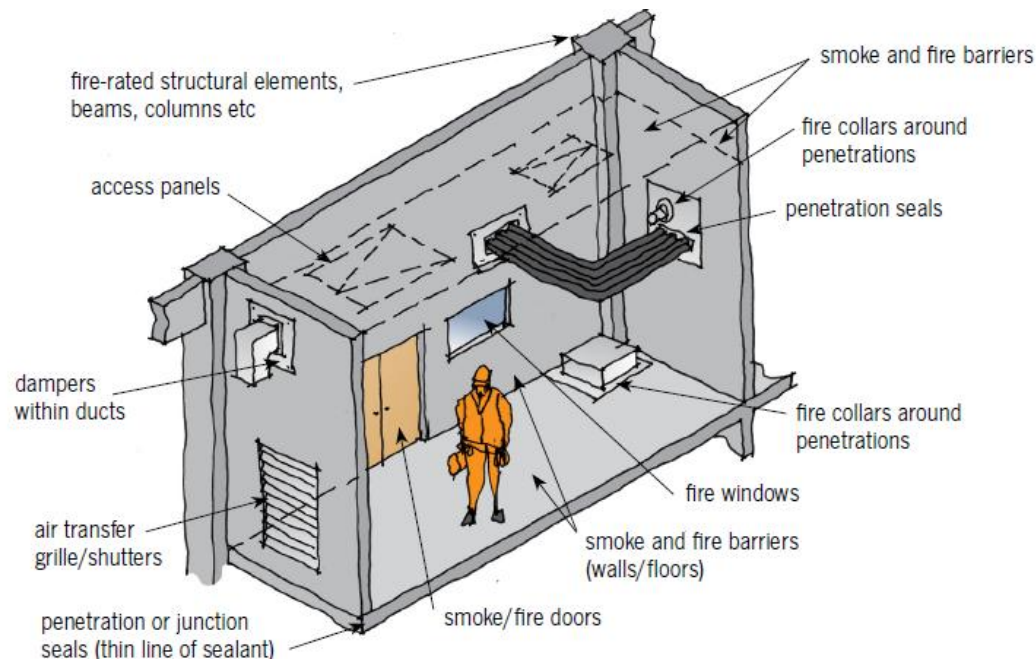
## Compartmentation principles

- Ability to carry loads under fire exposure, without loss of structural stability
- Ability to prevent fire spread as a result of the passage of flames and hot gases
- Ability to prevent excessive heat transfer from one face to another



## Compartmentation principles

- Buildings may be subdivided into compartments designed to contain the fire and prevent its spread for a specified period of time.
- All penetrations in fire separations, doors, dampers and services must be sealed to maintain the performance of the fire-rated construction.

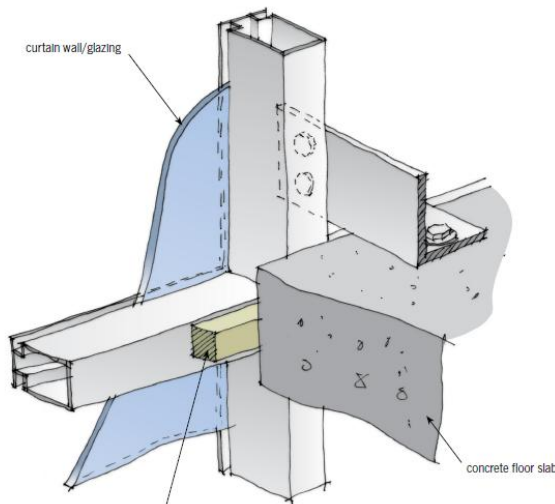
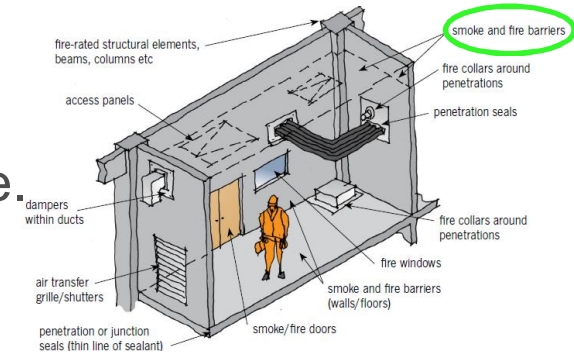




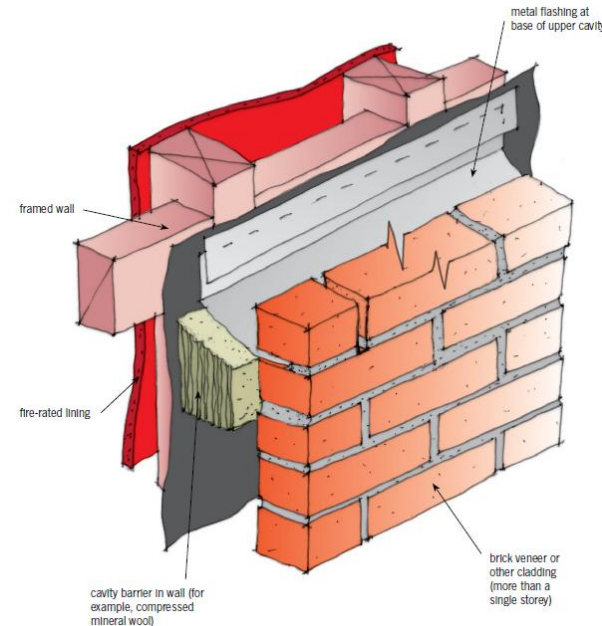
# Fire stopping installation

## Cavity barriers

- Should provide at least 30 minutes fire resistance.
- Should be fitted tightly to a rigid construction
- If gaps are formed they should be filled with fire stopping materials



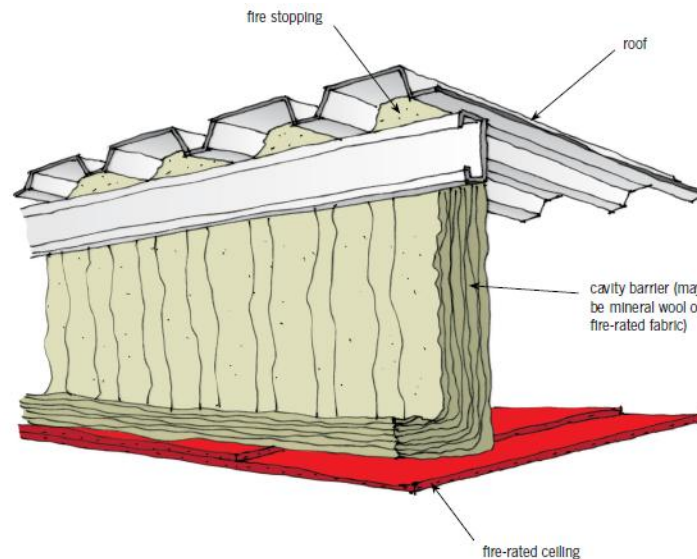
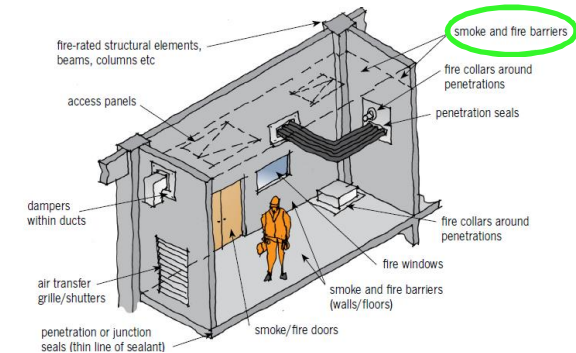
cavity barrier (for example, compressed mineral wool), may require additional support such as metal clips, must fill the gap



## Fire stopping installation

### Notes:

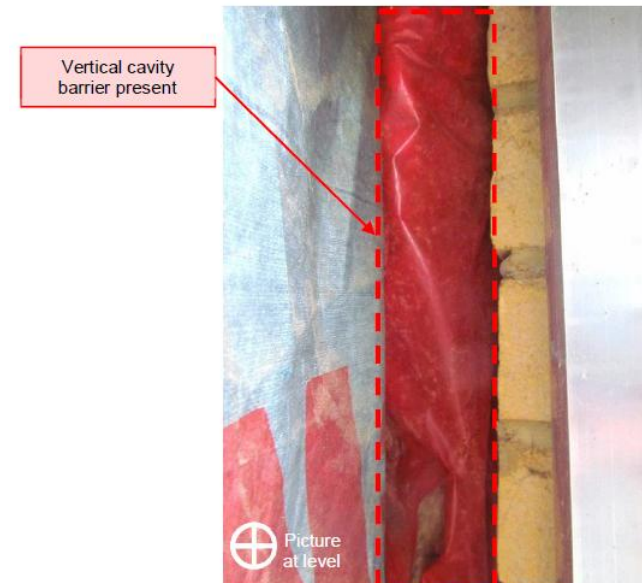
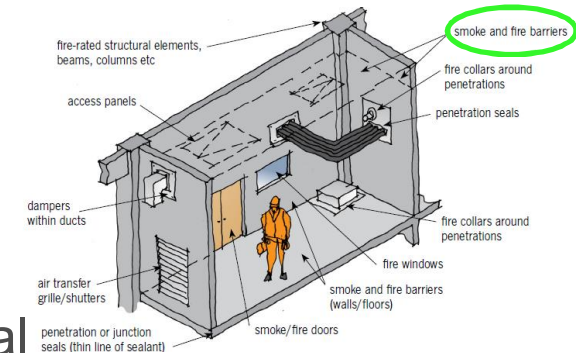
- Follow manufacturer's specifications
- Obtain datasheets, installation procedure, etc.
- Used for roof spaces, end floor slab, top of wall junctions, within hollow walls, curtain walls, into ceiling/floor spaces



## Fire stopping installation

### Examples:

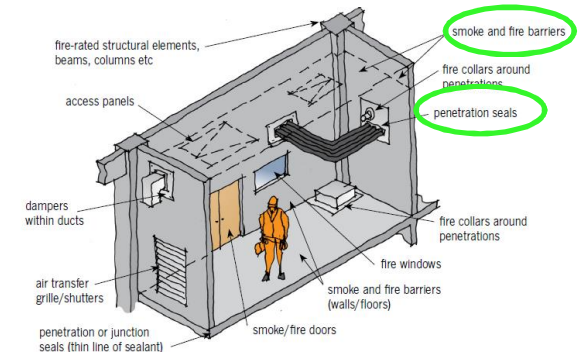
- No cavity barriers were present around the windows and between floors
- Vertical cavity barrier present between the vertical line of compartmentation



# Fire stopping installation

## Examples:

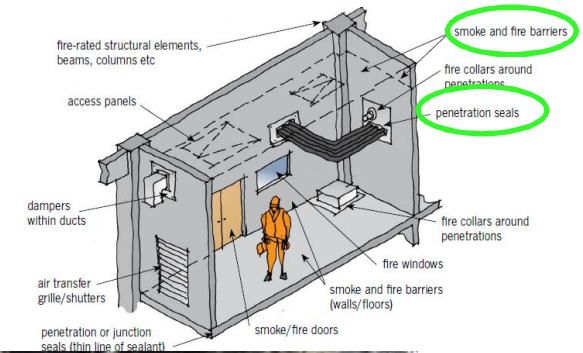
- Of inadequate fire stopping above fire doors



## Fire stopping installation

### Examples:

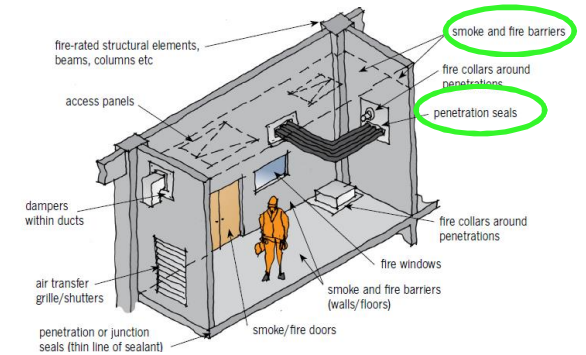
- Of inadequate fire stopping above fire doors
- Of inadequate fire stopping above compartment walls (wall to floor junction).



# Fire stopping installation

## Mechanism of fire spread

- Spread of fire through ceiling void
- Spread of fire due to large deflections and loss of stability of compartmentation system

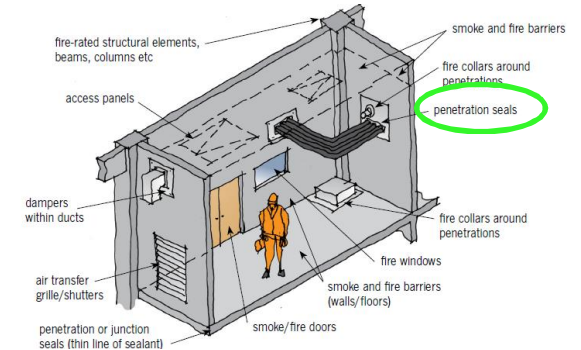


# Fire stopping installation

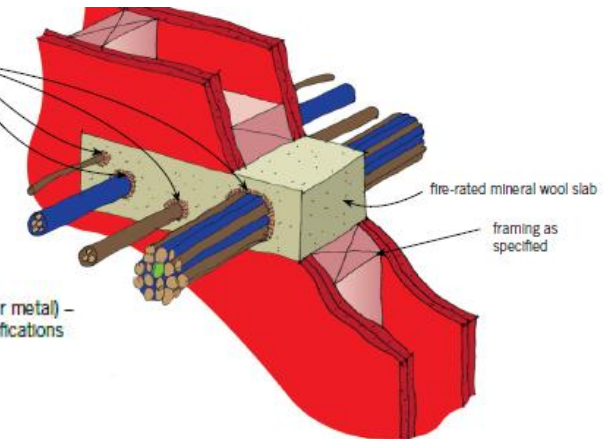
## Penetration seals

Main types of passive fire protection for penetrations are:

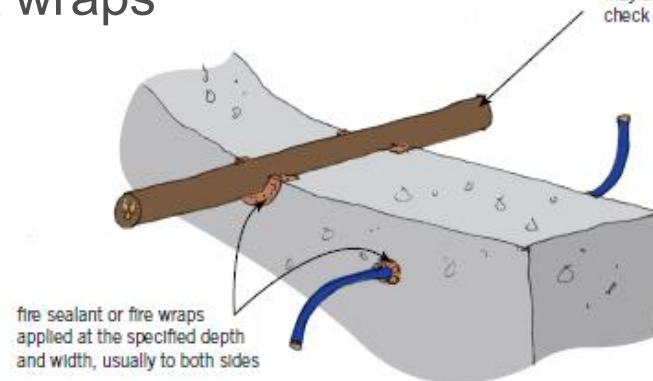
- Cementitious mortars and mineral wool
- Fire resistant pillows
- Intumescent sealants and collars
- External and internal dampers
- Intumescent wraps



fire sealant is applied at the specified depth and width – usually to both sides



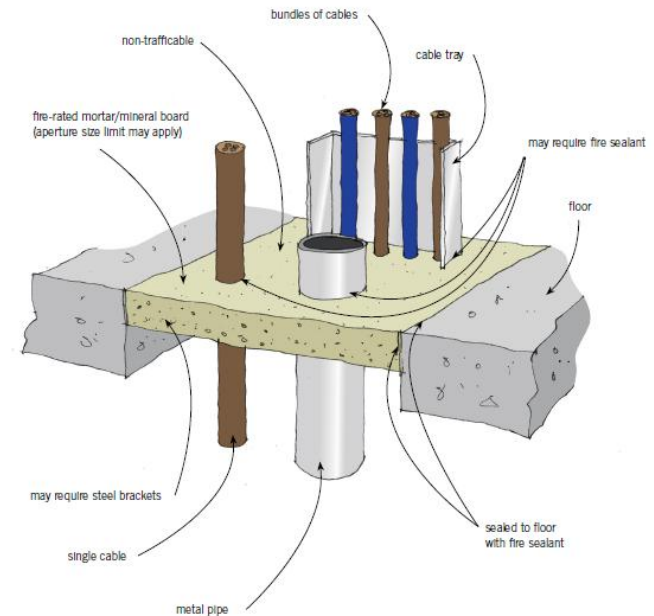
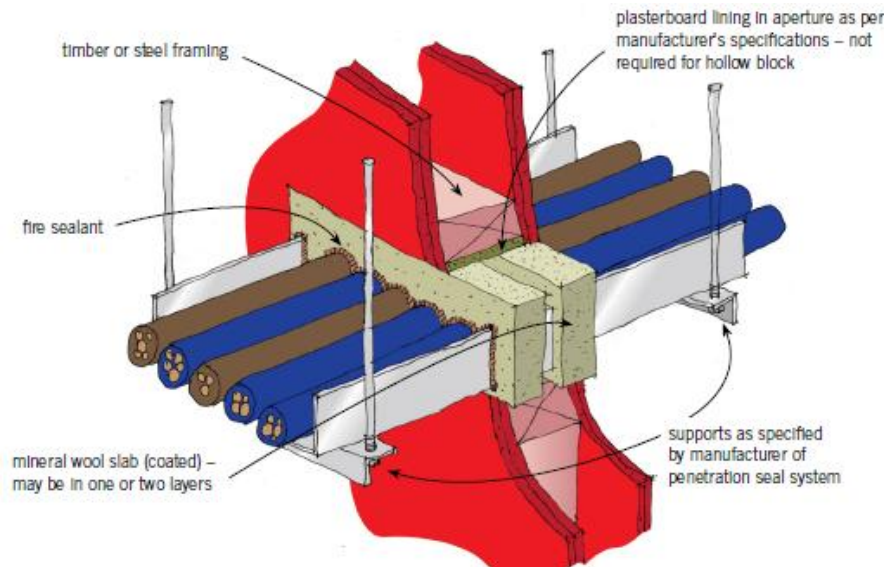
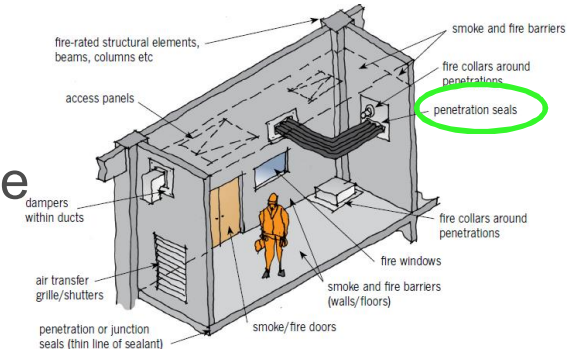
may be in conduit (plastic or metal) – check manufacturer's specifications



# Fire stopping installation

## Penetration seals

- Any openings may compromise the integrity of the compartmentation line
- Any openings crossing through a compartmentation line should be adequately sealed

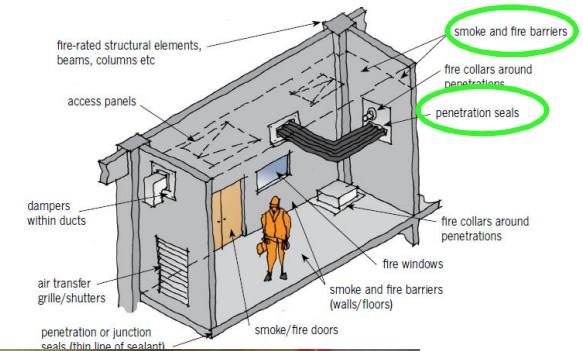




## Fire stopping installation

### Examples:

- Of inadequate fire stopping of penetration (not sealed/ partially sealed, improper use of materials, etc.)

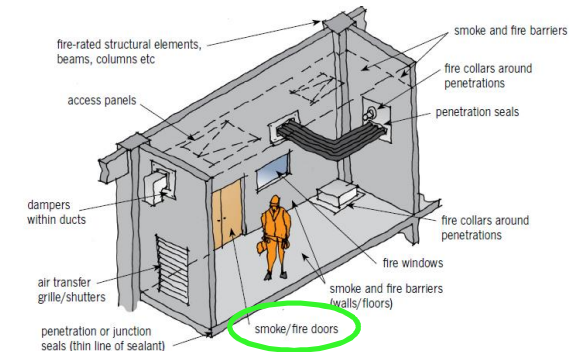


## Fire doors

### Fire resistant doors

Fire doors serve three main purposes:

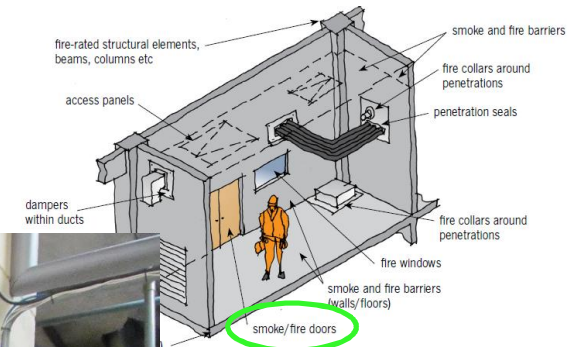
- Maintain the integrity of the means of escape in case of a fire
- Isolate areas within the building that represents a significant fire risk
- Provide access to compartment walls



# Fire doors

## Fire resistant doors

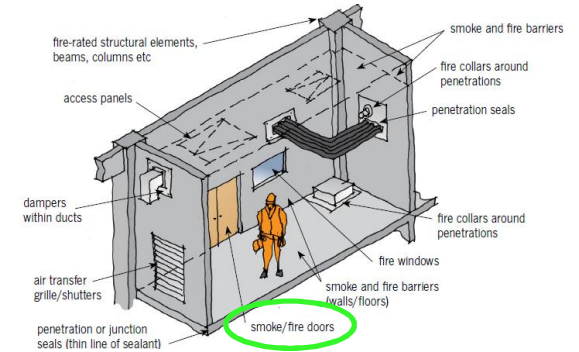
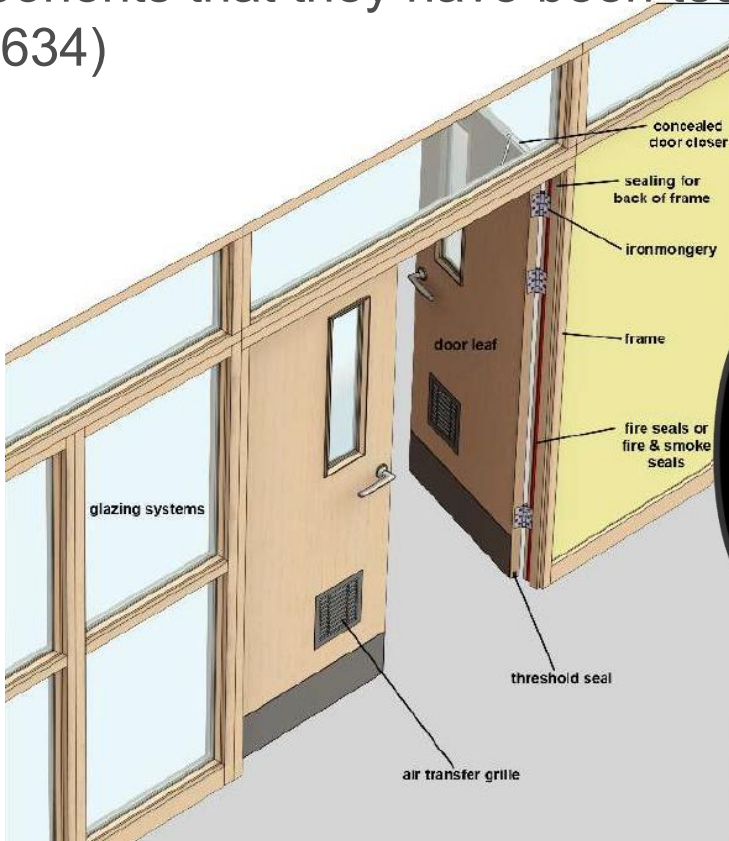
- Examples of fire doors after natural fire exposure



# Fire doors

## Fire resistant doors

Fire doors should have installed all the components that they have been tested with (BS EN 1634)



### Good Building Guide Installing fire doors and doorsets

Tom Lennon, Andy Russell, Ian Stewart and Mark Cummings

The Good Building Guide is designed to illustrate the importance of correctly installing fire doors and doorsets to ensure the safety of buildings occupants and the protection of property on the event of a fire. Some key issues for the guidance of specifiers, manufacturers, contractors and approved authorities are identified, together with useful references to more comprehensive guidance documents. The importance of adequate testing, product quality, installation and maintenance is highlighted, along with the critical role of third party certification schemes.

#### Introduction

The safety for building occupants is maintained through the provision of adequate means of escape in the event of a fire. Any building, no matter how small, must provide a means of escape for its occupants. The building regulations 2010, 2.13.3.3, 2.13.3.4, 2.13.3.5 and 2.13.3.6 require that the fire performance of structures are based on fire tests objectives.

- To ensure that a structure remains intact for a period of time sufficient to ensure, or for as long as reasonably practicable, the safety of building occupants and firefighters.
- To prevent damage to other premises in the immediate vicinity of the fire.

The spread of fire within a building can be restricted by subdividing the building into compartments separated by fire-resisting walls and doors of the resisting construction. The provision of compartments is essential in maintaining safe escape routes and the building occupants and firefighters in the event of a fire. Any penetration of compartments walls represents a potential weakness in the fire safety of a building.

Fire doors serve three main purposes:

- To maintain the integrity of means of escape in the event of a fire.
- To isolate areas within a building that represent a significant fire risk.
- To provide access through compartment walls.



Figure 1: Show the door with an open glass panel.

Fire doors are complex engineered products. It is essential that the correct components are used in design, manufacture and installation and that the door assembly system used is representative of those tested and approved. There is a complex relationship between the door leaves, emergency escape panels, intumescent seals and the surrounding structure including the floor frame. It is essential that designers ensure the integrity of compartments within a building and its performance in the event of a fire.

The Good Building Guide highlights the importance of correct installation and maintenance of fire doors (Figures 1 and 2), components (Section 2) and testing, and focuses on some key points and issues.

DIGEST  
DG 524  
FIRE DOORS  
Norman Macdonald and Andy Russell

A well designed door assembly should be able to fulfil its normal function of controlled access and security without causing too much hindrance to the movement of people and goods. For doors to play a key role in delaying the spread of fire and the smoke, they must not undergo damage to primary and secondary.

The Digest, which supersedes BRE Digest 220, details the tests applied by the door's intumescent smoke, action doors), the thickness of its casting, their performance and the requirements for door assemblies using widely different forms of design. Therefore, it is no longer appropriate to give simplified guidance on their construction. The importance of third party certification for the manufacturer, installation and maintenance of fire doors is highlighted.

The Digest introduces the key performance requirements for fire doors and smoke control doors so will be of interest to specifiers, manufacturers, installers and approved authorities such as building control and insurers. It concludes with a checklist of reference documents.



Figure 1: The resistance tests BS 4743-1:1987a

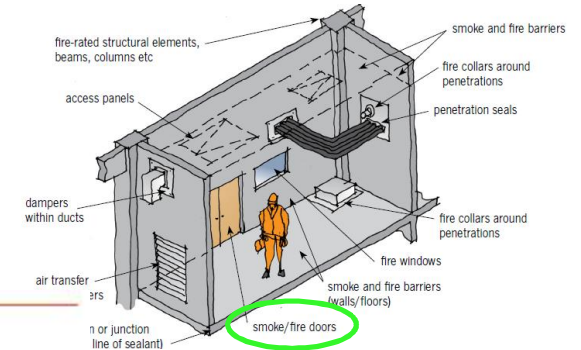
To provide adequate means of escape in the event of a fire and to maintain the production, different parts of a building may need to be separated by fire-resisting construction. Any opening in which these enclosures for the passage of people or goods will need to be closed off by doors or shutters which have a proven function to fulfil in the event of a fire.

- Fire doors should prevent a serious transmission of products of combustion which can interfere with the safe use of escape routes.
- Essentially, fire doors restrict the effects of fire as a barrier of the wall or partition in which it is located.

# Fire doors

## Fire resistant doors

- Colour code giving a performance identification for non-metallic doors and frames



**Table 1: Range of colour codes giving a performance identification for non-metallic doors and frames (to be used for inspection purposes only)<sup>[8]\*</sup>**

| Core colour | Label colour or background colour | Integrity (minutes) | Colour code interpretation  |
|-------------|-----------------------------------|---------------------|---|
| Red         | White                             | 20                  | Intumescent seals need to be added at time of original installation |
|             | Yellow                            | 30                  |   |
|             | Pink                              | 45                  |   |
|             | Blue                              | 60                  |   |
|             | Brown                             | 90                  |   |
|             | Black                             | 120                 |   |
| Green       | White                             | 20                  | Intumescent seals will have been fitted at time of                  |
|             | Yellow                            | 30                  |   |
|             | Pink                              | 45                  |   |
|             | Blue                              | 60                  |   |
|             | Brown                             | 90                  |   |
|             | Black                             | 120                 |   |

\* Permission to reproduce extracts from British Standards is granted by BSI Standards Ltd (BSI). N

**Exova**  
BMTRADA

Timber Fire Door Certification Scheme

Outer colour / Integ. / Fire resistance (min)

Approved door, intumescent not set, Approved door, intumescent in door factory fitted, Intumescent frame to match door, All intumescent to door and frame fitted.

For scheme and members' details visit [www.exovabmtrada.com](http://www.exovabmtrada.com) or telephone +44 (0) 330 212 2113.

**bwf** Registration Number Here  
Manufacturers Name Here  
01999 123456

Fire Door Certification invalid unless installed and maintained exactly in accordance with manufacturer's instructions and this label is retained unmarked and not removed.

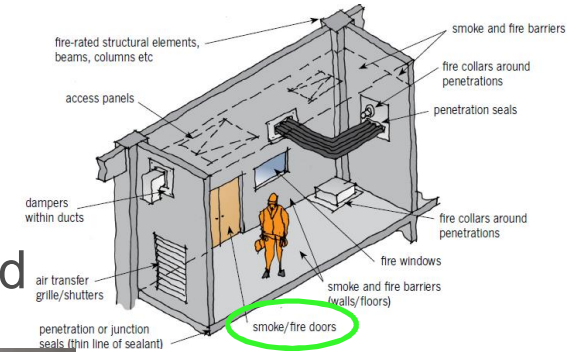
**CERTIFIED FIRE DOOR**  
**FD 30**  
DO NOT REMOVE LABEL

| Fire Resistant Ratings    | Intumescent Necessary | Untumescent Not Necessary Green Core |
|---------------------------|-----------------------|--------------------------------------|
| 30/20 (White background)  |                       |                                      |
| 30/30 (Yellow background) |                       |                                      |
| 60/60 (Blue background)   |                       |                                      |

# Fire doors

## Fire resistant doors

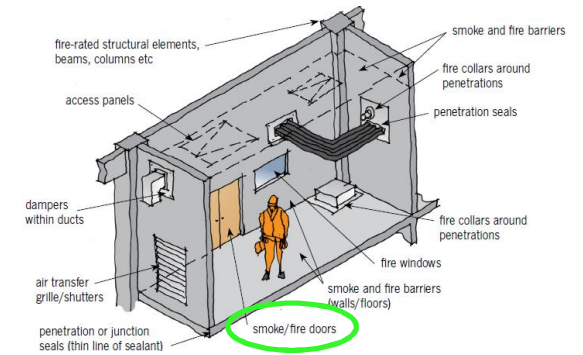
- Improper use of fire resistant doors
- Fire doors should never be kept blocked or locked



# Fire doors

## Fire resistant doors

Testing according with BS EN 1634-1



Classification

**EI<sub>1</sub> 30/EI<sub>2</sub> 30/EW 30**

**Thank you for your attention!**

**Views / Comments/ Questions**

