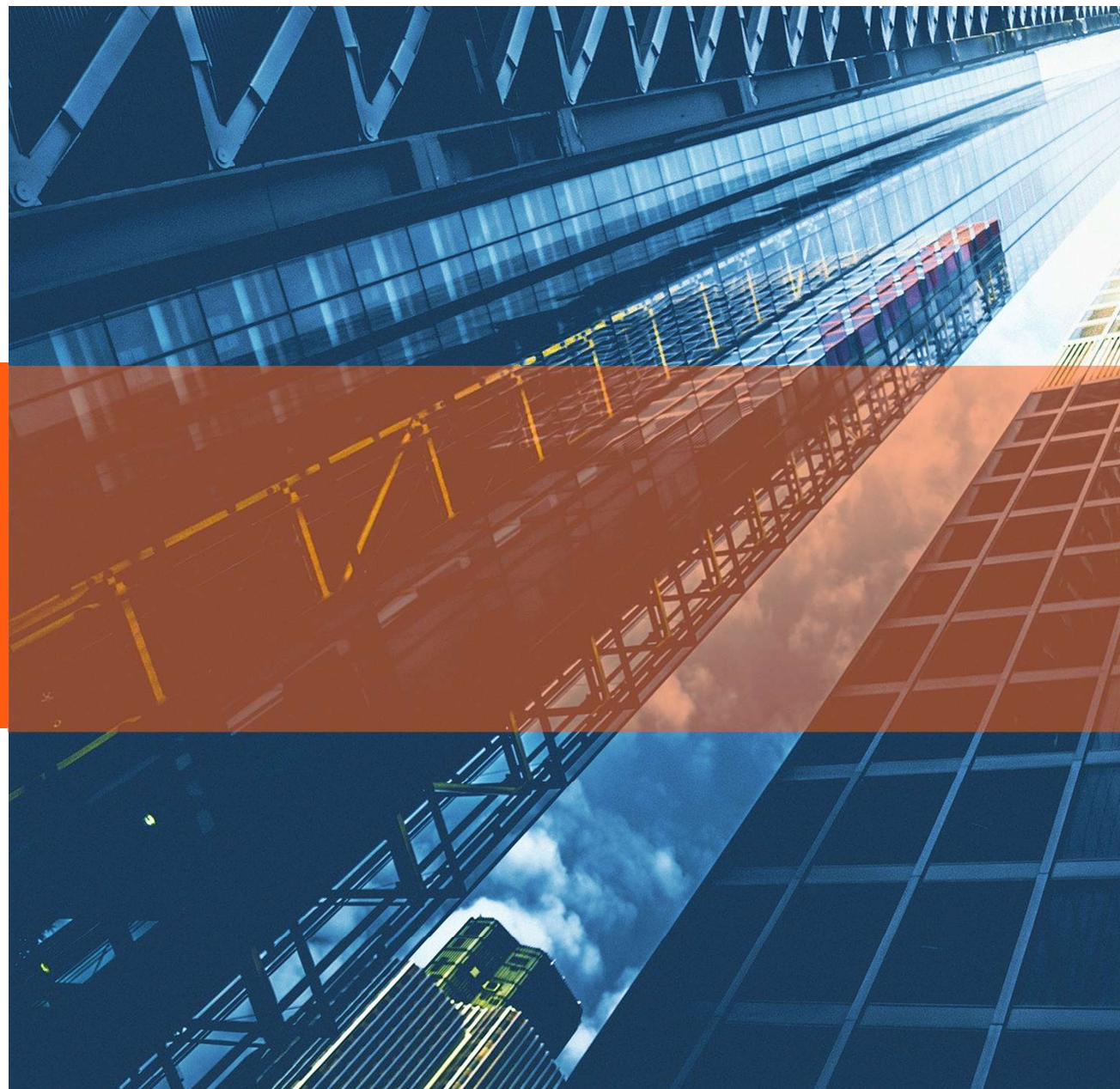


# Common issues with loft conversions

A recipe for success

**London Building Control**  
13 Woodstock Street, Mayfair, London, W1C 2AG

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# Introduction

Legal stuff... controls ☺

General advice and structure ☺

Fire safety – Common practice and guidance ☺

Other stuff... ☺

Questions??



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## How is 'Building Work' controlled and assessed



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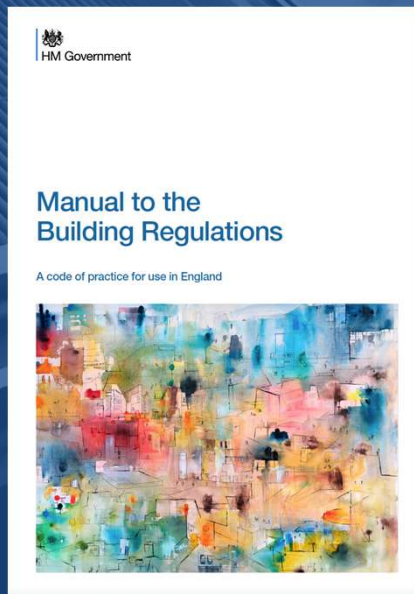
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# The Building Regulations

## Responsibility?



### Responsibility for compliance

Receiving a [completion certificate](#) or [final certificate](#) is not a complete guarantee of compliance with the [Building Regulations](#). The legal meaning of the certificate is that it is 'evidence but not conclusive evidence' of compliance. The building control officer or [approved inspector](#) will not have checked every piece of building material and how it has been fitted or every aspect of submitted documents. It is the responsibility of those carrying out [building work](#) to comply with the [Building Regulations](#). The [building control body](#) will inspect the work on site at appropriate stages, but you cannot rely on this as the only method of ensuring that the work complies with the [Building Regulations](#). The responsibility for ensuring compliance rests with the people carrying out the work.

For example, a [building](#) has just received the [final certificate](#) or [completion certificate](#), but the roof is leaking. The fact that the roof leaks is the builder's or building designer's problem and not the [building control body's](#) problem. However, the [building control body](#) may point out problems either with the design or construction at any stage up to granting the [final certificate](#) or [completion certificate](#).

***Appropriate – Reasonable – Adequate – Suitable***

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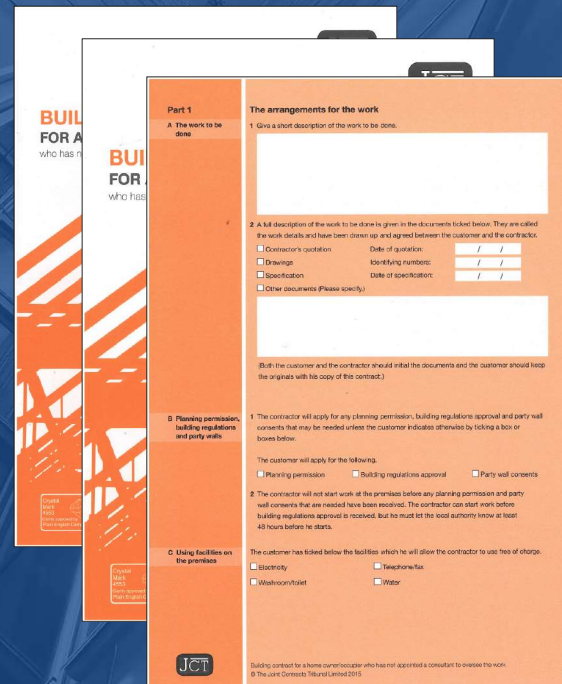


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**Part 1**  
**A The work to be done**

**The arrangements for the work**

1 Give a short description of the work to be done.

2 A full description of the work to be done is given in the documents ticked below. They are called the work details and have been drawn up and agreed between the customer and the contractor.

☐ Contractor's quotation      Date of quotation:      /      /      /  
☐ Drawings      Identifying number:      /      /      /  
☐ Specification      Date of specification:      /      /      /  
☐ Other documents (Please specify):

Both the customer and the contractor should initial the documents and the customer should keep the originals with his copy of the contract.)

**B Planning permission, building regulations and party walls**

1 The contractor will apply for any planning permission, building regulations approval and party wall consents that may be needed unless the customer indicates otherwise by ticking a box or boxes below.

The customer will apply for the following:

☐ Planning permission      ☐ Building regulations approval      ☐ Party wall consents

2 The contractor will not start work at the premises before any planning permission and party wall consents that are needed have been received. The contractor can start work before building regulations approval is received, but he must let the local authority know at least 48 hours before he starts.

**C Using facilities on the premises**

The customer has ticked below the facilities which he will allow the contractor to use free of charge.

☐ Electricity      ☐ Telephone/fax  
☐ Washroom/trait      ☐ Water

**JCT**

Building contract for a home owner/occupier who has not appointed a consultant to oversee the work.  
 © The Joint Contracts Tribunal Limited 2015

## Construction Contract issues:

Construction Contract issues:

Use of recognised contract

Payment terms/drawdown

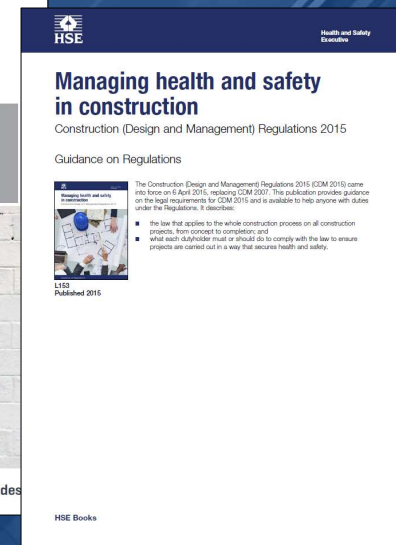
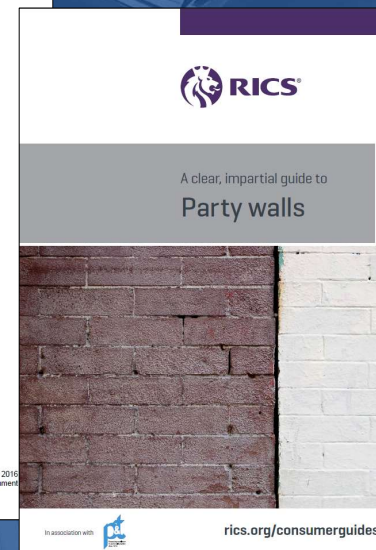
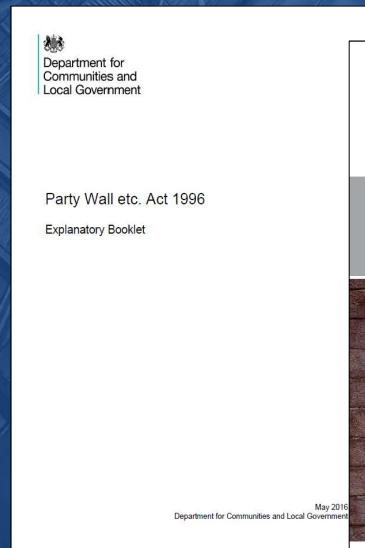
Clear duty for compliance

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Don't forget ...



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# Common issues with loft conversions

## Structure

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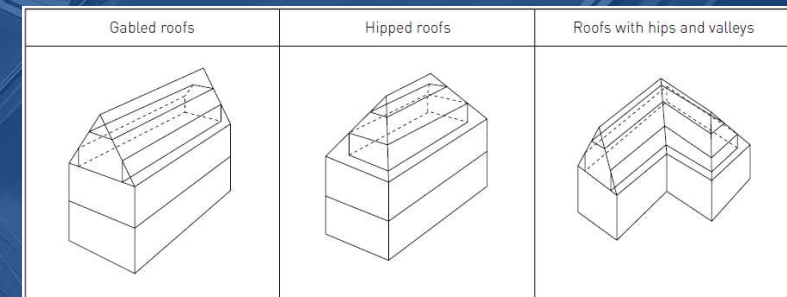


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## Existing or New Structure??

### Feasibility

- Assessment of space
- Internal layouts
- Buildability
- Financial



### Full structural survey/assessment – *Why?*

- Loading on existing structure increased
- Existing structure being modified
- Condition of existing structural elements

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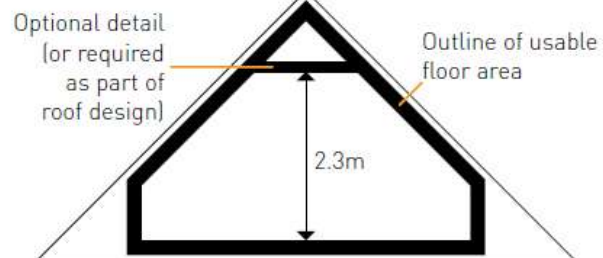
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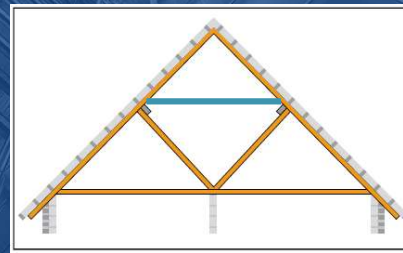
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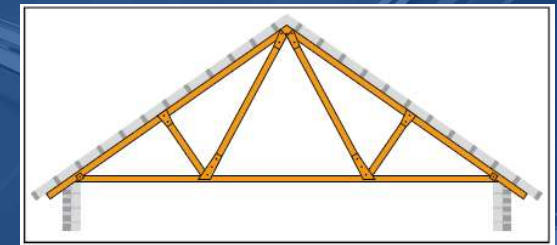
## Existing or New Structure??



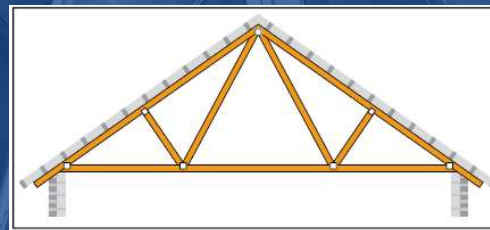
Traditional roof



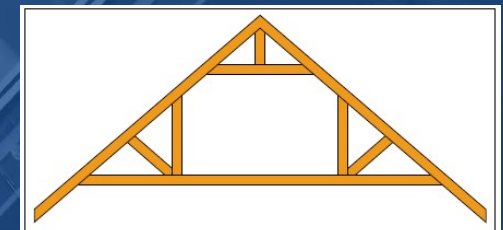
TDA roof



Trussed rafter roof



Attic truss roof



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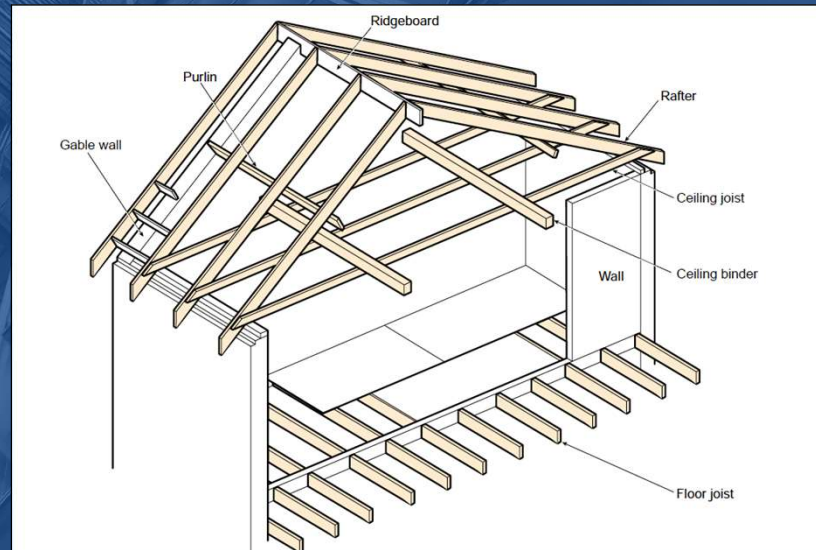
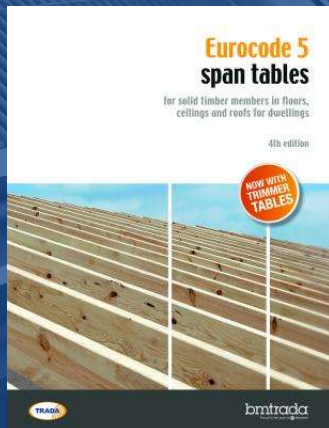


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## New Structure – Trada guidance



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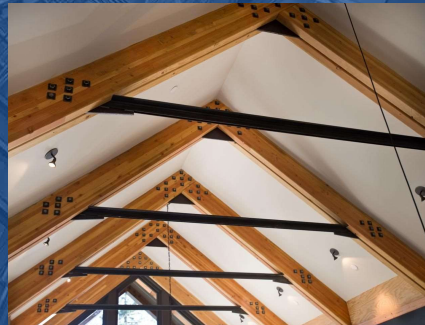
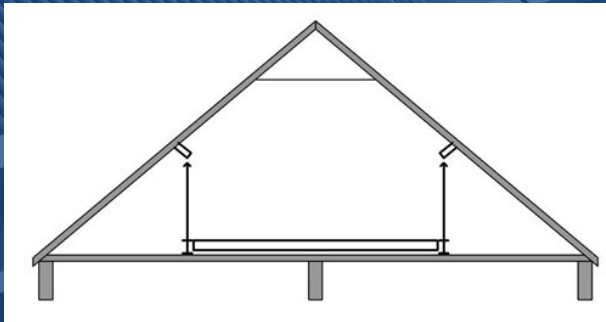
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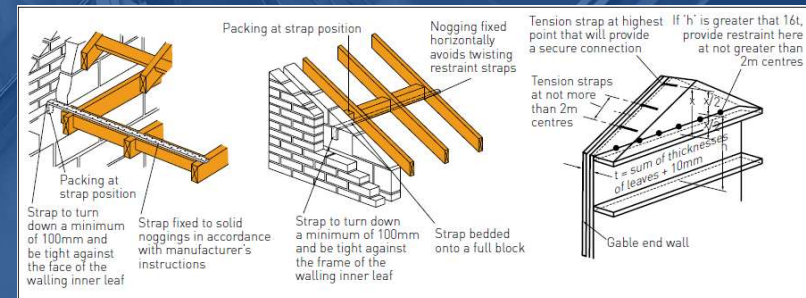
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## Proposed Structure



<https://www.pinterest.co.uk/bbevelly7/metal-collar-ties/>



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## Proposed Structure

### Permitted areas – Drilling/Notching

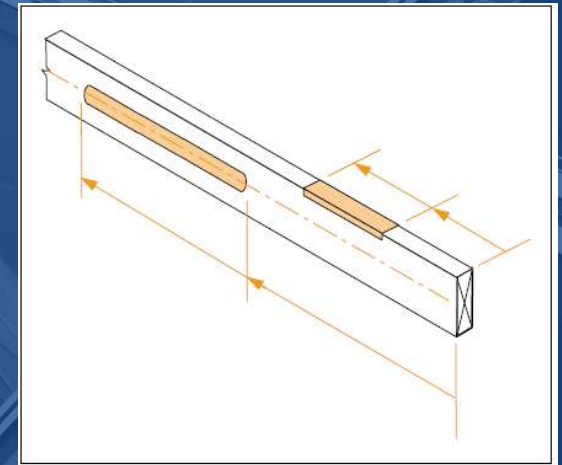
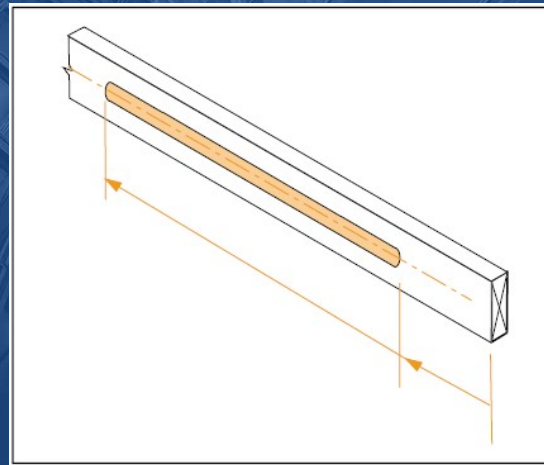
Notches and holes in simply supported floor and ceiling joists should be within the following limits:

**Notches** should be not deeper than 0.125 times the depth of a joist and should not be cut closer to the support than 0.07 of the span, nor further away than 0.25 times the span.

**Holes** should have a diameter not greater than 0.25 times the depth of a joist and should be drilled at the joist centreline. They should be not less than 3 diameters (centre to centre) apart and should be located between 0.25 and 0.4 times the span from the support.

Notches or holes should not be cut in rafters, purlins or binders unless approved by the building designer.

Rafters restrained by ceiling ties at eaves level may be birdsmouthed at supports to a depth not exceeding one third of the rafter depth.



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# Common issues with loft conversions

## Means of escape

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## Why is Fire Safety important?

How long have we got...??

### Typical timeline of a 2-story house being engulfed by fire:

0:30 seconds, the fire starts and rapidly grows.  
1:04 minutes, the fire spreads and room begins to fill with smoke.  
1:50 minutes, smoke detector goes off  
2:30 minutes, the temperature in the source room climbs above 400°F.  
2:48 minutes, smoke will start pouring into the other rooms of the house.  
3:03 minutes, temperature 500°F. No human can survive  
3:20 minutes, escaping will be difficult.  
3:41 minutes - a "flashover" occurs. Everything in the room ignites, with the temperature exceeding 1,400°F.  
3:50 minutes - the only possible way out is the second exit.  
4:33 minutes, flames will engulf the home's exterior. Rescue?

Less than 5 minutes for a fire to completely engulf most homes!!



Photo: iStockphoto.com/Scott Green/Scott Green/Getty Images



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## Fire Safety Guidance Documents



ONLINE VERSION

HM Government

The Building Regulations 2010

**Fire safety**

APPROVED DOCUMENT

**B**

**Volume 1: Dwellings**

Requirement B1: Means of warning and escape  
Requirement B2: Internal fire spread (linings)  
Requirement B3: Internal fire spread (structure)  
Requirement B4: External fire spread  
Requirement B5: Access and facilities for the fire service  
Regulations: 6(3), 7(2) and 38

2019 edition – for use in England

ONLINE VERSION

BS 9991:2015

BSI Standards Publication

Fire safety in the design, management and use of residential buildings – Code of practice

bsi.

...making excellence a habit™

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BS 7974:2019

BSI Standards Publication

Application of fire safety engineering principles to the design of buildings – Code of practice

bsi.

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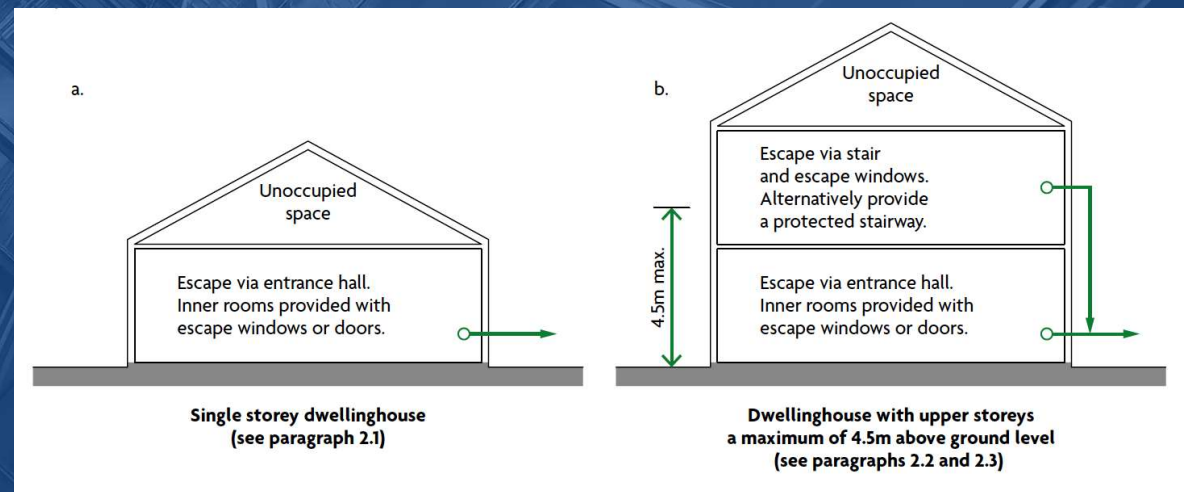


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Houses General

## Code compliant Solutions *Floors less than 4.5m from ground level*



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## Houses General

### Inner rooms ADB

**2.11** An **inner room** is permitted when it is one of the following.

- a. A kitchen.
- b. A laundry or utility **room**.
- c. A dressing **room**.
- d. A bathroom, WC or shower **room**.
- e. Any **room** on a **storey** that is a maximum of 4.5m above ground level which is provided with an emergency escape window as described in paragraph 2.10.
- f. A **gallery** that complies with paragraph 2.15.

**2.12** A **room** accessed only via an **inner room** (an inner **inner room**) is acceptable when all of the following apply.

- a. It complies with paragraph 2.11.
- b. The **access rooms** each have a smoke alarm (see Section 1).
- c. None of the **access rooms** is a kitchen.

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## Code compliant Solutions *Escape Windows – Balconies?*

### Emergency escape windows and external doors

**2.10** Windows or external doors providing emergency escape should comply with all of the following.

- a. Windows should have an unobstructed openable area that complies with all of the following.
  - i. A minimum area of  $0.33\text{m}^2$ .
  - ii. A minimum height of 450mm and a minimum width of 450mm (the route through the window may be at an angle rather than straight through).
  - iii. The bottom of the openable area is a maximum of 1100mm above the floor.
- b. People escaping should be able to reach a place free from danger from fire. Courtyards or inaccessible back gardens should comply with Diagram 2.5.
- c. Locks (with or without removable keys) and opening stays (with child-resistant release catches) may be fitted to escape windows.
- d. Windows should be capable of remaining open without being held.



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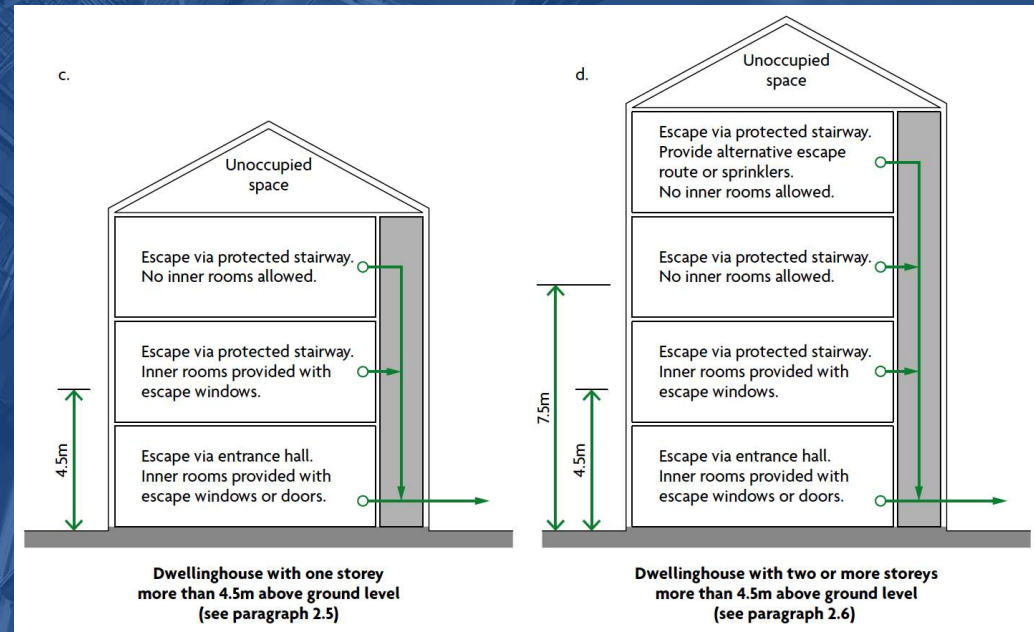
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## Code compliant Solutions – Floors over 4.5m and 7.5m



Houses General



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## Code compliant Solutions – Protected Stairs



Houses General

See para 2.5

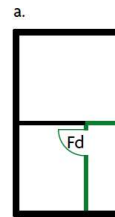


Diagram 2.2

See para 2.5

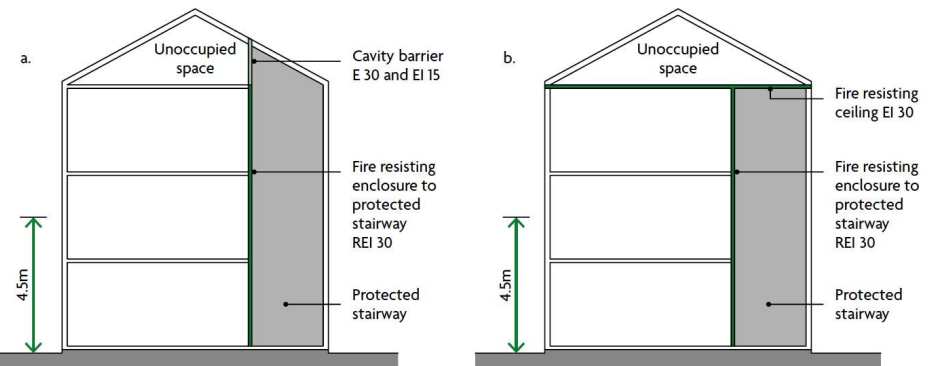


Diagram 2.3 Alternative cavity barrier arrangements in roof space over protected stairway in a house with a storey more than 4.5m above ground level

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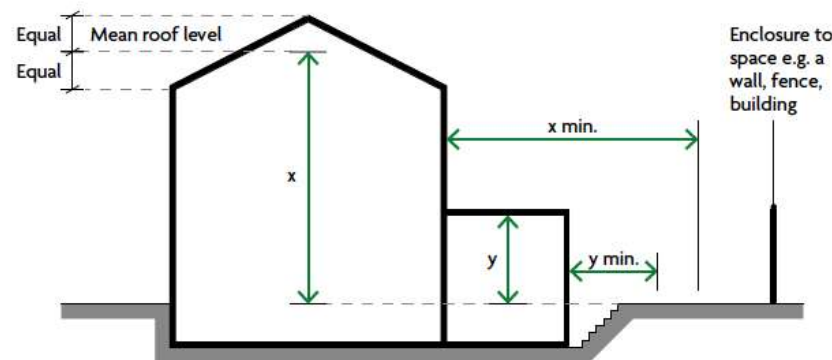


## Code compliant Solutions – *Place of safety*



Houses General

See para 2.10



Where escape from a dwellinghouse is to an enclosed space with exit only possible through other buildings (e.g. a courtyard or back garden), the length of the space should exceed whichever is the greater of the following.

- The height of the dwellinghouse above ground level ( $x$ ).
- Where a rear extension is provided, the height of the extension ( $y$ ).

Diagram 2.5 Ground or basement storey exit into an enclosed space

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## House Loft Conversions

### Code compliant Solutions – *Loft Conversions*

#### Loft conversions

**2.21** Where a new **storey** is added through conversion to create a **storey** above 4.5m, both of the following should apply.

- a. The full extent of the **escape route** should be addressed.
- b. **Fire resisting** doors (minimum E 20) and partitions (minimum REI 30) should be provided, including upgrading the existing doors where necessary.

**NOTE:** Where the layout is open plan, new partitions should be provided to enclose the **escape route** (Diagram 2.2).

**2.22** Where it is undesirable to replace existing doors because of historical or architectural merit, the possibility of retaining, and where necessary upgrading, them should be investigated.

**2.23** An alternative approach to that described in paragraph 2.21 would be to comply with all of the following.

- a. Provide sprinkler protection to the open-plan areas.
- b. Provide a **fire resisting** partition (minimum REI 30) and door (minimum E 20) to separate the ground **storey** from the upper **storeys**. The door should allow occupants of the loft **room** access to a first **storey** escape window.
- c. Separate cooking facilities from the open-plan area with **fire resisting** construction (minimum REI 30).

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## House Loft Conversions

### Alternative Compliance options – *Loft Conversions*



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## House Loft Conversions

### Alternative loft conversion guide (house becoming three storey)

### Existing Door retention guidance with enhanced AFD

Where doors meet the guidance below and it is proposed to provide a minimum Grade A LD2 AFD system throughout the property (including bedrooms) there will be no requirement to upgrade the doors to meet the 20-minute fire resistance standards – subject to the following:

- Solid wood doors with a stile thickness over 32mm subject to there being no significant defects.
- If the door has thin panels, these may need to be treated with intumescent applications.
- Doors must be a good fit with a maximum 4mm gap at the head and the jambs and 10mm at the threshold. The doors may require 'lipping' to ensure a good fit. (The duty holders should assess the doors when the project commences and advise of any necessary improvements).
- Intumescent strips must be provided where the above maximum gap sizes cannot be achieved.
- The hinges must be steel or have a melting point no less than 800°C.
- Any non-fire rated glazing in doors must be replaced with suitable fire rated glass.

Existing softwood or other lightweight or hollow doors are not considered adequate to provide a reasonable level of fire protection and should be replaced by suitably certificated fire doors. All newly provided doors must be suitably certificated fire doors

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## Alternative Compliance options – Odd ones!



### Alternative approaches

**0.9** The fire safety requirements of the Building Regulations will probably be satisfied by following the relevant guidance in this approved document. However, approved documents provide guidance for some common building situations, and there may be alternative methods of complying with the Building Regulation requirements.

If alternative methods are adopted, the overall level of safety should not be lower than the approved document provides. It is the responsibility of those undertaking the work to demonstrate compliance.

If other standards or guidance documents are adopted, the relevant fire safety recommendations in those publications should be followed in their entirety. However, in some circumstances it may be necessary to use one publication to supplement another. Care must be taken when using supplementary guidance to ensure that an integrated approach is used in any one building.

Guidance documents intended specifically for assessing fire safety in existing buildings often include less onerous provisions than those for new buildings and are therefore unlikely to be appropriate for building work that is controlled by the Building Regulations.

Buildings for industrial and commercial activities that present a special fire hazard, e.g. those that sell fuels, may require additional fire precautions to those in this approved document.

3. Where very large (over 18m in height or with a 10m deep basement) or unusual dwellinghouses are proposed, some of the guidance for buildings other than dwellings may be needed.

provisions in this document may be appropriate. In such cases, it is appropriate to assess the hazard and risk in the particular case and consider a range of fire safety features in that context.

### Sheltered housing

**0.11** While many of the provisions in this approved document for means of escape from flats are applicable to sheltered housing, the nature of the occupancy may necessitate some additional fire protection measures. The extent of such measures will depend on the form of the development. For example, a group of specially adapted bungalows or two storey flats, with few communal facilities, will not need to be treated differently from other single storey or two storey dwellinghouses or flats.

### Fire safety engineering

**0.12** Fire safety engineering might provide an alternative approach to fire safety. Fire safety engineering may be the only practical way to achieve a satisfactory standard of fire safety in some complex buildings and in buildings that contain different uses.

Fire safety engineering may also be suitable for solving a specific problem with a design that otherwise follows the provisions in this document.

**0.13** BS 7974 and supporting published documents (PDs) provide a framework for and guidance on the application of fire safety engineering principles to the design of buildings.



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# Common issues with loft conversions

## Active Fire Safety Systems

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## Houses General

# Means of early warning – AD compliant

### General provisions

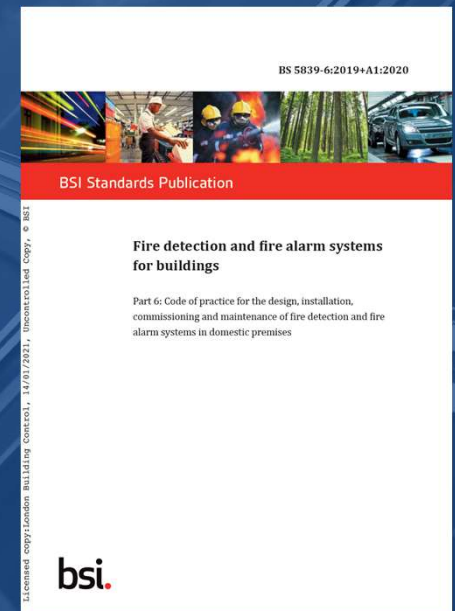
- 1.1 All **dwelling**s should have a fire detection and alarm system, minimum Grade D2 Category LD3 standard, in accordance with the relevant recommendations of **BS 5839-6**.  
A higher standard of protection should be considered where occupants of a proposed **dwelling** would be at special risk from fire. Further advice on this is also given in **BS 5839-6**.
- 1.2 Smoke alarms should be mains operated and conform to **BS EN 14604**.
- 1.3 Heat alarms should be mains operated and conform to **BS 5446-2**.
- 1.4 Smoke and heat alarms should have a standby power supply, such as a battery (rechargeable or non-rechargeable) or capacitor. More information on power supplies is given in clause 15 of **BS 5839-6**.  
**NOTE:** The term 'fire alarm system' describes the combination of components for giving an audible and/or other perceptible warning of fire.  
**NOTE:** In this document, the term 'fire detection system' describes any type of automatic sensor network and associated control and indicating equipment. Sensors may be sensitive to smoke, heat, gaseous combustion products or radiation. Automatic sprinkler systems can also be used to operate a fire alarm system.

### Reference to BS 5839 Part 6

**Grade D2 = mains powered with standby supply**  
**Category LD3 = Detectors in circulation spaces only**

### Large dwellinghouses

- 1.5 A large **dwellinghouse** has more than one **storey**, and at least one **storey** exceeds 200m<sup>2</sup>.
- 1.6 A large **dwellinghouse** of two **storeys** (excluding **basement storeys**) should be fitted with a Grade A Category LD3 fire detection and alarm system, as described in **BS 5839-6**.
- 1.7 A large **dwellinghouse** of three or more **storeys** (excluding **basement storeys**) should be fitted with a Grade A Category LD2 fire detection and alarm system as described in **BS 5839-6**.



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## Houses General

### System Categories *Coverage and level of detection*

#### LD1 – High Protection

- All areas where a fire could start, e.g.:
- Hallways
- Landings
- Living Room
- Kitchen
- Bedrooms
- Airing cupboards/  
Meter cupboards



#### LD2 – Medium Protection

- Escape routes and high risk areas, e.g.:
- Hallways
- Landings
- Living Room
- Kitchen



#### LD3 – Minimum Protection

- Escape routes, e.g.:
- Hallways
- Landings



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## Houses General

### System Grades

*Grade relates to the engineering components of the system.  
It's about reliability and availability!*

*The grades are defined as follows.*

- *Grade A: A fire detection and fire alarm system, which incorporates CIE conforming to BS EN 54-2 and power supply equipment conforming to BS EN 54-4, and which is designed and installed in accordance with all the recommendations of BS 5839-1:2017, Section 1 to Section 4 inclusive, except those in the following clauses, for which the corresponding clauses of this part of BS 5839 need to be substituted.*
- *Grade C: A system of fire detectors and alarm sounders (which may be combined in the form of smoke alarms) connected to a common power supply, comprising the normal mains and a standby supply, with central control equipment.*
- *Grade D1: A system of one or more mains-powered detectors (see [3.12](#)), each with a tamper-proof standby supply consisting of a battery or batteries (see [3.62](#)).*
- *Grade D2: A system of one or more mains-powered detectors (see [3.12](#)), each with an integral standby supply consisting of a user-replaceable battery or batteries.*

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## Sprinkler design to BS 9251

- *Mains water supply*
- *Pipework can be of plastic material*
- *Installation certified*



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## Water-mist Design to BS 8458

*An alternative to sprinklers. Requires specialist design to the standard or demonstrate equivalency to sprinklers*

- *High pressure cylinders/pumps*
- *Nozzle differences*
- *Installation certified*



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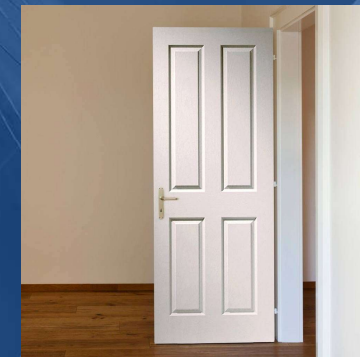
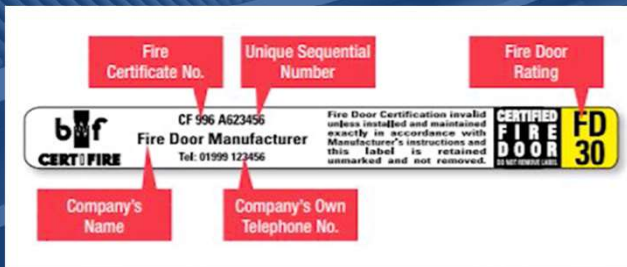
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## Fire safety – Doors

- Fire door designs should be tested to BS 476 Part 22 or the European equivalent BS EN 1634 Part 1.
- Demonstrate that there is evidence supporting the performance of the door in the event of a fire.



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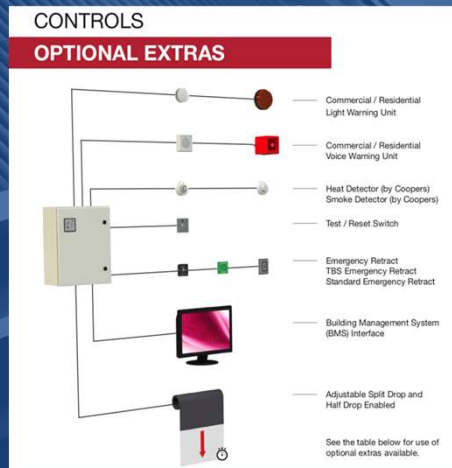
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## Fire Curtain barriers



### Considerations

- Controls
- Linked to detection
- Obstruction alerts
- Operation alert
- Manual retract buttons
- Half drop facility
- Types
- Smoke or Fire resistance
- Radiant heat provision



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# Common issues with loft conversions

Fire spread

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## House Loft Conversions

### B3 – Internal Fire Spread

#### Requirement

##### 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—
- sub-division of the building with fire-resisting construction;
  - 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.

##### Limits on application

#### Floors in loft conversions

- 5.4** Where adding an additional **storey** to a two **storey** single family **dwellinghouse**, new floors should have a minimum REI 30 **fire resistance**. Any floor forming part of the enclosure to the **circulation space** between the loft conversion and the **final exit** should achieve a minimum rating of REI 30.
- The existing first-**storey** construction should have a minimum rating of R 30. The fire performance may be reduced for integrity and insulation, when both of the following conditions are met.
- Only one **storey** is added, containing a maximum of two **habitable rooms**.
  - The new **storey** has a maximum total area of 50m<sup>2</sup>.

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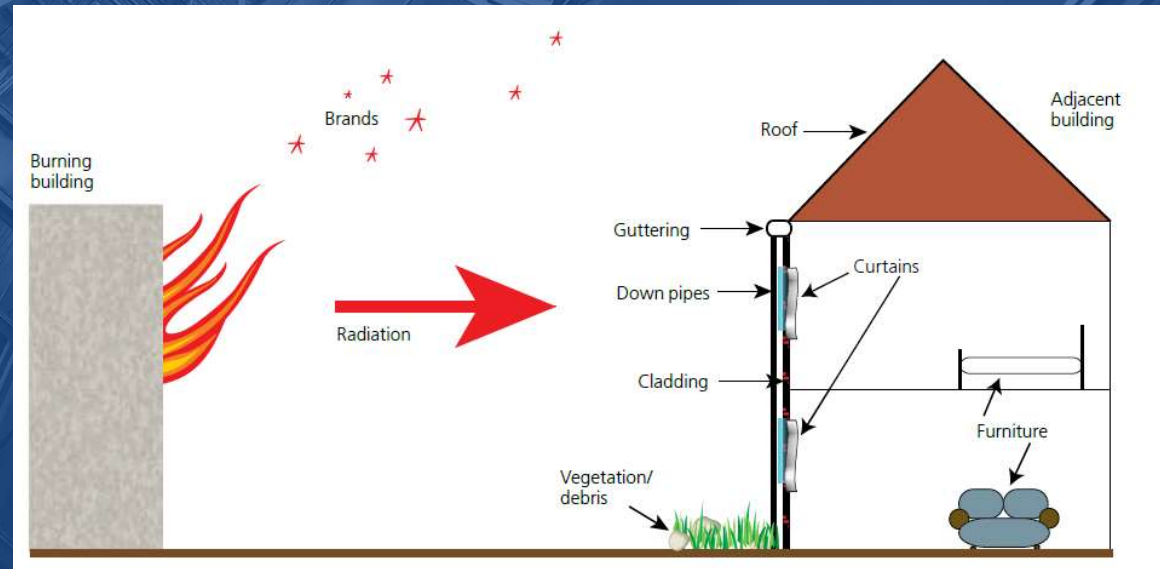


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## B4 – External Fire Spread Basic Principles



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## B4 – External Fire Spread – Buildings below 18m!

### Requirement

#### *Requirement*

#### *Limits on application*

#### **External fire spread**

- B4.** (1) The external walls of the building shall adequately resist the spread of fire over the walls and from one building to another, having regard to the height, use and position of the building.
- (2) The roof of the building shall adequately resist the spread of fire over the roof and from one building to another, having regard to the use and position of the building.

### Roofs

**11.14** Roofs with a pitch of more than 70 degrees to the horizontal should be assessed in accordance with this section. Vertical parts of a pitched roof, such as dormer windows, should be included *only* if the slope of the roof exceeds 70 degrees.

It is a matter of judgement whether a continuous run of dormer windows that occupies most of a steeply pitched roof should be treated as a wall rather than a roof.

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## B4 – External Fire Spread

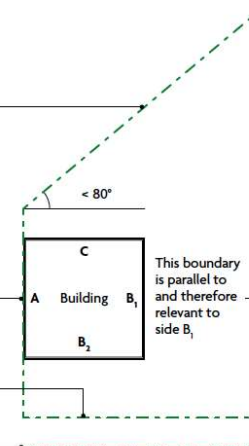
See para 11.5

This boundary is at less than 80 degrees to side C and is therefore relevant to side C

This boundary coincides with and is therefore relevant to side A

The boundary is parallel to side B<sub>1</sub>

But the relevant boundary may be the centre line of a road, railway, canal or river



### NOTES:

This diagram sets out the rules that apply in respect of a boundary for it to be considered as a relevant boundary.

For a boundary to be relevant it should comply with one of the following:

- Coincide with the side of the building (A).
- Be parallel to the side of the building (B<sub>1</sub> or B<sub>2</sub>).
- Be at an angle of maximum 80 degrees to the side of the building (C).

Diagram 11.2 Relevant boundary

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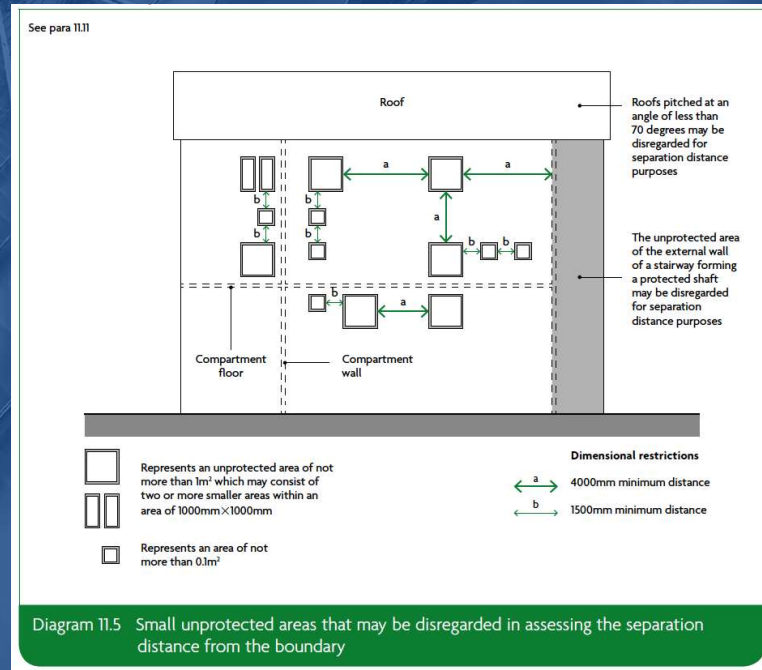
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## B4 – External Fire Spread



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## B4 – External Fire Spread – Unprotected area methods



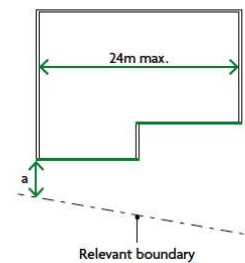
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### Method 1

**11.17** This method applies to small buildings intended to be used for blocks of flats or dwellinghouses.

**11.18** The building should not exceed three storeys in height (excluding basements) or 24m in length. Each side of the building should meet the limits stated in Diagram 11.7. Any small unprotected areas falling within the limits shown in Diagram 11.5 can be ignored.

See para 11.18



Minimum distance (a) between side of building and relevant boundary (m)	Maximum total area of unprotected areas (m <sup>2</sup> )
1	5.6
2	12
3	18
4	24
5	30
6	No limit

Diagram 11.7 Permitted unprotected areas in small residential buildings

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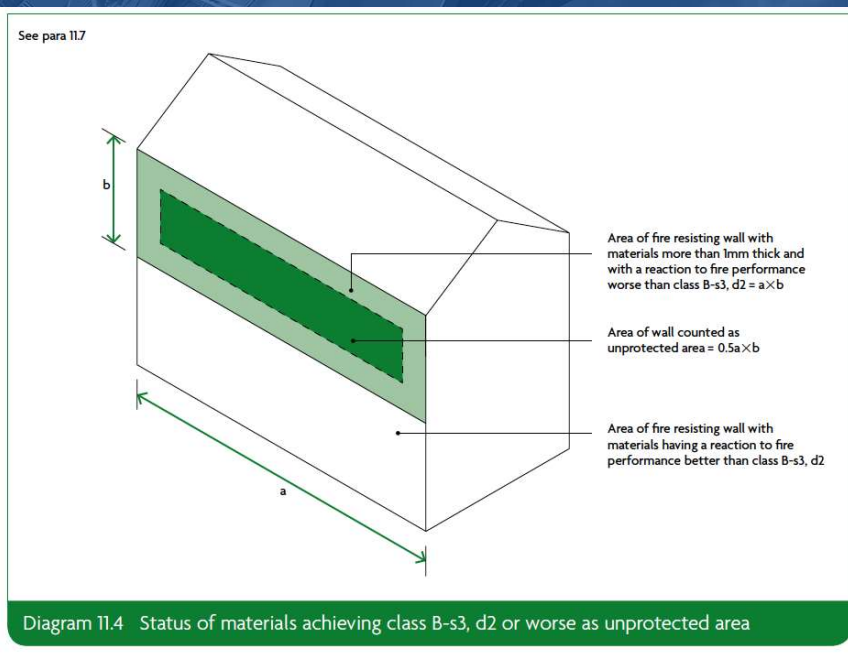
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## B4 – External Fire Spread – Wall finishes (cladding)



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# Common issues with loft conversions

Staircases

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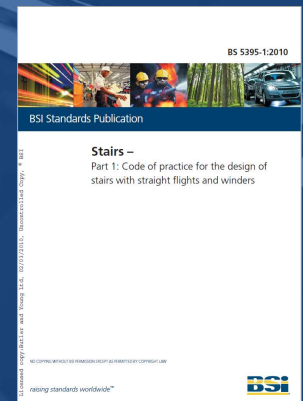
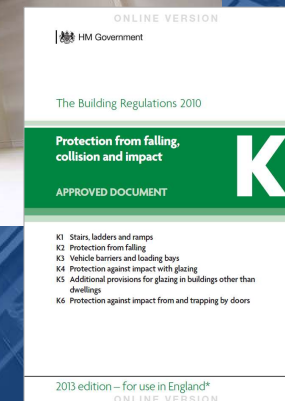
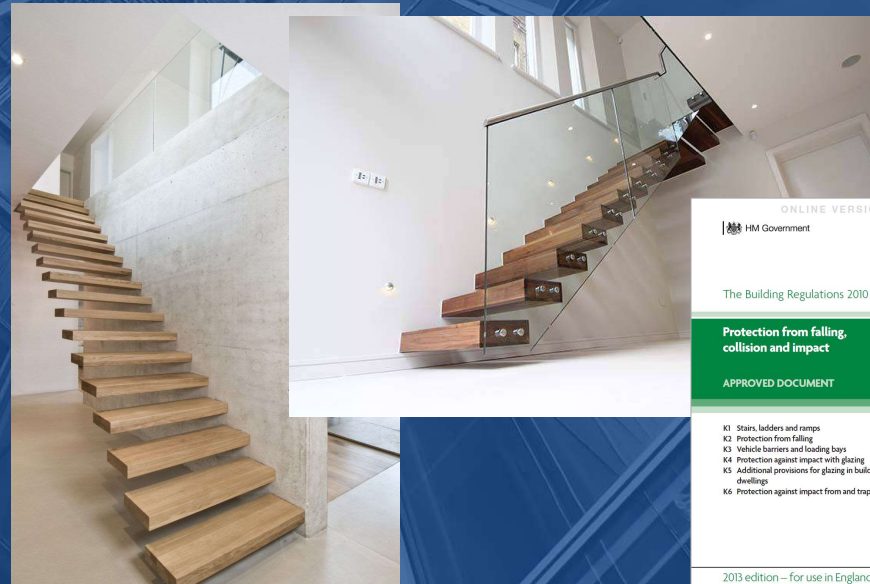
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## Grand stair designs...



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## Mind your head

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HM Government

The Building Regulations 2010

**Protection from falling, collision and impact**

**K**

APPROVED DOCUMENT

- K1 Stairs, ladders and ramps
- K2 Protection from falling
- K3 Vehicle barriers and loading bays
- K4 Protection against impact with glazing
- K5 Additional provisions for glazing in buildings other than dwellings
- K6 Protection against impact from and trapping by doors

2013 edition – for use in England\*  
ONLINE VERSION

See para 1.11

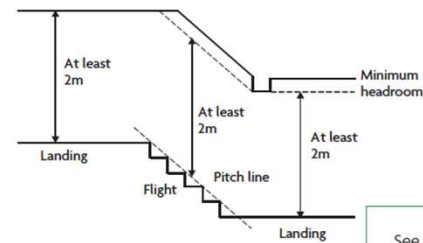


Diagram 1.3 Minimum headroom



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See para 1.13

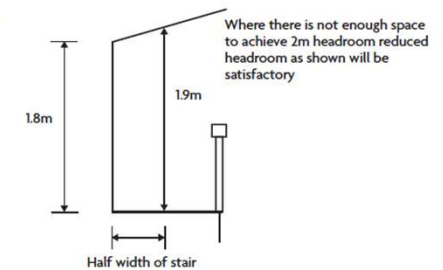


Diagram 1.4 Reduced headroom for loft conversions

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# Common issues with loft conversions

Roof ventilation and energy conservation

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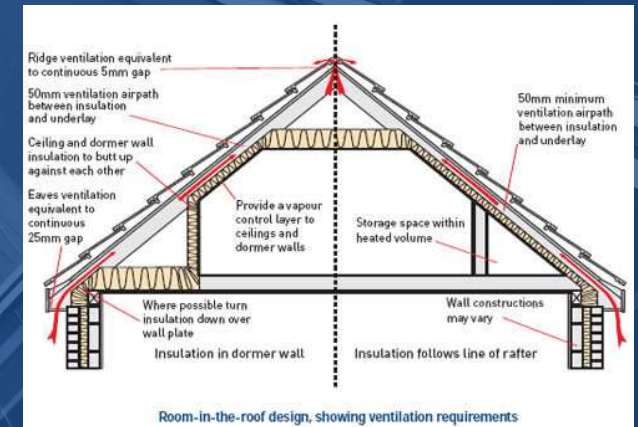
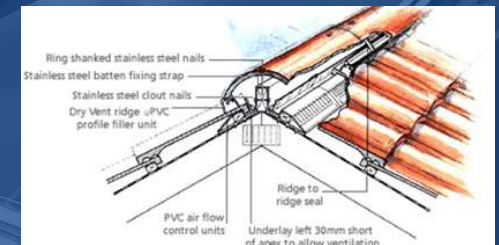
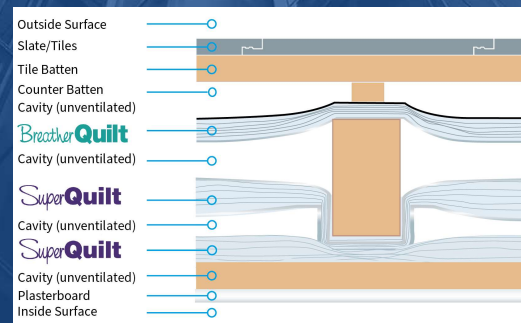
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# Insulation and Ventilation

Traditional roofs – PIR insulation & ventilate eaves & ridge

Hybrid roofs – incl. recovering with breather felt or similar (check!)

Multifoil insulation



<https://buildme.ie/attic-conversion-where-to-start/>

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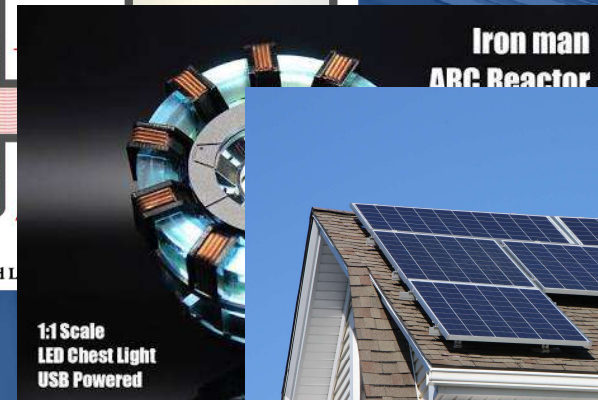
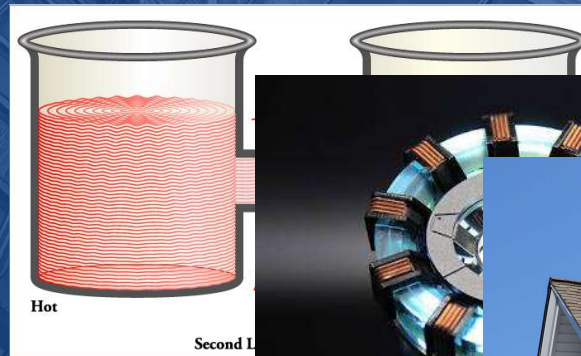


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## Final Thought!

Energy generation focus??



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