

# The Building Regulations 2010

## The Merged Approved Documents



For use in England

July 2021 compilation of individual approved documents

# Main changes in the July 2021 edition

This document of the Approved Documents includes the 2021 editions of Approved Document B volume 1: Dwellings and Approved Document B volume 2: Buildings other than dwellings, which took effect on 26 November 2020 for use in England. The 2019 editions of Approved Document B will continue to apply where a building notice or an initial notice has been given to, or full plans deposited with, a local authority before 26 November 2020 and either the building work to which it relates:

- a. has started before that day; or
- b. is started before 29 January 2021

The changes focus on the following fire safety provisions in blocks of flats:

- a. Sprinklers: A reduction in the trigger height from 30m to 11m.
- b. Wayfinding signage for the fire service: A new recommendation for floor identification and flat indication signage within blocks of flats with storeys over 11m

In addition a typographical error is corrected in both volumes. Purpose group number 2 is now included in reference to 'residential' buildings in the guidance on boundaries.

Date	Amendment
July 2021 edition	Incorporating 2020 editions of Approved Document B1 and Approved Document B2

# Using the Merged Approved Documents

## How to use the Merged Approved Documents

This document combines the approved documents into a single PDF. Each approved document is self-contained and has its own introduction. Each introduction relates only to the corresponding approved document. Each introduction also contains information on when the document's guidance came into effect (or will come into effect). It is important to check that the version of each approved document you are using remains current and is the correct version for your project. Please refer to the Ministry of Housing, Communities and Local Government website to check, and confirm with your building control body if in doubt.

## Key features

The Merged Approved Documents enable the user to:

- undertake a word search across all of the approved documents
- cut and paste text and diagrams into other documents
- add notes to a saved copy
- use an index to access individual sections of the guidance

## Correction to Approved Document K

The heading in section 1.18 of the online version of Approved Document K have been corrected to match the print version.

## Forthcoming changes

Please check the Ministry of Housing, Communities and Local Government's website to ensure that each approved document you are using is current for your project. This is particularly important in relation to Approved Document B as this has been subject to frequent update. It is intended that the Merged Approved Documents will be updated whenever an amendment or revision to an approved document is made.

# The Building Regulations 2010

## Materials and workmanship

# 7

### APPROVED DOCUMENT

## Regulation 7

2013 edition incorporating 2018 amendments –  
for use in England\*

# Main changes in the 2013 edition

This approved document supports regulation 7: Materials and workmanship. It takes effect on 1 July 2013 and is for use in England\*. The 1999 edition will continue to apply to work started before 1 July 2013, or to work subject to a building notice, full plans application or initial notice submitted before 1 July 2013.

## **There is no change to Regulation 7. The main changes in this approved document are that:**

- The document has been updated to reflect the full implementation of European Regulation 305/2011/EU-CPR covering construction products, referred to as the Construction Products Regulation, from 1 July 2013. This Regulation requires that products covered by a harmonised European product standard or conforming to a European Technical Assessment should normally have CE marking.
- Reference to the environmental impact of building work has been deleted.
- Guidance on resistance to moisture and substances in the subsoil has been deleted; this is now included in Approved Document C.
- Examples of materials susceptible to changes in their properties have been deleted. (In the case of intumescent coatings, durability testing is now an established element of testing of such products.)
- A new-style format has been used.

## **Main changes made by the 2018 amendments**

Paragraph 1.28 has been inserted in line with the introduction of regulation 7(2).

\* This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No. 2) Order 2009.

# The approved documents

## What is an approved document?

The Secretary of State has approved a series of documents that give practical guidance about how to meet the requirements of the Building Regulations 2010 for England. Approved documents give guidance on each of the technical parts of the regulations and on regulation 7 (see the back of this document).

Approved documents set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirements of the Building Regulations to which they refer. If you follow the guidance in an approved document, there will be a presumption of compliance with the requirements covered by the guidance. However, compliance is not guaranteed; for example, 'normal' guidance may not apply if the particular case is unusual in some way.

Note that there may be other ways to comply with the requirements – *there is no obligation to adopt any particular solution contained in an approved document*. If you prefer to meet a relevant requirement in some other way than described in an approved document, you should discuss this with the relevant building control body.

In addition to guidance, some approved documents include provisions that must be followed exactly, as required by regulations or where methods of test or calculation have been prescribed by the Secretary of State.

Each approved document relates only to the particular requirements of the Building Regulations that the document addresses. However, building work must also comply with any other applicable requirements of the Building Regulations.

## How to use this approved document

This document uses the following conventions.

- a. Text against a green background is an extract from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations.
- b. Key terms, printed in green, are defined in Appendix A.
- c. When this approved document refers to a named standard or other document, the relevant version is listed in Appendix B. However, if the issuing body has revised or updated the listed version of the standard or document, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations.

**NOTE:** Standards and technical approvals may also address aspects of performance or matters that are not covered by the Building Regulations, or they may recommend higher standards than required by the Building Regulations.

## Where you can get further help

If you do not understand the technical guidance or other information in this approved document or the additional detailed technical references to which it directs you, you can seek further help through a number of routes, some of which are listed below.

- a. The Planning Portal website: [www.planningportal.gov.uk](http://www.planningportal.gov.uk).
- b. *If you are the person undertaking the building work:* either from your local authority building control service or from an approved inspector.
- c. *If you are registered with a competent person scheme:* from the scheme operator.
- d. *If your query is highly technical:* from a specialist or an industry technical body for the relevant subject.

# The Building Regulations

The following is a high level summary of the Building Regulations relevant to most types of building work. Where there is any doubt you should consult the full text of the regulations, available at [www.legislation.gov.uk](http://www.legislation.gov.uk).

## Building work

Regulation 3 of the Building Regulations defines ‘building work’. Building work includes:

- a. the erection or extension of a building
- b. the provision or extension of a controlled service or fitting
- c. the material alteration of a building or a controlled service or fitting.

Regulation 4 states that building work should be carried out in such a way that, when work is complete:

- a. for new buildings or work on a building that complied with the applicable requirements of the Building Regulations: the building complies with the applicable requirements of the Building Regulations.
- b. for work on an existing building that did not comply with the applicable requirements of the Building Regulations:
  - (i) the work itself must comply with the applicable requirements of the Building Regulations
  - (ii) the building must be no more unsatisfactory in relation to the requirements than before the work was carried out.

## Material change of use

Regulation 5 defines a ‘material change of use’ in which a building or part of a building that was previously used for one purpose will be used for another.

The Building Regulations set out requirements that must be met before a building can be used for a new purpose. To meet the requirements, the building may need to be upgraded in some way.

## Energy efficiency requirements

Part 6 of the Building Regulations imposes additional specific requirements for energy efficiency.

If a building is extended or renovated, the energy efficiency of the existing building or part of it may need to be upgraded.

## Notification of work

Most building work and material changes of use must be notified to a building control body unless one of the following applies.

- a. It is work that will be self-certified by a registered competent person or certified by a registered third party.
- b. It is work exempted from the need to notify by regulation 12(6A) of, or Schedule 4 to, the Building Regulations.

## Responsibility for compliance

People who are responsible for building work (e.g. agent, designer, builder or installer) must ensure that the work complies with all applicable requirements of the Building Regulations. The building owner may also be responsible for ensuring that work complies with the Building Regulations. If building work does not comply with the Building Regulations, the building owner may be served with an enforcement notice.

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# Approved Document 7: Materials and workmanship

## Summary

**0.1** This approved document gives guidance on how to comply with regulation 7 of the Building Regulations. It contains the following sections:

**Section 1:** Materials

**Section 2:** Workmanship.

## Continuing control

**0.2** There are no provisions under the Building Regulations for continuing control over the materials used in building work following completion of the work. However, under section 19 of the Building Act 1984, local authorities may impose conditions with regard to the proposed use of prescribed short-lived materials, even when the plans conform to the regulations. However, no materials are currently prescribed for the purpose of section 19.

## Interaction with other legislation

**0.3** The Construction Products Regulation requires that construction products that are covered by a harmonised European product standard or conform to a European Technical Assessment should normally have CE marking.

# Regulation 7 of the Building Regulations

This approved document gives guidance on how to meet regulation 7 of the Building Regulations 2010.

## Regulation

### Materials and workmanship

- 7.** (1) Building work shall be carried out—
- (a) with adequate and proper materials which—
    - (i) are appropriate for the circumstances in which they are used,
    - (ii) are adequately mixed or prepared, and
    - (iii) are applied, used or fixed so as adequately to perform the functions for which they are designed; and
  - (b) in a workmanlike manner.

# Performance and limitations

## Performance

In the Secretary of State's view, you will meet the requirements of regulation 7 if you satisfy both of the following conditions.

- a. **Materials** are of a suitable nature and quality in relation to the purposes and conditions of their use.
- b. Workmanship is such that, where relevant, **materials** are adequately mixed or prepared and applied, used or fixed so as to perform adequately the functions for which they are intended.

**Materials** include:

- a. manufactured products such as components, fittings, items of equipment and systems
- b. naturally occurring **materials** such as stone, timber and thatch
- c. backfilling for excavations in connection with building work.

## Limitations

Regulation 7 applies to all building work. However, in accordance with regulation 8 and Schedule 1, the standards of **materials** and workmanship need be no more than are necessary to:

- a. *for Parts A–D, F–K, N and P (except for paragraphs G2, H2 and J7) of Schedule 1: secure reasonable standards of health or safety for people in or about the building*
- b. *for Part E of Schedule 1: secure reasonable resistance to the passage of sound for the welfare and convenience of people in or about the building*
- c. *for Part L of Schedule 1: conserve fuel and power*
- d. *for Part M of Schedule 1: provide access to buildings and their facilities for people.*

## Section 1: Materials

- 1.1** Building work must meet the functional requirements of Schedule 1 to the Building Regulations. Approved documents refer to **materials** covered by harmonised European product standards, British Standards and other technical specifications. However, there is no obligation to adopt any particular solution contained in an approved document in order to meet functional requirements; the references are not exclusive and other **materials** may be suitable in the particular circumstances.

### Ways of establishing the fitness of materials

- 1.2** You can assess the suitability of a **material** for use for a specific purpose in a number of ways, as described in paragraphs 1.3 to 1.21.

#### CE marking under the Construction Products Regulation

- 1.3** Many **materials** are construction products that have CE marking under the Construction Products Regulation (305/2011/EU-CPR).

The Construction Products Regulation requires that construction products on the EU market covered by a harmonised European product standard should normally have CE marking. In addition, manufacturers of products not covered by a harmonised standard can choose to affix CE marking to their products by obtaining a **European Technical Assessment**.

**NOTE:** You can find a list of the harmonised product standards under the Construction Products Regulation on the **NANDO** information system website at <http://ec.europa.eu/enterprise/newapproach/nando/index.cfm?fuseaction=cpd.hs>.

- 1.4** CE marking includes the reference of the product standard and the levels or classes of performance being declared against some or all of the characteristics covered by the standard. The CE marking should be on the product, its label, the packaging or accompanying documents. The CE symbol by itself does not necessarily indicate that the **material** is suitable for the building work.
- 1.5** In addition to CE marking, the product will have a declaration of performance containing more detailed information on the product. This may be a paper or electronic document, or it may be on a website.

It is essential to check that the declared performance is suitable for the building works.

- 1.6** In the absence of indications to the contrary, the **building control body** should assume that the information given in the CE marking and declaration of performance is accurate and reliable, and that the product meets the declared performance.
- 1.7** If the declared performance of a product is suitable for its intended use, the **building control body** should not prohibit or impede the use of the product.

#### CE marking under other EU directives and regulations

- 1.8** Products may have CE marking under European legislation such as the Gas Appliances Directive or the Pressure Equipment Directive. Such CE marking shows that the product meets the essential requirements set out in the legislation – for example, minimum safety requirements – and can be placed on the EU market.

- 1.9** Some products have CE marking in accordance with both the Construction Products Regulation and other legislation. The CE marking shows that the product complies with the requirements in all relevant EU legislation.

### British Standards

- 1.10** Nearly all British Standards for construction products are the British versions of harmonised European standards used for CE marking. The BSI numbering policy is to adopt the CEN numbering, prefaced with BS, e.g. **BS EN 197-1:2000**.
- 1.11** Some British Standards are the British version of non-harmonised European standards; these also adopt the CEN numbering, prefaced with BS. These do not contain an Annex ZA, so CE marking cannot be affixed to products made to these standards.
- 1.12** Some British Standards for products not covered by a European standard will continue to exist.
- 1.13** Where a construction product has been made and assessed in accordance with one or more British Standards referred to in 1.11 and 1.12, this may show whether the product is suitable for its intended use.

### Other national and international technical specifications

- 1.14** An international technical specification, including those prepared by ISO, or a national technical specification of a country other than the UK, may be used to demonstrate that a product not covered by a harmonised European standard meets the performance requirements of the Building Regulations.

Where necessary, the person who intends to carry out the work should obtain translations of specifications and demonstrate how the material meets the requirements of regulation 7.

**NOTE:** The national technical specifications of EU member states (and non-EU countries that are full members of CEN) are being progressively replaced by harmonised European standards, as is the case with British Standards.

### Independent certification schemes

- 1.15** There are many independent product certification schemes in the UK and elsewhere that may provide information on the performance of a product. Such schemes certify that a material complies with the requirements of a recognised document and indicates it is suitable for its intended purpose and use. These may be in addition to, but not conflict with, CE marking.
- NOTE:** Materials which are not certified by an independent scheme might still conform to a relevant standard.
- 1.16** Accreditation of a certification body by a national accreditation body belonging to the European co-operation for Accreditation (EA) provides a means of demonstrating that their certification scheme can be relied upon. In the UK, most independent certification bodies are accredited by the United Kingdom Accreditation Service (UKAS), which belongs to the EA.

It is important to check the scope of the accreditation of a certification body, as accreditation might cover only part of the certification body's testing or certification business.

### Tests and calculations

- 1.17** Where there is no relevant harmonised European standard, tests, calculations or other means may be used to demonstrate that the material can perform the function for which it is intended. UKAS or an equivalent national accreditation body belonging to the EA may accredit the testing laboratories; this accreditation provides a means of showing that tests can be relied on.

### Past experience

- 1.18** Past experience, such as use in an existing building, may show that the **material** can perform the function for which it is intended.

### Sampling

- 1.19** Under regulation 46 of the Building Regulations, local authorities have the power to take samples as necessary to establish whether **materials** to be used in building work comply with the provisions of the regulations.
- 1.20** Regulation 46 does not apply to any work specified in an initial notice or to any work for which a final certificate has been given by an approved inspector and accepted by the local authority.
- 1.21** Regulation 8 of the Building (Approved Inspectors etc.) Regulations 2010 provides that an approved inspector, having given an initial notice which continues to be in force, may take samples of **material** as are reasonable to establish within the limits of professional skill and care that regulation 7 of the Building Regulations or any other applicable regulations are complied with.

### Short-lived materials

- 1.22** Some **materials**, in the absence of special care, may be considered unsuitable because of their rapid deterioration in relation to the expected life of the building.
- 1.23** A short-lived **material** which is readily accessible for inspection, maintenance and replacement may meet the requirements of the regulations if the consequences of failure are not likely to be serious to the health or safety of people in and around the building.
- 1.24** If a short-lived **material** is not readily accessible for inspection, maintenance and replacement, and the consequences of failure are likely to be serious for health or safety, it is unlikely that the **material** will meet the requirements of the regulations.
- 1.25** As noted in paragraph 0.2, local authorities have the power to impose conditions on the use of short-lived **materials**.

### Materials susceptible to changes in their properties

- 1.26** The properties of some **materials** can change in certain environmental conditions. These changes can affect the performance of the **materials** over time.
- 1.27** **Materials** that are susceptible to changes in their properties may be used in building work and will meet the requirements of the regulations if the residual properties, including the structural properties, meet both of the following conditions.
- Residual properties can be estimated at the time of their incorporation in the work.
  - Residual properties are shown to be adequate for the building to perform the function for which it is intended, for the expected life of the building.

### Non-combustible materials in external walls of tall buildings

- 1.28** The Building Regulations restrict the use of combustible **materials** in the external walls of certain buildings over 18m in height. Refer to regulation 7(2) of the Building Regulations and to Approved Document B: volume 2, part B4 for details.

## Section 2: Workmanship

### Ways of establishing the adequacy of workmanship

**2.1** Examples of ways to establish the adequacy of workmanship are described in paragraphs 2.2 to 2.11.

#### CE marking

**2.2** If a **material** has CE marking, workmanship may be specified in the relevant **European Technical Assessment** or harmonised product standard.

#### Standards

**2.3** Methods of carrying out different types of work are also given in British Standards or other appropriate technical specifications.

**NOTE:** The **BS 8000** series of standards on workmanship on building sites combines guidance from other **BSI** codes and standards. The various parts of **BS 8000** are listed in appendix B.

#### Independent certification schemes

**2.4** Some independent certification schemes specify how workmanship will deliver a declared level of performance. The person carrying out the work should show that the workmanship will provide the appropriate level of protection and performance.

**2.5** Schemes, including competent person self-certification schemes, that register installers of **materials** can provide a means of ensuring that work has been carried out by knowledgeable contractors to appropriate standards.

#### Management systems

**2.6** The quality of workmanship is covered by a quality management scheme, such as one that complies with the relevant recommendations of **BS EN ISO 9000** and related series of standards. There are a number of such **UKAS**-accredited schemes.

#### Past experience

**2.7** Past experience, such as use in an existing building, may show that workmanship is appropriate for the function for which it is intended.

#### Tests

**2.8** Tests can be used to show that workmanship is appropriate.

**2.9** In the following three instances, the Building Regulations require those carrying out building work to have testing carried out to demonstrate compliance.

- a. Sound insulation as described in regulation 41.
- b. Air flow rate of mechanical ventilation as described in regulation 42.
- c. Pressure testing as described in regulation 43.

- 2.10** Under regulation 45 of the Building Regulations 2010, regulation 8 of the Building (Approved Inspectors etc.) Regulations 2010 and section 33 of the Building Act 1984, **building control bodies** have powers to make tests as they consider necessary to establish whether building work complies with the requirements of regulation 7.
- 2.11** Those carrying out building work may voluntarily include testing in the activities they carry out to demonstrate that the work complies with the requirements of the regulations.

# Appendix A: Key terms

## The following are key terms used in this document:

### BSI

The British Standards Institution is the UK national standards body. BSI publishes European standards in the UK as BS EN. Further information is available at: [www.bsigroup.co.uk](http://www.bsigroup.co.uk)

### Building control body

A local authority or an approved inspector.

### CEN

The Comité Européen de Normalisation is the European standards body that prepares harmonised European product standards. Declarations of performance against such standards should provide sufficient information for any member state to allow the product onto its market and for specifiers and users to be able to assess whether the product is suitable for its intended use.

CEN also prepares non-harmonised European standards, such as test or calculation standards and standards for products or services that have not been mandated under a CE Marking Directive.

CEN does not issue standards directly, only through national standards bodies; **BSI** is the designated standards body for the UK.

Further information is available at: [www.cen.eu](http://www.cen.eu)

### EA

The European co-operation for Accreditation is the umbrella organisation for all national accreditation bodies in Europe. Product certification bodies, inspection bodies and test laboratories approved by national accreditation bodies belonging to EA are equivalent to those approved by **UKAS**.

Further information is available at: [www.european-accreditation.org](http://www.european-accreditation.org)

### European Technical Assessments

A favourable technical assessment issued under the European Construction Products Regulation 2011 that allows a manufacturer to affix CE markings on their products. Further information is available at: [www.eota.eu](http://www.eota.eu)

### ISO

The International Organization for Standardization is the worldwide federation of national standards institutions. Standards are identified by 'ISO' and a number. **ISO** standards may be published separately or transposed into the UK as BS **ISO** or BS EN **ISO**. Further information is available at: [www.iso.org](http://www.iso.org)

### Materials

Materials include manufactured products such as components, fittings, items of equipment and systems; naturally occurring **materials** such as stone, timber and thatch; and backfilling for excavations in connection with building work.

### NANDO

New Approach Notified and Designated Organisations is an information system produced by the European Commission. It lists the harmonised European standards and the bodies notified by member states to carry out conformity assessment tasks for CE marking. Further information is available at: <http://ec.europa.eu/enterprise/newapproach/nando>

### UKAS

The United Kingdom Accreditation Service is the sole national accreditation body recognised by the UK government to assess, against internationally agreed standards, organisations that provide certification, testing, inspection and calibration services. Accreditation by UKAS demonstrates the competence, impartiality and performance capability of these organisations. Further information is available at: [www.ukas.com](http://www.ukas.com)

## Appendix B: Standards referred to

**BS EN ISO 9000**

Quality management systems. Fundamentals and vocabulary [2005]

**BS EN ISO 9001**

Quality management systems. Requirements [2008]

**BS 8000-1**

Workmanship on building sites. Code of practice for excavation and filling [1989]

**BS 8000-2-1**

Workmanship on building sites. Code of practice for concrete work. Mixing and transporting concrete [1990 + AMD 9324].

**BS 8000-2-2**

Workmanship on building sites. Code of practice for concrete work. Sitework with in situ and precast concrete [1990]

**BS 8000-3**

Workmanship on building sites. Code of practice for masonry [2001]

**BS 8000-4**

Workmanship on building sites. Code of practice for waterproofing [1989]

**BS 8000-5**

Workmanship on building sites. Code of practice for carpentry, joinery and general fixings [1990]

**BS 8000-6**

Workmanship on building sites. Code of practice for slating and tiling of roofs and claddings [1990]

**BS 8000-7**

Workmanship on building sites. Code of practice for glazing [1990]

**BS 8000-8**

Workmanship on building sites. Code of practice for plasterboard partitions and dry linings [1994]

**BS 8000-9**

Workmanship on building sites. Cementitious levelling screeds and wearing screeds. Code of practice [2003]

**BS 8000-11**

Workmanship on building sites. Internal and external wall and floor tiling. Ceramic and agglomerated stone tiles, natural stone and terrazzo tiles and slabs, and mosaics. Code of practice [2011]

**BS 8000-12**

Workmanship on building sites. Code of practice for decorative wallcoverings and painting [1989]

**BS 8000-13**

Workmanship on building sites. Code of practice for above ground drainage and sanitary appliances [1989]

**BS 8000-14**

Workmanship on building sites. Code of practice for below ground drainage [1989]

**BS 8000-15**

Workmanship on building sites. Code of practice for hot and cold water services (domestic scale) [1990]

**BS 8000-16**

Workmanship on building sites. Code of practice for sealing joints in buildings using sealants [1997 + A1:2010]

# Appendix C: Documents referred to

## Legislation

Building Act 1984 c.55 (as amended)

Building Regulations 2010 (SI 2010/2214) (as amended)

Building (Approved Inspectors etc.) Regulations 2010 (SI 2010/2215) (as amended)

Construction Products Regulation (305/2011/EU-CPR)

Gas Appliances Directive (2009/142/EC)

Pressure Equipment Directive (97/23/EC)

The Welsh Ministers (Transfer of Functions) (No. 2) Order 2009 (SI 2009/3019)

# List of approved documents

The following publications give practical guidance on how to meet the Building Regulations. You can find the date of the edition approved by the Secretary of State at [www.gov.uk](http://www.gov.uk).

## **Approved Document A**

Structure

## **Approved Document B**

Fire safety

Volume 1: Dwellinghouses

Volume 2: Buildings other than dwellinghouses

## **Approved Document C**

Site preparation and resistance to contaminants and moisture

## **Approved Document D**

Toxic substances

## **Approved Document E**

Resistance to the passage of sound

## **Approved Document F**

Ventilation

## **Approved Document G**

Sanitation, hot water safety and water efficiency

## **Approved Document H**

Drainage and waste disposal

## **Approved Document J**

Combustion appliances and fuel storage systems

## **Approved Document K**

Protection from falling, collision and impact

## **Approved Document L1A**

Conservation of fuel and power in new dwellings

## **Approved Document L1B**

Conservation of fuel and power in existing dwellings

## **Approved Document L2A**

Conservation of fuel and power in new buildings other than dwellings

## **Approved Document L2B**

Conservation of fuel and power in existing buildings other than dwellings

## **Approved Document M**

Access to and use of buildings

Volume 1: Dwellings

Volume 2: Buildings other than dwellings

## **Approved Document P**

Electrical safety – Dwellings

## **Approved Document Q**

Security – Dwellings

## **Approved Document R**

Physical infrastructure for high-speed electronic communications networks

## **Approved Document 7**

Materials and workmanship

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## The Building Regulations 2010

# Structure



### APPROVED DOCUMENT

- A1**      **Loading**
- A2**      **Ground movement**
- A3**      **Disproportionate collapse**

## MAIN CHANGES MADE BY THE 2013 AMENDMENTS

The main changes, which apply only to England\*, are to:

- References to British Standard design standards
- Guidance on disproportionate collapse
- Wind maps
- Guidance on strip footings
- Materials and workmanship

There have been no changes to Part A of Schedule 1 to the Building Regulations.

## MAIN CHANGES MADE BY THE 2010 AMENDMENTS

The 2010 amendments reflect the Building Regulations 2010 and Building (Approved Inspectors etc) Regulations 2010. The changes mainly reflect regulation number changes as a result of re-ordering. There have been no amendments to the substantive requirements in Part A of Schedule 1 to the Building Regulations.

## MAIN CHANGES IN THE 2004 EDITION

The 2004 edition replaced the 1992 Edition (with 1994 and 2000 amendments edition). The main changes were:

- Guidance on the sizing of timber floors and roofs for traditional house construction removed, as the Timber Tables are now published by TRADA.
- Map of basic wind speeds revised.
- Stainless steel cavity wall ties specified for all houses regardless of their location.
- Guidance on masonry walls to dwellings extended.
- Guidance on concrete foundations to houses revised.
- Guidance on the design and construction of domestic garages extensively updated.
- Disproportionate collapse: the Application Limit to Requirement A3 (ie. the 5 storey limit) removed to bring all buildings under control of Requirement A3.

\* This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No. 2) Order 2009.

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# Use of guidance

## THE APPROVED DOCUMENTS

This document is one of a series that has been approved by the First Secretary of State for the purpose of providing practical guidance with respect to the requirements of Schedule 1 to and Regulation 7 of the Building Regulations 2010 (SI 2010/2214) for England and Wales.

**At the back of this document is a list of all the documents that have been approved and issued by the Secretary of State for this purpose.**

Approved Documents are intended to provide guidance for some of the more common building situations. However, there may well be alternative ways of achieving compliance with the requirements. **Thus there is no obligation to adopt any particular solution contained in an Approved Document if you prefer to meet the relevant requirement in some other way.**

### Other requirements

The guidance contained in an Approved Document relates only to the particular requirements of the Regulations which that document addresses. The building work will also have to comply with the requirements of any other relevant paragraphs in Schedule 1 to the Regulations.

There are Approved Documents which give guidance on each of the parts of Schedule 1 and on Regulation 7.

## LIMITATION ON REQUIREMENTS

In accordance with Regulation 8, the requirements in Part A of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about the buildings.

## MATERIALS AND WORKMANSHIP

Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations shall be carried out in accordance with regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in Approved Document 7.

Building Regulations are made for specific purposes, primarily the health and safety, welfare and convenience of people and for energy conservation. Standards and other technical specifications may provide relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance or matters which, although they relate to health and safety etc., are not covered by the Building Regulations.

When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

## OTHER HEALTH AND SAFETY LEGISLATION

Health and safety regulations such as the Workplace (Health, Safety and Welfare) Regulations 1992 may impose requirements on employers and those in control of buildings used as workplaces in relation to certain physical characteristics of the workplace. There are also requirements in health and safety law which affect building design. In particular, regulation 11 of the Construction (Design and Management) Regulations 2007 places duties on designers including the need to take account of the Workplace (Health, Safety and Welfare) Regulations 1992 which relate to the design of, and materials used in, any structure intended for use as a workplace.

Where such regulations apply there may be confusion as to whether the Building Regulations or health and safety requirements take precedence, as both will apply. Where an inspector for the purposes of the Health and Safety at Work etc. Act 1974 has identified a contravention of such health and safety regulations they may seek to serve an improvement notice to secure compliance. In such circumstances the inspector is prevented by virtue of Section 23(3) of the Health and Safety at Work etc. Act 1974 from requiring measures which are more onerous than necessary to comply with any requirements of the Building Regulations, unless the specific requirement of health and safety regulations are themselves more onerous.

## OTHER FORMS OF HOUSE CONSTRUCTION

This Approved Document includes guidance on structural elements of residential buildings of traditional masonry construction. It is recognised, however, that there are other suitable forms of construction in use in the housing sector some of which (e.g. timber framed) have been in common use for a number of years and have demonstrated an adequate performance in compliance with the A1 requirement. Such alternative forms include prefabricated timber, light steel and precast concrete framed construction.

A number of guidance documents relating to these alternative forms are presently being developed by industry. The intention is to reference these in this Approved Document as soon as they become available and are approved by the Secretary of State.

## BRITISH STANDARDS

The British Standards Institution notified the British Standards for structural design referenced in the 2004 edition of this Approved Document as withdrawn on 31 March 2010. British Standards for structural design based upon the Eurocodes were correspondingly implemented by the British Standards Institution on 1 April 2010 and it is these standards with their UK National Annexes which are now referenced in this Approved Document as practical guidance on meeting Part A requirements.

There may be alternative ways of achieving compliance with the requirements and there might be cases where it can be demonstrated that the use of withdrawn standards no longer maintained by the British Standards Institution continues to meet Part A requirements.

# The Requirements

This Approved Document deals with the following Requirements which are contained in the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>Loading</b>	
<b>A1.</b> (1) The building shall be constructed so that the combined dead, imposed and wind loads are sustained and transmitted by it to the ground:	
(a) safely; and	
(b) without causing such deflection or deformation of any part of the building, or such movement of the ground, as will impair the stability of any part of another building.	
(2) In assessing whether a building complies with sub-paragraph (1) regard shall be had to the imposed and wind loads to which it is likely to be subjected in the ordinary course of its use for the purpose for which it is intended.	
<b>Ground movement</b>	
<b>A2.</b> The building shall be constructed so that ground movement caused by:	
(a) swelling, shrinkage or freezing of the subsoil; or	
(b) land-slip or subsidence (other than subsidence arising from shrinkage), in so far as the risk can be reasonably foreseen, will not impair the stability of any part of the building.	

# Guidance

## Introduction

**0.1** In the Secretary of State's view the requirements of A1 and A2 will be met by following the recommendations given in the documents listed in Section 1 or by adopting the guidance in Sections 2-4:

- a. **Section 1** is relevant to all building types and lists Codes, Standards and other references for structural design and construction but, where they do not give precise guidance, consideration should be given to paragraph 0.2.
- b. **Section 2** give sizes of structural elements for certain residential buildings and other small buildings of traditional construction.
- c. **Section 3** gives guidance on the support and fixing of wall cladding.
- d. **Section 4** gives guidance where roofs are to be re-covered as a material alteration as defined in the Regulations.

**0.2** The safety of a structure depends on the successful combination of design and completed construction, particularly:

- a. The design should be based on identification of the hazards to which the structure is likely to be subjected and assessment of the risks. The selection of relevant critical situations for design should be made reflecting the conditions that can reasonably be foreseen during future use.
- b. Loading. Dead load, imposed load and wind load should be in accordance with the current Codes of practice referred to in Section 1 of this document.
- c. Properties of materials.
- d. Detailed design and assembly of the structure.
- e. Safety factors.
- f. Workmanship.

The numeric values of safety factors, whether expressed explicitly or implicitly in design equations, or design values, should be derived from considerations of the above aspects of design and construction as a whole. A change in any one of these aspects may disturb the safety of the structure.

Loads used in calculations should allow for possible dynamic, concentrated and peak load effects that may occur.

**0.3** Grandstands and structures erected in places of public assembly may need to sustain the synchronous or rhythmic movement of numbers of people. It is important to ensure that the design of the structure takes these factors into account so as to avoid the structure being impaired or causing alarm to people using the structure.

Guidance on the design and testing of grandstands may be found in '*Dynamic performance requirements for permanent grandstands subject to crowd action – Recommendations for management, design and assessment*' published by The Institution of Structural Engineers, December 2008.

# Section 1: Codes, standards and references for all building types

## Introduction

**1.1** This section is relevant to all building types and lists codes, standards and other references for structural design and construction.

## References

### 1.2 Basis of structural design and loading:

Eurocode: Basis of Structural Design

BS EN 1990:2002+A1:2005 Eurocode – Basis of structural design; with UK National Annex to BS EN 1990:2002+A1:2005

Eurocode 1: Actions on Structures

BS EN 1991-1-1:2002 Eurocode 1: Actions on structures – Part 1.1: General actions – Densities, self weight, imposed loads for buildings; with UK National Annex to BS EN 1991-1-1:2002

BSI PD 6688-1-1:2011 Published Document – Recommendations for the design of structures to BS EN 1991-1-1

BS EN 1991-1-3:2003 Eurocode 1: Actions on structures – Part 1.3: General actions – Snow loads; with UK National Annex to BS EN 1991-1-3:2003

BS EN 1991-1-4:2005+A1:2010 Eurocode 1: Actions on structures – Part 1.4: General actions – Wind actions; with UK National Annex to BS EN 1991-1-4:2005+A1:2010

BSI PD 6688-1-4:2009 Published Document – Background information to the National Annex to BS EN 1991-1-4 and additional guidance

BS EN 1991-1-5:2003 Eurocode 1: Actions on structures – Part 1.5: General actions – Thermal actions; with UK National Annex to BS EN 1991-1-5:2003

BS EN 1991-1-6:2005 Eurocode 1: Actions on structures – Part 1.6: General actions – Actions during execution; with UK National Annex to BS EN 1991-1-6:2005

BS EN 1991-1-7:2006 Eurocode 1: Actions on structures – Part 1.7: General actions – Accidental actions; with UK National Annex to BS EN 1991-1-7:2006

BSI PD 6688-1-7:2009 Published Document – Recommendations for the design of structures to BS EN 1991-1-7

BS EN 1991-3:2006 Eurocode 1: Actions on structures – Part 3: Actions induced by cranes and machinery; with UK National Annex to BS EN 1991-3:2006

### 1.3 Structural work of reinforced, pre-stressed or plain concrete:

Eurocode 2: Design of Concrete Structures

BS EN 1992-1-1:2004 Eurocode 2: Design of concrete structures – Part 1.1: General rules and rules for buildings; with UK National Annex to BS EN 1992-1-1:2004

BSI PD 6687-1:2010 Published Document – Background paper to the UK National Annexes to BS EN 1992-1 and BS EN 1992-3

BS EN 13670:2009 Execution of concrete structures

### 1.4 Structural work of steel:

Eurocode 3: Design of Steel Structures

BS EN 1993-1-1:2005 Eurocode 3: Design of steel structures – Part 1.1: General rules and rules for buildings; with UK National Annex to BS EN 1993-1-1:2005

BS EN 1993-1-3:2006 Eurocode 3: Design of steel structures – Part 1.3: General rules – Supplementary rules for cold-formed members and sheeting; with UK National Annex to BS EN 1993-1-3:2006

BS EN 1993-1-4:2006 Eurocode 3: Design of steel structures – Part 1.4: General rules – Supplementary rules for stainless steels; with UK National Annex to BS EN 1993-1-4:2006

BS EN 1993-1-5:2006 Eurocode 3: Design of steel structures – Part 1.5: Plated structural elements; with UK National Annex to BS EN 1993-1-5:2006

BS EN 1993-1-6:2007 Eurocode 3: Design of steel structures – Part 1.6: Strength and stability of shell structures

BS EN 1993-1-7:2007 Eurocode 3: Design of steel structures – Part 1.7: Plated structures subject to out of plane loading

BS EN 1993-1-8:2005 Eurocode 3: Design of steel structures – Part 1.8: Design of joints; with UK National Annex to BS EN 1993-1-8:2005

BS EN 1993-1-9:2005 Eurocode 3: Design of steel structures – Part 1.9: Fatigue; with UK National Annex to BS EN 1993-1-9:2005

BSI PD 6695-1-9:2008 Published Document – Recommendations for the design of structures to BS EN 1993-1-9

BS EN 1993-1-10:2005 Eurocode 3: Design of steel structures – Part 1.10: Material toughness and through-thickness properties; with UK National Annex to BS EN 1993-1-10:2005

BSI PD 6695-1-10:2009 Published Document – Recommendations for the design of structures to BS EN 1993-1-10

BS EN 1993-1-11:2006 Eurocode 3: Design of steel structures – Part 1.11: Design of structures with tension components; with UK National Annex to BS EN 1993-1-11:2006

BS EN 1993-1-12:2007 Eurocode 3: Design of steel structures – Part 1.12: Additional rules for the extension of EN 1993 up to steel grades S 700; with UK National Annex to BS EN 1993-1-12:2007

BS EN 1993-5:2007 Eurocode 3: Design of steel structures – Part 5: Piling; with UK National Annex to BS EN 1993-5:2007+A1:2012

BS EN 1993-6:2007 Eurocode 3: Design of steel structures – Part 6: Crane supporting structures; with UK National Annex to BS EN 1993-6:2007

BS EN 1090-2:2008+A1:2011 Execution of steel structures and aluminium structures – Part 2: Technical requirements for the execution of steel structures

BRE Digest 437 Industrial platform floors: mezzanine and raised storage

### **1.5 Structural work of composite steel and concrete:**

Eurocode 4: Design of Composite Steel and Concrete Structures

BS EN 1994-1-1:2004 Eurocode 4: Design of composite steel and concrete structures – Part 1.1: General rules and rules for buildings; with UK National Annex to BS EN 1994-1-1:2004

### **1.6 Structural work of timber:**

Eurocode 5: Design of Timber Structures

BS EN 1995-1-1:2004+A1:2008 Eurocode 5: Design of timber structures – Part 1.1: General – Common rules and rules for buildings; with UK National Annex to BS EN 1995-1-1:2004+A1:2008

BSI PD 6693-1:2012 Published Document – Recommendations for the design of timber structures to Eurocode 5: Design of timber structures Part 1: General – Common rules and rules for buildings

BS 8103-3:2009 Structural design of low-rise buildings – Part 3: Code of practice for timber floors and roofs for housing

### **1.7 Structural work of masonry:**

Eurocode 6: Design of Masonry Structures

BS EN 1996-1-1:2005+A1:2012 Eurocode 6: Design of masonry structures – Part 1.1: General rules for reinforced and unreinforced masonry structures; with UK National Annex to BS EN 1996-1-1:2005+A1:2012

BS EN 1996-2:2006 Eurocode 6: Design of masonry structures – Part 2: Design considerations, selection of materials and execution of masonry; with UK National Annex to BS EN 1996-2:2006

BSI PD 6697:2010 Published Document – Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2

BS EN 1996-3:2006 Eurocode 6: Design of masonry structures – Part 3: Simplified calculation methods for unreinforced masonry structures; with UK National Annex to BS EN 1996-3:2006

BS 8103-1:2011 Structural design of low-rise buildings – Part 1: Code of Practice for stability, site investigation, foundations, precast concrete floors and ground floor slabs for housing

BS 8103-2:2005 Structural design of low-rise buildings – Part 2: Code of practice for masonry walls for housing

### **1.8 Geotechnical work and foundations:**

Eurocode 7: Geotechnical Design

BS EN 1997-1:2004 Eurocode 7: Geotechnical design – Part 1: General rules; with UK National Annex to BS EN 1997-1:2004

BS EN 1997-2:2007 Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing; with UK National Annex to BS EN 1997-2:2007

### **1.9 Seismic aspects:**

Eurocode 8: Design of Structures for Earthquake Resistance

BS EN 1998-1:2004+A1:2013 Eurocode 8: Design of structures for earthquake resistance – Part 1: General rules, seismic actions and rules for buildings; with UK National Annex to BS EN 1998-1:2004

BS EN 1998-5:2004 Eurocode 8: Design of structures for earthquake resistance – Part 5: Foundations, retaining structures and geotechnical aspects; with UK National Annex to BS EN 1998-5:2004

BSI PD 6698:2009 Published Document – Recommendations for the design of structures for earthquake resistance to BS EN 1998

**1.10 Structural work of aluminium:**

Eurocode 9: Design of Aluminium Structures

BS EN 1999-1-1:2007+A1:2009 Eurocode 9: Design of aluminium structures – Part 1.1: General structural rules; with UK National Annex to BS EN 1999-1-1:2007+A1:2009

BS EN 1999-1-3:2007+A1:2011 Eurocode 9: Design of aluminium structures – Part 1.3: Structures susceptible to fatigue; with UK National Annex to BS EN 1999-1-3:2007+A1:2011

BSI PD 6702-1:2009 Published Document – Structural use of aluminium – Part 1: Recommendations for the design of aluminium structures to BS EN 1999

BS EN 1999-1-4:2007+A1:2011 Eurocode 9: Design of aluminium structures – Part 1.4: Cold-formed structural sheeting; with UK National Annex to BS EN 1999-1-4:2007

BS EN 1999-1-5:2007 Eurocode 9: Design of aluminium structures – Part 1.5: Shell structures; with UK National Annex to BS EN 1999-1-5:2007

BS EN 1090-3:2008 Execution of steel structures and aluminium structures – Part 3: Technical requirements for aluminium structures

BSI PD 6705-3:2009 Published Document – Structural use of steel and aluminium – Part 3: Recommendations for the execution of aluminium structures to BS EN 1090-3

## Ground movement (Requirement A2b)

**1.11** There may be known or recorded conditions of ground instability, such as that arising from landslides, disused mines or unstable strata which, if ignored, can have a devastating effect on the safety of a building and its environs. Such conditions should be taken into account in the design of the building and its foundations. Attention is drawn to DOE Planning Policy Guidance Note 14 Development on unstable land (obtainable from The Stationery Office), which sets out the broad planning and technical issues relating to development on unstable land.

The Department has also sponsored a series of reviews aimed at determining the scale and nature of problems arising from mining instability, natural underground cavities and adverse foundation conditions. Databases of both subsidence incidents and subsidence potential produced from these reviews are available from the following licence holders:

British Geological Survey, Sir Kingsley Dunham Centre, Keyworth, Nottingham NG12 5GG.

Landmark, 7 Abbey Court, Eagle Way, Exeter, Devon EX2 7HY.

Peter Brett Associates, 16 Westcote Road, Reading, Berkshire RG20 2DE.

Catalytic Data Ltd, The Spinney, 19 Woodlands Road, Bickley, Kent BRI 2AD.

The reports from these reviews, which include 1:250,000 scale maps showing the distribution of the physical constraints, are available from the following organisations:

Arup Geotechnics, 1991. Review of mining instability in Great Britain.

Obtainable from Arup Geotechnics, Bede House, All Saints, Newcastle-upon-Tyne NE1 2EB.

Applied Geology Ltd, 1994. Review of instability due to natural underground cavities in Great Britain.

Obtainable from Kennedy & Donkin Ltd, 14 Calthorpe Road, Edgbaston, Birmingham B15 1TH.

Wimpey Environmental Ltd, and National House Building Council, 1995. Foundation conditions in Great Britain, a guide for planners and developers. Obtainable from ESNR International Ltd, 16 Frogmore Road, Hemel Hempstead, Hertfordshire HP3 9RW.

## Existing buildings

**1.12** Compliance with Part A (Structure) is required in certain classes of change of use of a building, subject to the control of Regulations 5 and 6. Guidance relevant to structural appraisals related to 'change of use' is given in the following documents:

- a. BRE Digest 366: Structural Appraisal of Existing Buildings, Including for a Material Change of Use, 2012
- b. The Institution of Structural Engineers Technical Publication Appraisal of Existing Structures (third edition), 2010

Note: With reference to 'design checks' in the referenced Institution of Structural Engineers' Technical Publication the choice of various partial factors should be made to suit the individual circumstances of each case.

# Section 2: Sizes of structural elements for certain residential buildings and other small buildings of traditional construction

## General

**2.1** This section is presented as follows:

### Section 2A

Basic requirements for stability.

### Section 2B

Sizes of certain timber members in floors and roofs for dwellings.

Areas at risk from house longhorn beetle.

### Section 2C

Thickness of masonry walls in certain residential buildings of not more than three storeys, small single-storey non-residential buildings and annexes.

### Section 2D

Proportions for masonry chimneys.

### Section 2E

Foundations of plain concrete.

**2.2** Section 2A gives general rules which must be observed in following Sections 2B and 2C. Sections 2B to 2E may be used independently of each other.

Throughout this section the diagrams are only illustrative and do not show all the details of construction.

## Definitions

**2.3** The following meanings apply to terms throughout this section:

**Buttressing wall** A wall designed and constructed to afford lateral support to another wall perpendicular to it, support being provided from the base to the top of the wall.

**Cavity width** The horizontal distance between the two leaves of a cavity wall.

**Compartment wall** A wall constructed as a compartment wall to meet the requirements of regulation B3(2).

**Dead load** The load due to the weight of all walls, permanent partitions, floors, roofs and finishes including services, and all other permanent construction.

**Imposed load** The load assumed to be produced by the intended occupancy or use, including the weight of movable partitions, distributed, concentrated, impact, inertia and snow loads, but excluding wind loads.

**Pier** A member which forms an integral part of a wall, in the form of a thickened section at intervals along the wall, so as to afford lateral support to the wall to which it is bonded or securely tied.

**Separating wall** A wall or part of a wall which is common to adjoining buildings, and constructed to meet the requirements of regulation B3(2).

**Spacing** The distance between the longitudinal centres of any two adjacent timber members of the same type, measured in the plane of floor, ceiling or roof structure.

**Span** The distance measured along the centre line of a member between the centres of any two adjacent bearings or supports.

**Supported wall** A wall to which lateral support is afforded by a combination of buttressing walls, piers or chimneys acting in conjunction with floor(s) or roof.

**Wind load** The load due to the effect of wind pressure or suction.

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## Section 2A: Basic requirements for stability

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**2A1** This section must be used in conjunction with sections 2B and 2C and its principles relate to all forms of low-rise residential buildings.

**2A2** Adequate provision shall be made to ensure that the building is stable under the likely imposed and wind loading conditions. This will commonly necessitate meeting the following requirements:

- a. That the overall size and proportioning of the building are limited in accordance with the specific guidance for each form of construction.
- b. That a suitable layout of walls (both internal and external) forming a robust 3 dimensional box structure in plan is constructed with restriction on the maximum size of cells measured in accordance with the specific guidance for each form of construction.
- c. That the internal and external walls are adequately connected either by masonry bonding or by using mechanical connections.
- d. That the intermediate floors and roof are of such construction and interconnection with the walls that they provide local support to the walls and also act as horizontal diaphragms capable of transferring the wind forces to buttressing elements of the building.

Note: A traditional cut timber roof (i.e. using rafters, purlins and ceiling joists) generally has sufficient built in resistance to instability and wind forces (e.g. from hipped ends, tiling battens, rigid sarking or the like). However, the need for diagonal rafter bracing equivalent to that recommended in BS EN 1995-1-1:2004 with its UK National Annex and additional guidance given in BSI Published Document PD 6693-1:2012 and BS 8103-3:2009 for trussed rafter roofs should be considered, especially for single-hipped and non-hipped roofs of greater than 40° pitch to detached houses.

# Section 2B: Sizes of certain timber members in floors and roofs for dwellings. Areas at risk from house longhorn beetle

## Sizing of members

**2B1** Guidance on the sizing of certain members in floors and roofs is given in 'Span tables for solid timber members in floors, ceilings and roofs (excluding trussed rafter roofs) for dwellings', published by TRADA, available from Chiltern House, Stocking Lane, Hughenden Valley, High Wycombe, Bucks HP14 4ND.

Alternative guidance is available in BS EN 1995-1-1:2004 Design of timber structures with its UK National Annex and additional guidance given in BSI Published Document PD 6693-1:2012 and also BS 8103-3:2009 Structural design of low-rise buildings, Code of practice for timber floors and roofs for housing.

## House longhorn beetle

**2B2** In the geographical areas specified in Table 1, softwood timber for roof construction or fixed in the roof space, including ceiling joists within the void spaces of the roof, should be adequately treated to prevent infestation by the house longhorn beetle (*Hylotrupes bajulus* L.).

Guidance on suitable preservative treatments is given within The Wood Protection Association's manual 'Industrial Wood Preservation: Specification and Practice' (2012), available from 5C Flemming Court, Castleford, West Yorkshire, WF10 5HW.

**Table 1 Areas at risk from house longhorn beetle**

### Geographical area

In the Borough of Bracknell Forest the parishes of Sandhurst and Crowthorne.

The Borough of Elmbridge

In the District of Hart, the parishes of Hawley and Yateley

The District of Runnymede

The Borough of Spelthorne

The Borough of Surrey Heath

In the Borough of Rushmoor, the area of the former district of Farnborough

The Borough of Woking

# Section 2C: Thickness of walls in certain small buildings

## Application

**2C1** This section applies to the following building types:

- a. residential buildings of not more than three storeys;
- b. small single-storey non-residential buildings;
- c. small buildings forming annexes to residential buildings (including garages and outbuildings).

## Wall types

**2C2** Only the types of wall given in Table 2, which must extend to the full storey height, and parapet walls are considered in this section.

## The use of this section

**2C3** When using this section it should be noted that:

- a. this section must be used in conjunction with section 2A;
- b. if wall thickness is to be determined according to paragraphs **2C5** to **2C13**, all appropriate design conditions given in this section must be satisfied;
- c. walls should comply with the relevant requirements of BS EN 1996-2:2006 with its UK National Annex and additional guidance given in BSI Published Document PD 6697:2010, except as regards the conditions given in paragraphs **2C4** and **2C14** to **2C38**;
- d. in formulating the guidance of this section the worst combination of circumstances likely to arise was taken into account. If a requirement of this part is considered too onerous in a particular case it may be appropriate to consider a minor departure on the basis of judgement and experience, or to show adequacy by calculation in respect of the aspect of the wall which is subject to the departure rather than for the entire wall;

- e. the guidance given is based upon the compressive strengths of bricks and blocks being not less than indicated in Tables 6 and 7.

BS EN 1996-1-1:2005 with its UK National Annex gives design strengths for walls where the suitability for use of masonry units of other compressive strengths is being considered.

## Conditions relating to the building of which the wall forms part

**2C4** This section applies only to buildings having proportions within the following parameters (see Diagrams 1 and 2):

- a. **residential buildings of not more than three storeys:**
  - i. the maximum height of the building measured from the lowest finished ground level adjoining the building to the highest point of any wall or roof should not be greater than 15m, subject to the limits of paragraph **2C16**;
  - ii. the height of the building H should not exceed twice the least width of the building W1;
  - iii. the height of the wing H2 should not exceed twice the least width of the wing W2 where the projection P exceeds twice the width W2;
- b. **small single-storey non-residential buildings:** height H should not exceed 3m and W (being the greatest length or width of the building) should not exceed 9m (see Diagram 2), subject to the limits of paragraph **2C16**;
- c. **annexes:** height H as variously indicated in Diagram 2 should not exceed 3m, subject to the limits of paragraph **2C16**.

**Table 2 Wall types considered in this section**

### Residential buildings of up to three storeys

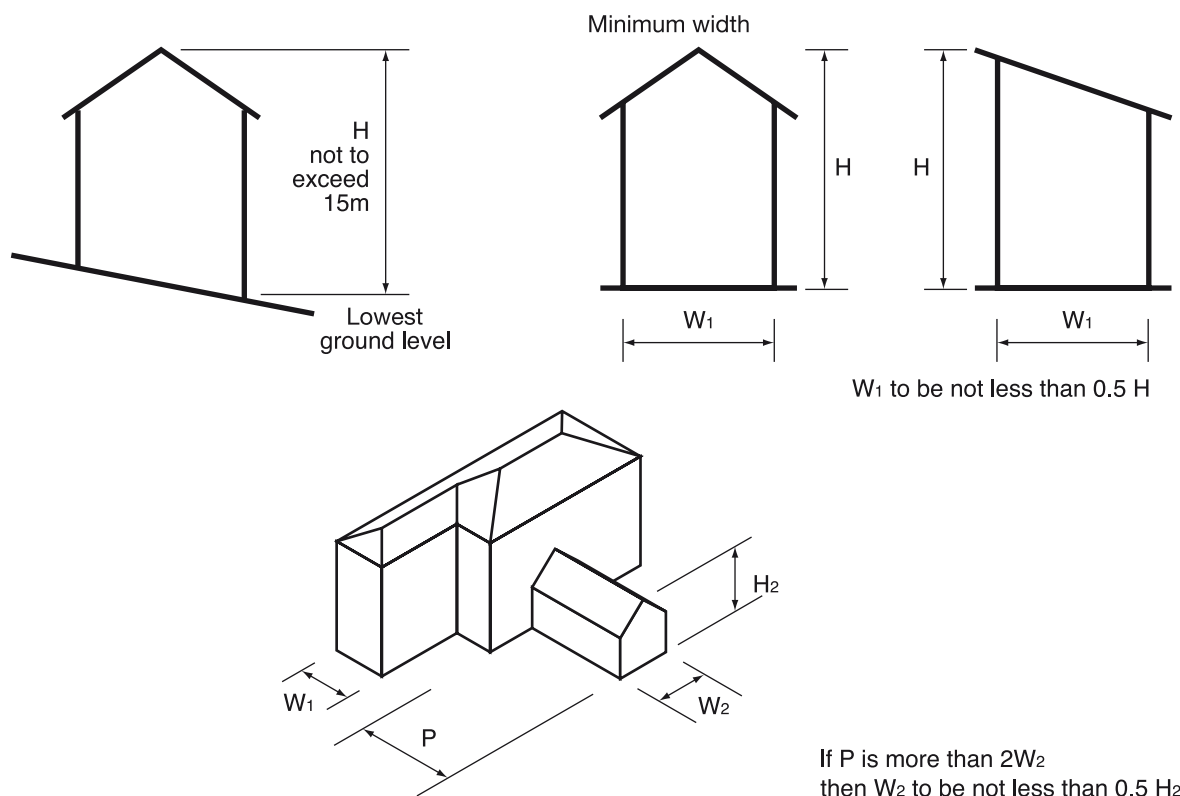
External walls  
Internal load-bearing walls  
Compartment walls  
Separating walls

### Small single-storey non-residential buildings and annexes

External walls  
Internal load-bearing walls

Diagram 1 Size and proportion of residential buildings of not more than three storeys

See para 2C4



## Thickness of walls

**2C5** General wall thickness may be determined according to this section provided:

- conditions relating to the building of which the wall forms part (see paragraphs **2C4**, **2C14** to **2C16**, **2C38**); and
- conditions relating to the wall (see paragraphs **2C17** to **2C37**) are met. (See Diagram 3.)

**2C6 Solid external walls, compartment walls and separating walls in coursed brickwork or blockwork:** Solid walls constructed of coursed brickwork or blockwork should be at least as thick as 1/16 of the storey height. Further requirements are given in Table 3.

**2C7 Solid external walls, compartment walls and separating walls in uncoursed stone, flints, etc.:** The thickness of walls constructed in uncoursed stone, flints, clunches, bricks or other burnt or vitrified material should not be less than 1.33 times the thickness determined by paragraph **2C6**.

**2C8 Cavity walls in coursed brickwork or blockwork:** All cavity walls should have leaves at least 90mm thick and cavities at least 50mm wide. The wall ties should have a horizontal spacing of 900mm and a vertical spacing of 450mm, or alternatively should be spaced such

that the number of wall ties per square metre is not less than 2.5 ties/m<sup>2</sup>. Wall ties should also be provided, spaced not more than 300mm apart vertically, within a distance of 225mm from the vertical edges of all openings, movement joints and roof verges. For selection of wall ties for use in a range of cavity widths refer to Table 5. For specification of cavity wall ties refer to paragraph **2C19**.

For external walls, compartment walls and separating walls in cavity construction, the combined thickness of the two leaves plus 10mm should not be less than the thickness determined by paragraph **2C6** and Table 3 for a solid wall of the same height and length.

**2C9 Walls providing vertical support to other walls:** Irrespective of the material used in the construction, a wall should not be less in thickness than any part of the wall to which it gives vertical support.

**2C10 Internal load-bearing walls in brickwork or blockwork** (except compartment walls or separating walls): All internal load-bearing walls should have a thickness not less than:

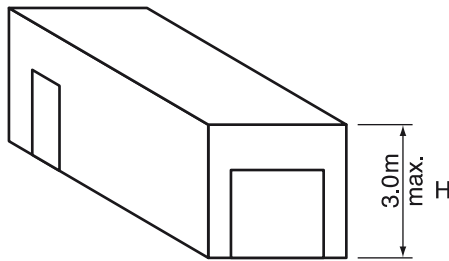
$$\frac{(\text{specified thickness from Table 3})}{2} - 5\text{mm}$$

*Continued on page 17*

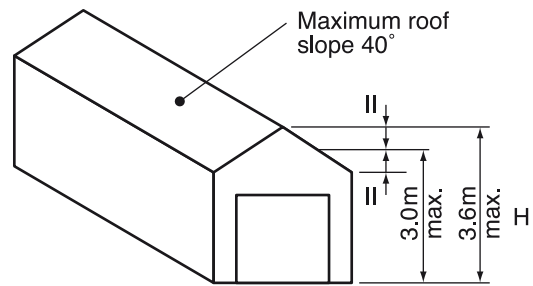
Diagram 2 Size and proportion of non-residential buildings and annexes

See paras 2C4b and 2C4c

## a. Non-residential buildings

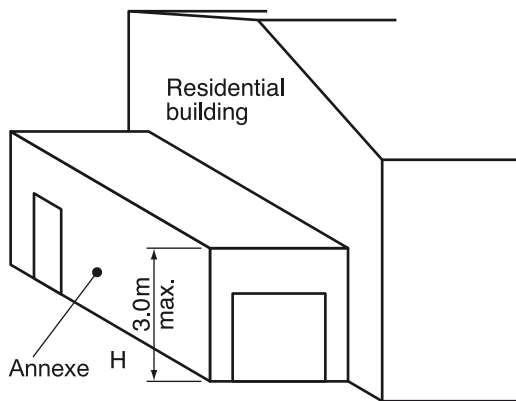


Flat roof buildings

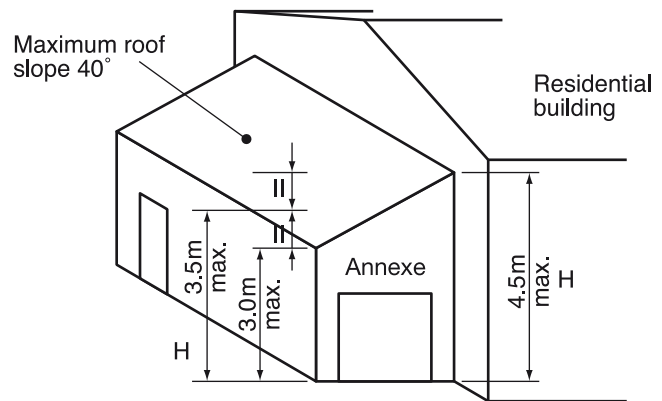


Pitched roof buildings

## b. Annexes



Flat roof annexes

Pitched roof annexes  
(type 1)

**Note**  
Height H should be measured from top of the foundation or from the underside of the floor slab where this provides effective lateral restraint.

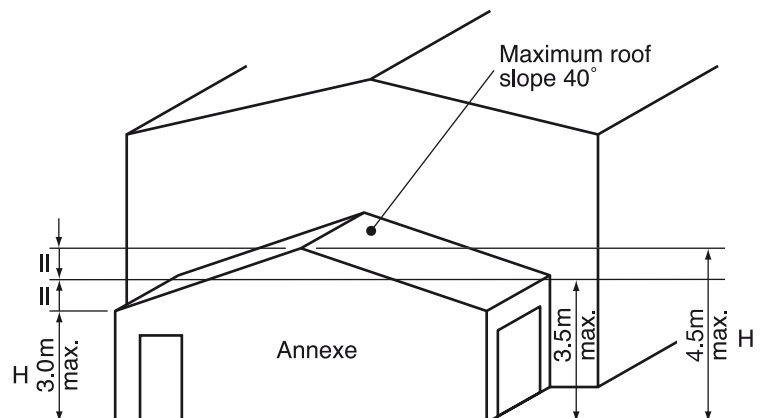
Pitched roof annexes  
(type 2)

Diagram 3 **Determination of wall thickness**

See para 2C5

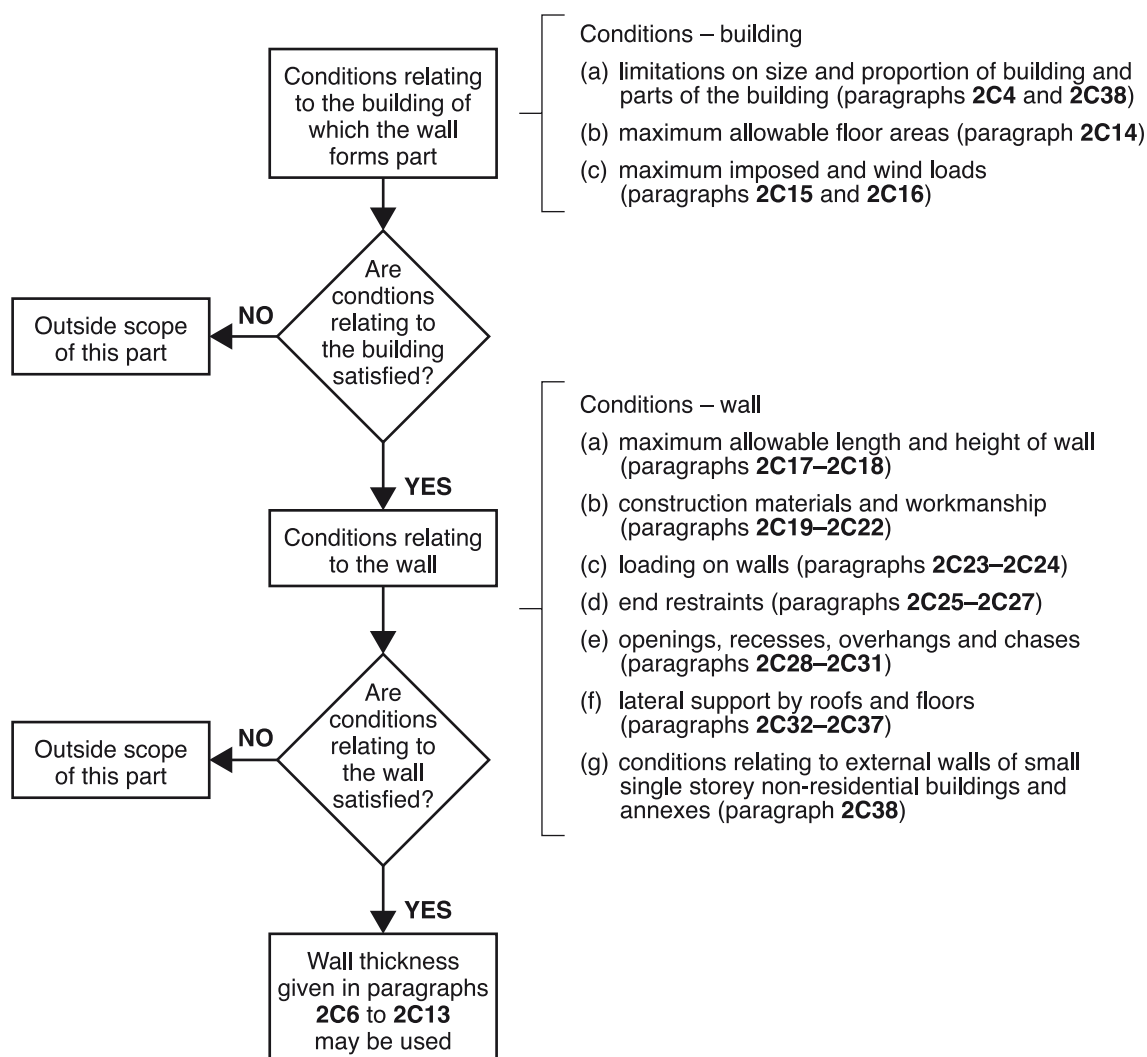
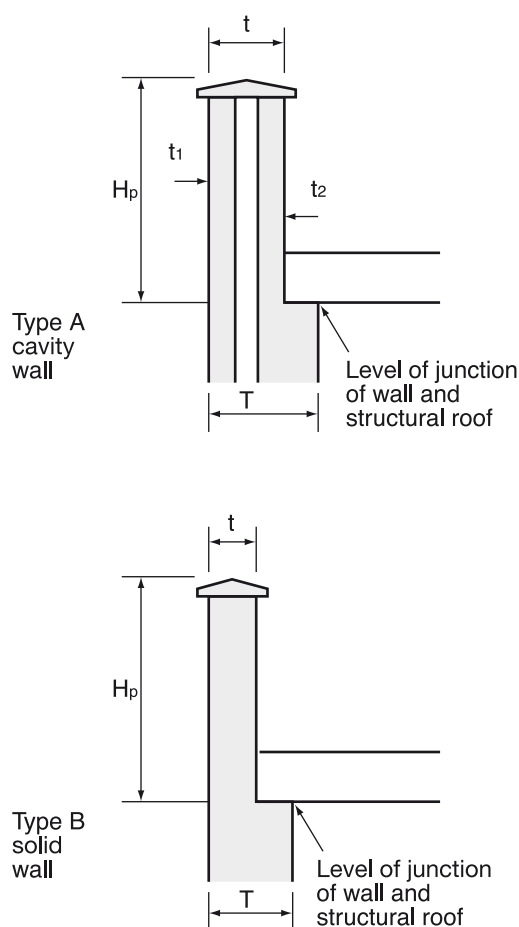


Table 3 **Minimum thickness of certain external walls, compartment walls and separating walls**

Height of wall	Length of wall	Minimum thickness of wall
Not exceeding 3.5m	Not exceeding 12m	190mm for whole of its height
Exceeding 3.5m but not exceeding 9m	Not exceeding 9m	190mm for whole of its height
	Exceeding 9m but not exceeding 12m	290mm from the base for the height of one storey and 190mm for the rest of its height
Exceeding 9m but not exceeding 12m	Not exceeding 9m	290mm from the base for the height of one storey and 190mm for the rest of its height
	Exceeding 9m but not exceeding 12m	290mm from the base for the height of two storeys and 190mm for the rest of its height

Diagram 4 Parapet walls: height

See para 2C11

Note:  $t$  should be less than or equal to  $T$ 

Wall type	Thickness (mm)	Parapet height $H_p$ to be not more than (mm)
Type A cavity wall	$t_1 + t_2$ equal or less than 200	600
	$t_1 + t_2$ greater than 200 equal or less than 250	860
Type B solid wall	$t = 150$	600
	$t = 190$	760
	$t = 215$	860

except for a wall in the lowest storey of a three storey building, carrying load from both upper storeys, which should have a thickness as determined by the equation or 140mm whichever is the greatest.

**2C11 Parapet walls:** The minimum thickness and maximum height of parapet walls should be as given in Diagram 4.

**2C12 Single leaves of certain external walls:** The single leaf of external walls of small single-storey non-residential buildings and of annexes need be only 90mm thick, notwithstanding paragraphs 2C38.

**2C13 Modular bricks and blocks:** Where walls are constructed of bricks or blocks having modular dimensions, wall thicknesses prescribed in this section which derive from a dimension of brick or block may be reduced by an amount not exceeding the deviation from work size permitted by a British Standard relating to equivalent sized bricks or blocks made of the same material.

**2C14 Maximum floor area:** The guidance of this section assumes that no floor enclosed by structural walls on all sides exceeds 70m<sup>2</sup>, and that no floor without a structural wall on one side exceeds 36m<sup>2</sup>. (See Diagram 5.)

**2C15 Imposed loads on roofs, floors and ceilings:** The design considerations given in this section are intended to be adequate for the imposed loads given in Table 4.

**2C16 Maximum height of buildings:** The design guidance in this section is based on BS EN 1991-1-4:2005 with its UK National Annex. The maximum heights of buildings given in Table c of Diagram 7 correlate to various site exposure conditions and wind speeds. A map showing wind speeds is given in Figure 1 of Diagram 6.

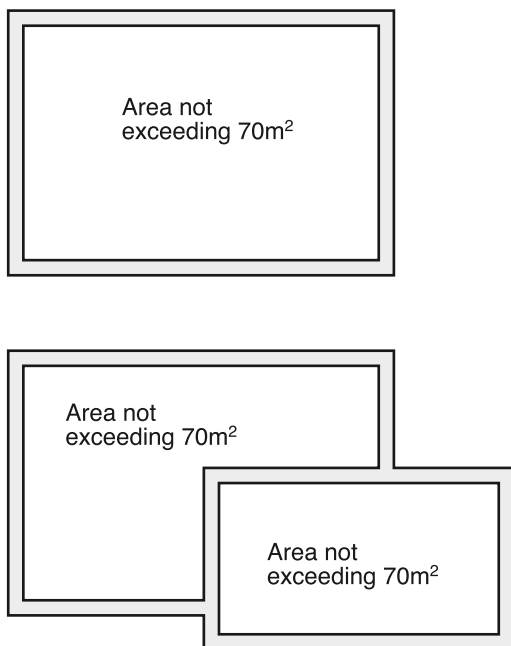
## Conditions relating to the wall

**2C17 Maximum allowable length and height of the wall:** This section does not deal with walls longer than 12m, measured from centre to centre of buttressing walls, piers or chimneys providing restraint, or with walls exceeding 12m in height (see also Table 3).

Diagram 5 **Maximum floor area enclosed by structural walls**

See para 2C14

**a. Structural walls on all sides**



**b. Structural walls on three sides**

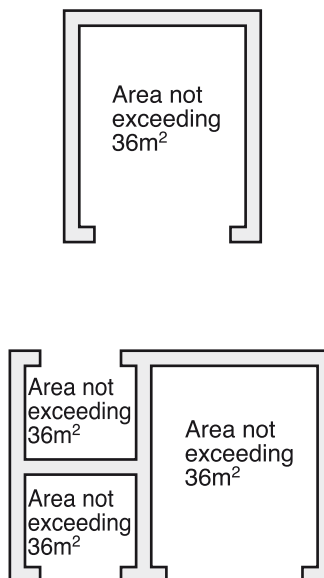


Table 4 **Imposed loads**

Element	Loading
Roof	Distributed loads 1.00kN/m <sup>2</sup> for spans not exceeding 12m 1.5kN/m <sup>2</sup> for spans not exceeding 6m
Floors	Distributed load: 2.00kN/m <sup>2</sup>
Ceilings	Distributed load: 0.25kN/m <sup>2</sup> together with concentrated load: 0.9kN

**2C18 Rules of measurement for heights of walls and storeys:** The height of a wall or a storey should be measured in accordance with the rules in Diagram 8.

## Construction materials and workmanship

**2C19 Wall ties:** Wall ties should comply with BS EN 845-1 and should be material references 1 or 3 in BS EN 845-1 Table A1 austenitic stainless steel. Wall ties should be selected in accordance with Table 5 of this Approved Document.

**2C20 Masonry units:** Walls should be properly bonded and solidly put together with mortar and constructed of masonry units conforming to:

- clay bricks or blocks to BS EN 771-1;
- calcium silicate bricks or blocks to BS EN 771-2;
- concrete bricks or blocks to BS EN 771-3 or BS EN 771-4;
- manufactured stone to BS EN 771-5;
- square dressed natural stone to the appropriate requirements described in BS EN 771-6.

**2C21 Compressive strength of masonry units:** Minimum compressive strength requirements for masonry units according to BS EN Standards are given in Diagram 9, where the masonry units indicated for Conditions A, B and C should have declared compressive strengths of not less than the values given in Table 6. Normalised compressive strengths for block sized clay and calcium silicate masonry units not complying with brick dimensional format are given in Table 7.

*Continued on page 25*

Diagram 6 Map showing wind speeds in m/s for maximum height of buildings

See para 2C16

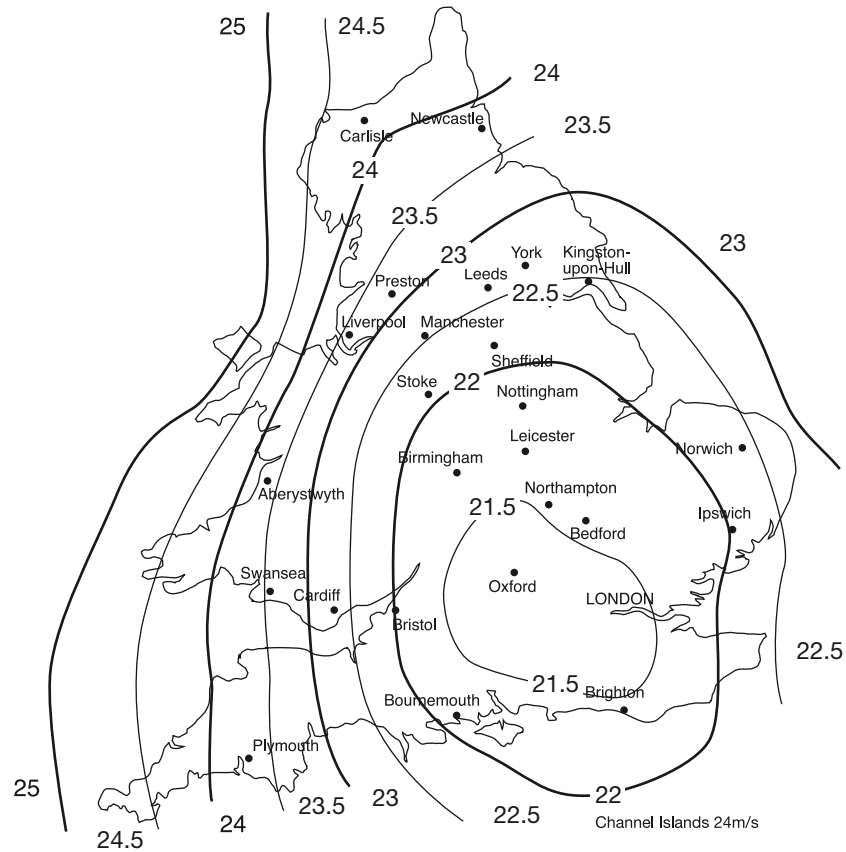
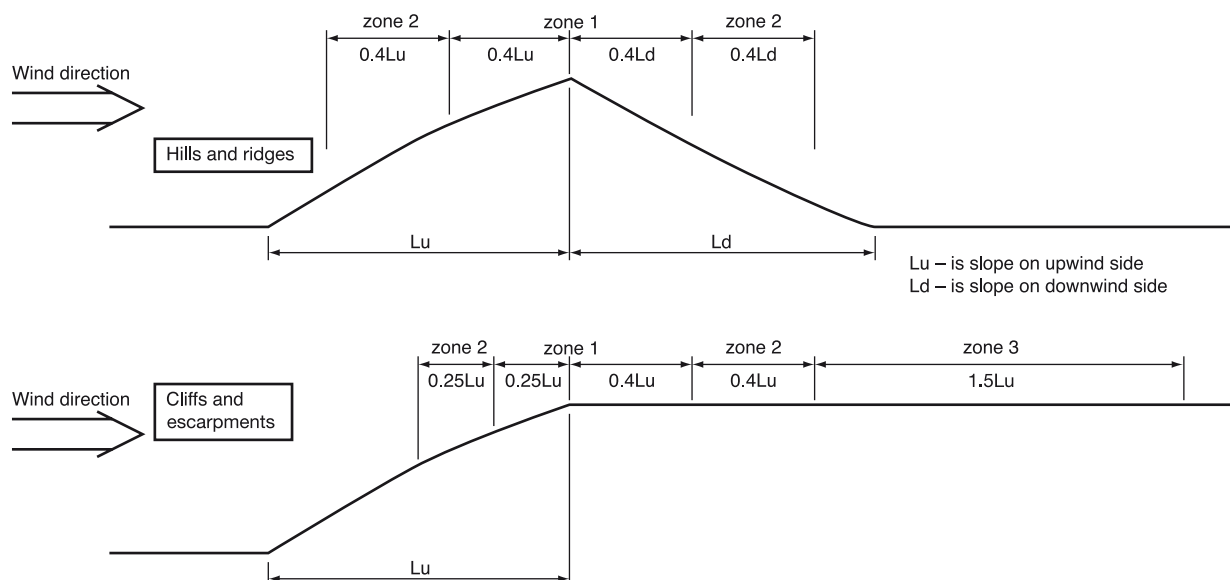
Figure 1 Map of wind speeds ( $V$ ) in m/s

Figure 2 Orographic zones for Factor O

Note: A more detailed approach for obtaining Factor O is given by Figure 3 Diagram 6.

Diagram 6 Map showing wind speeds in m/s for maximum height of buildings

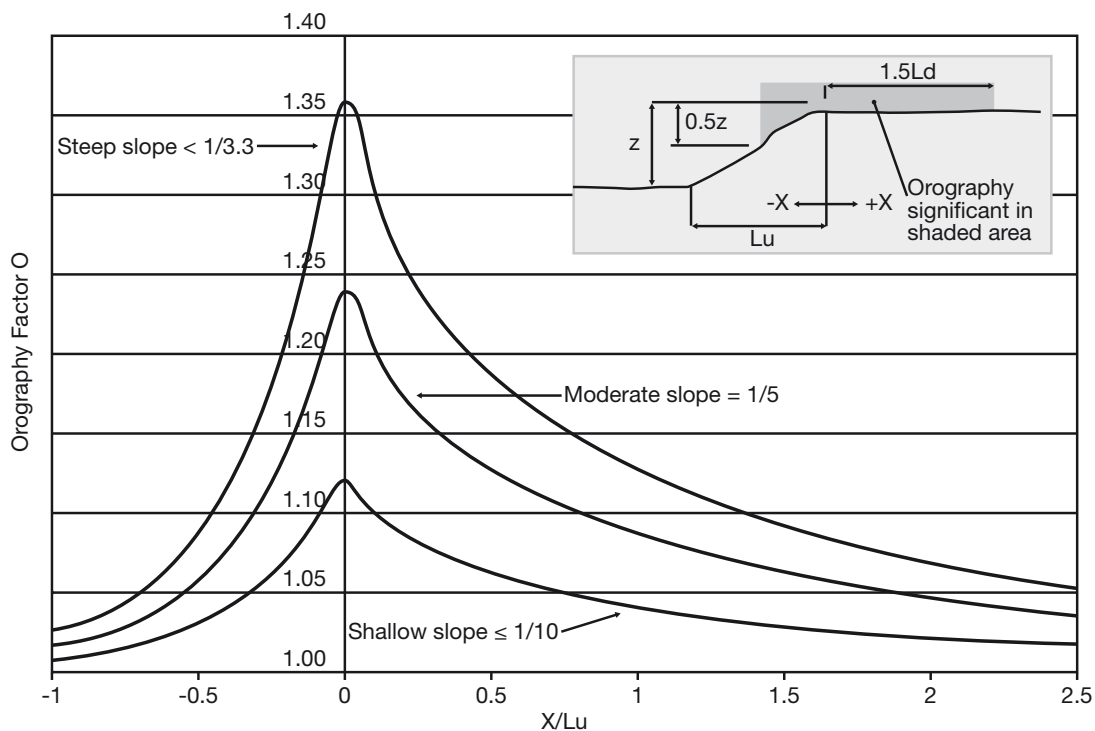
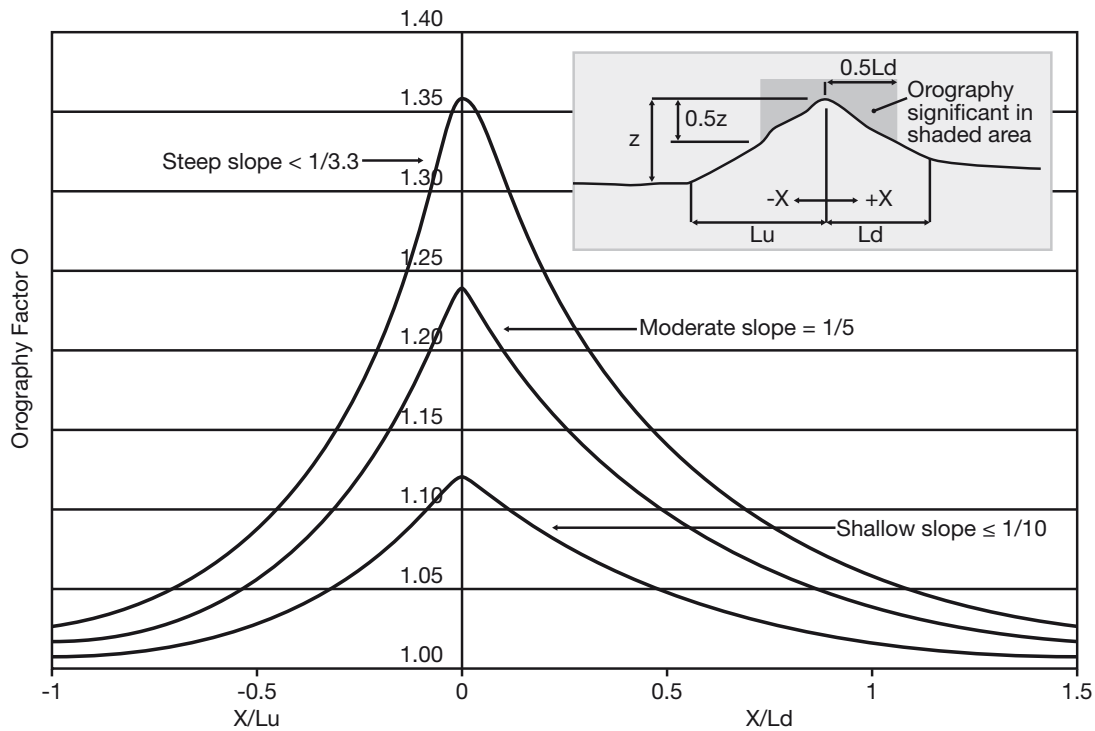
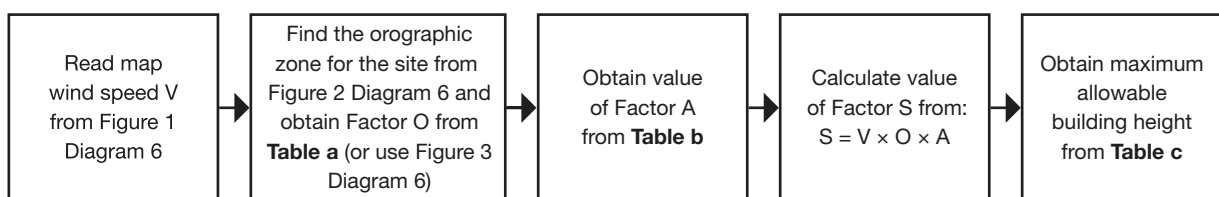


Figure 3 Alternative graphical method for determining Orography Factor O

Diagram 7 Maximum height of buildings

**Table a Factor O**

Orographic category and average slope of whole hillside, ridge, cliff or escarpment	Factor O		
	Zone 1	Zone 2	Zone 3
Category 1: Nominally flat terrain, average slope < 1/20	1.0	1.0	1.0
Category 2: Shallow terrain, average slope < 1/10	1.12	1.07	1.05
Category 3: Moderately steep terrain, average slope < 1/5	1.24	1.13	1.10
Category 4: Steep terrain, average slope > 1/5	1.36	1.20	1.15

**Table b Factor A**

Site altitude (m)	Factor A
0	1.00
50	1.05
100	1.10
150	1.15
200	1.20
300	1.30
400	1.40
500	1.50

**Table c Maximum allowable building height in metres**

Factor S	Country sites			Town sites		
	Distance to the coast			Distance to the coast		
	< 2km	2 to 20km	> 50km	< 2km	2 to 20km	> 50km
≤ 25	15	15	15	15	15	15
26	11.5	13.5	15	15	15	15
27	8	11	14.5	15	15	15
28	5.5	8	11	15	15	15
29	4	6.5	8.5	12.5	15	15
30	3	5	6.5	10	12.5	15
31		4	5.5	8.5	11	13.5
32		3.5	4.5	7	9.5	11.5
33		3	3.5	6	8	10
34			3	5.5	7	7.5
35				4.5	6.5	7.5
36				4	5.5	6.5
37				3.5	5	6
38				3	4.5	5.5
39					4	5
40					3.5	4.5
41					3	4
42						3.5
43						3.5
44						3

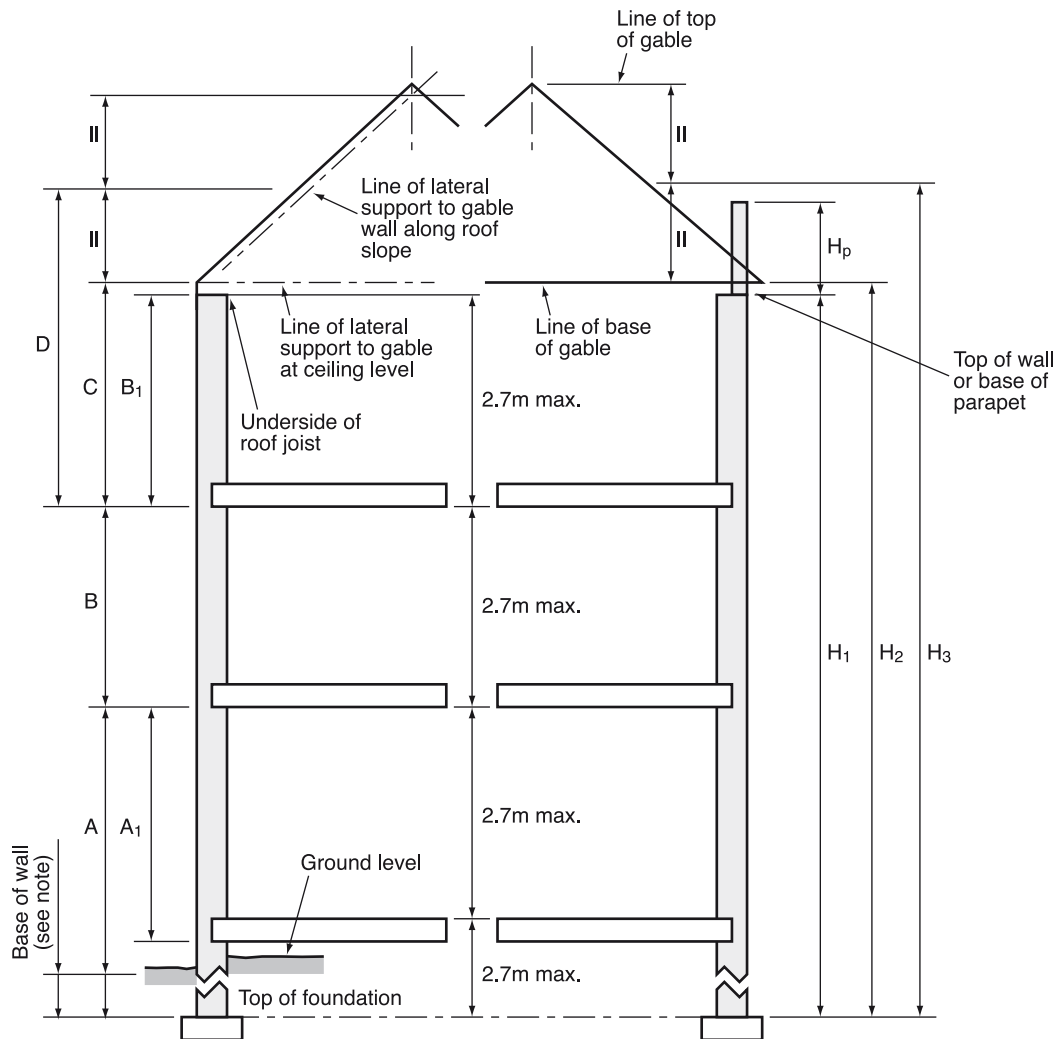
Notes: Table a – Outside of the zones shown in **Table a**, Factor O = 1.0.

Table b – For elevated sites where orography is significant a more accurate assessment of Factor A can be obtained by using the altitude at the base of the topographic feature instead of the altitude at the site, see Figure 2 Diagram 6 or, alternatively, Figure 3 Diagram 6.

Table c – i) Sites in town less than 300m from the edge of the town should be assumed to be in country terrain.  
 ii) Where a site is closer than 1km to an inland area of water which extends more than 1km in the wind direction, the distance to the coast should be taken as < 2km.  
 Interpolation may be used in **Tables b** and **c**.

Diagram 8 Measuring storey and wall heights

See para 2C18



## Key

### (a) Measuring storey heights

A<sub>1</sub> is the ground storey height if the ground floor provides effective lateral support to the wall, i.e. is adequately tied to the wall or is a suspended floor bearing on the wall.

A is the ground storey height if the ground floor does not provide effective lateral support to the wall.

Note: If the wall is supported adequately and permanently on both sides by suitable compact material, the base of the wall for the purposes of the storey height may be taken as the lower level of this support. (Not greater than 3.7m ground storey height.)

B is the intermediate storey height.

B<sub>1</sub> is the top storey height for walls which do not include a gable.

C is the top storey height where lateral support is given to the gable both at ceiling level and along the roof slope.

D is the top storey height for the external walls which include a gable where lateral support is given to the gable only along the roof slope.

### (b) Measuring wall heights

H<sub>1</sub> is the height of an external wall that does not include a gable.

H<sub>2</sub> is the height of an internal or separating wall which is built up to the underside of the roof.

H<sub>3</sub> is the height of an external wall which includes a gable.

H<sub>p</sub> is the height of a parapet (see Diagram 4). If H<sub>p</sub> is more than 1.2m add to H<sub>p</sub> to H<sub>1</sub>.

Table 5 Cavity wall ties

Nominal cavity width mm (Note 1)	Tie length mm (Note 2)	BS EN 845-1 tie
50 to 75	200	Type 1, 2, 3 or 4 to BSI PD 6697:2010 and selected on the basis of the design loading and design cavity width.
76 to 100	225	
101 to 125	250	
126 to 150	275	
151 to 175	300	
176 to 300	(See Note 3)	

**Notes:**

- Where face insulated blocks are used the cavity width should be measured from the face of the masonry unit.
- The embedment depth of the tie should not be less than 50mm in both leaves.
- For cavities wider than 175mm calculate the length as the nominal cavity width plus 125mm and select the nearest stock length. For wall ties requiring embedment depths in excess of 50mm, increase the calculated tie length accordingly.

Table 6 Declared compressive strength of masonry units complying with BS EN 771-1 to -5 (N/mm<sup>2</sup>)

Masonry unit	Clay masonry units to BS EN 771-1		Calcium silicate masonry units to BS EN 771-2		Aggregate concrete masonry units to BS EN 771-3	Autoclaved aerated conc. masonry units to BS EN 771-4	Manufactured stone masonry units to BS EN 771-5
Condition A (See Diagram 9)							Any unit complying with BS EN 771-5 will be acceptable for conditions A, B and C
Brick	Group 1 6.0		Group 1 6.0	Group 2 9.0	6.0	–	
Block	See Table 7	See Table 7	See Table 7	See Table 7	2.9*	2.9	
Condition B (See Diagram 9)							
Brick	Group 1 9.0		Group 1 9.0	Group 2 13.0	9.0	–	
Block	See Table 7	See Table 7	See Table 7	See Table 7	7.3*	7.3	
Condition C (See Diagram 9)							
Brick	Group 1 18.0		Group 1 18.0	Group 2 25.0	18.0	–	
Block	See Table 7	See Table 7	See Table 7	See Table 7	7.3*	7.3	

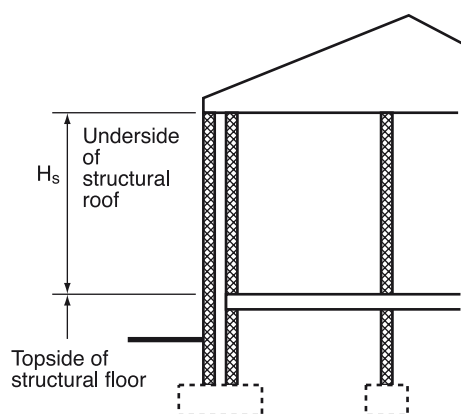
\* These values are dry strengths to BS EN 772-1

**Notes:**

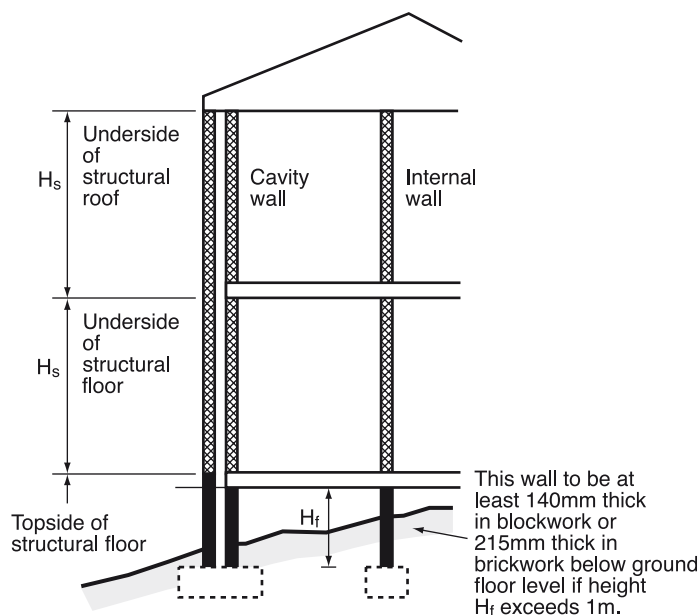
- This table applies to Group 1 and Group 2 units.
- For the EN 771 series of standards for masonry units the values of declared compressive strengths (N/mm<sup>2</sup>) given in Table 6 are mean values.
- Brick: a masonry unit having work sizes not exceeding 337.5mm in length or 112.5mm in height.
- Block: a masonry unit exceeding either of the limiting work sizes of a brick and with a minimum height of 190mm. For blocks with smaller heights, excluding cuts or make up units, the strength requirements are as for brick except for solid external walls where the blocks should have a compressive strength at least equal to that shown for block for an inner leaf of a cavity wall in the same position.
- Group 1 masonry units have not more than 25% formed voids (20% for frogged bricks). Group 2 masonry units have formed voids greater than 25%, but not more than 55%.

Diagram 9 Declared compressive strength of masonry units

See para 2C21



a. One storey



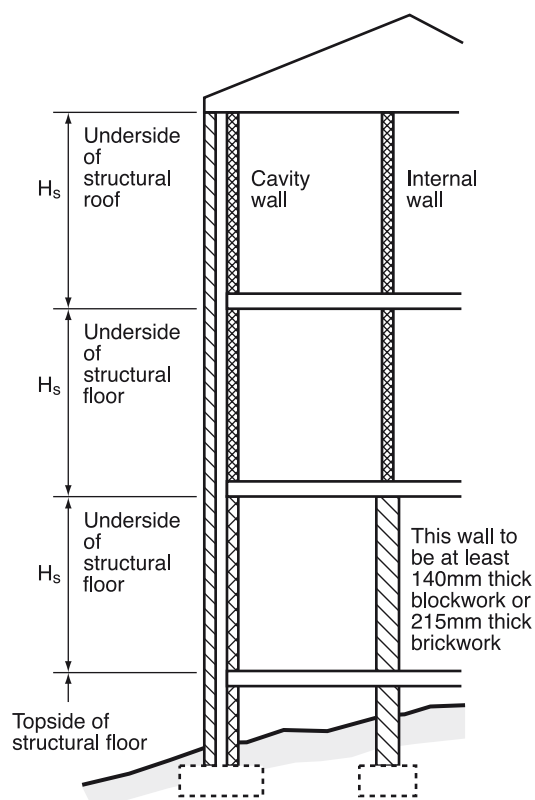
b. Two storeys

## Key



Condition C

Where  
 $H_f$  Less than or equal to 1m, Condition A  
 Where  
 $H_f$  Greater than 1m, Condition B



c. Three storeys

## Notes

**1** If  $H_s$  is not greater than 2.7m, the compressive strength of bricks or blocks should be used in walls as indicated by the key.

**2** If  $H_s$  is greater than 2.7m, the compressive strength of bricks or blocks used in the wall should be at least Condition B, or as indicated by the key, whichever is the greater.

**3** If the external wall is solid construction, the masonry units should have a compressive strength of at least that shown for the internal leaf of a cavity wall in the same position.

**4** The guidance given in the diagram for walls of two and three storey buildings should only be used to determine the compressive strength of the masonry units where the roof construction is of timber.

**Table 7 Normalised compressive strength of masonry units of clay and calcium silicate blocks complying with BS EN 771-1 and 2 (N/mm<sup>2</sup>)**

Standard	Condition (See Diagram 9)	Group 1 masonry units	Group 2 masonry units
Clay masonry units to BS EN 771-1	A	5.0	8.0
Calcium silicate masonry units to BS EN 771-2	B	7.5	11.0
	C	15.0	21.0

**Notes:**

1. Values in this table are normalised compressive strengths (N/mm<sup>2</sup>). Compressive strengths of masonry units should be derived according to EN 772-1.
2. The table applies to clay and calcium silicate block masonry units where the work size exceeds 337.5mm in length or 112.5mm in height.
3. Group 1 masonry units have not more than 25% formed voids (20% for frogged bricks). Group 2 masonry units have formed voids greater than 25%, but not more than 55%.

**2C22 Mortar:** Mortar should be:

- a. one of the following:
  - i. Mortar designation (iii) according to BS EN 1996-1-1:2005 with its UK National Annex;
  - ii. Strength class M4 according to BS EN 998-2:2010;
  - iii. 1:1:5 to 6 CEM I, lime, and fine aggregate measured by volume of dry materials, or
- b. of equivalent or greater strength and durability to the specifications in a. above.

**Loading on walls**

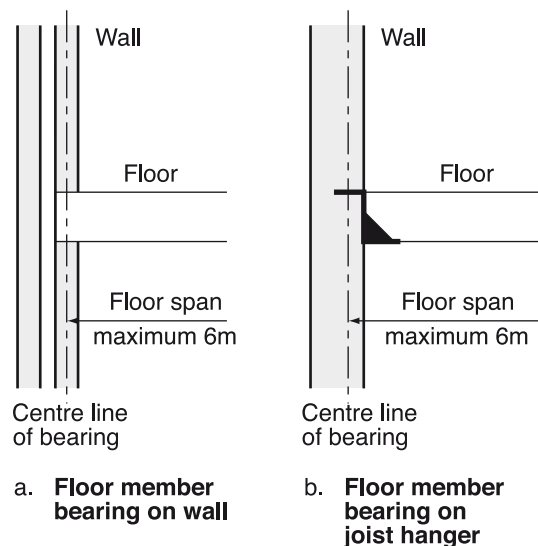
**2C23 Maximum span of floors:** The maximum span for any floor supported by a wall is 6m where the span is measured centre to centre of bearing (see Diagram 10).

**2C24 Other loading conditions:**

- a. Vertical loading on walls should be distributed. This may be assumed for concrete floor slabs, precast concrete floors, and timber floors designed in accordance with section 2B, and where the bearing length for lintels is 150mm or greater. Where a lintel has a clear span of 1200mm or less the bearing length may be reduced to 100mm.
- b. Differences in level of ground or other solid construction between one side of the wall and the other should be less than 4 times the thickness of the wall as shown in Diagram 11.
- c. The combined dead and imposed load should not exceed 70kN/m at base of wall (see Diagram 11).
- d. Walls should not be subjected to lateral load other than from wind, and that covered by paragraph **2C24(b)**.

**Diagram 10 Maximum span of floors**

See para 2C23

**End restraint****2C25 Vertical lateral restraint to walls**

The ends of every wall should be bonded or otherwise securely tied throughout their full height to a buttressing wall, pier or chimney. Long walls may be provided with intermediate buttressing walls, piers or chimneys dividing the wall into distinct lengths within each storey; each distinct length is a supported wall for the purposes of this section. The intermediate buttressing walls, piers or chimneys should provide lateral restraint to the full height of the supported wall, but they may be staggered at each storey.

**2C26 Buttressing walls**

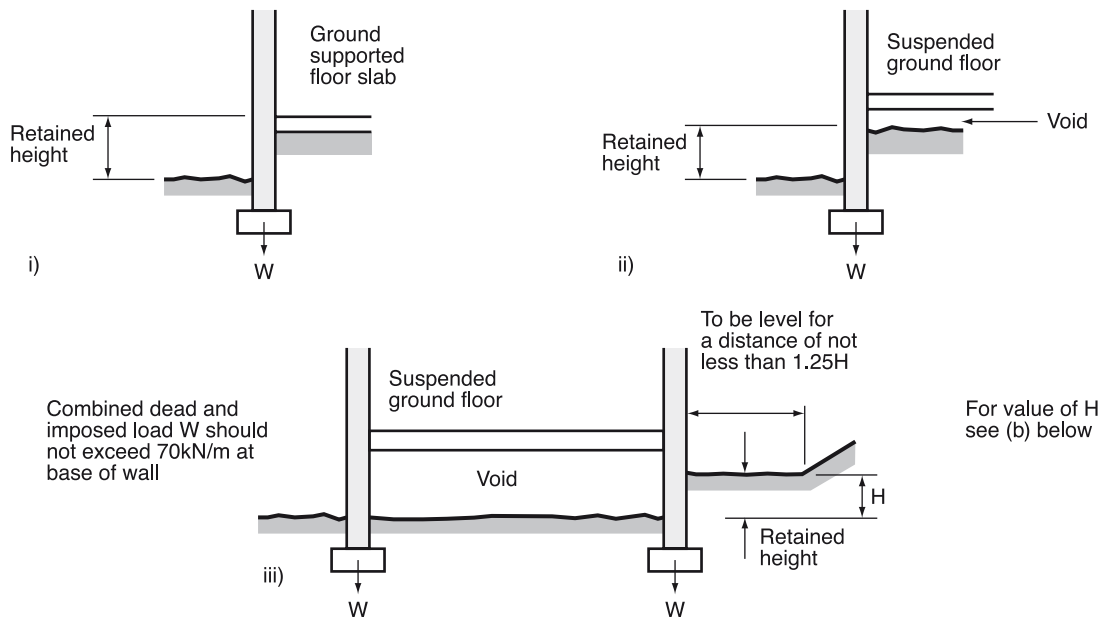
If the buttressing wall is not itself a supported wall its thickness  $T_2$  should not be less than:

*Continued on page 27*

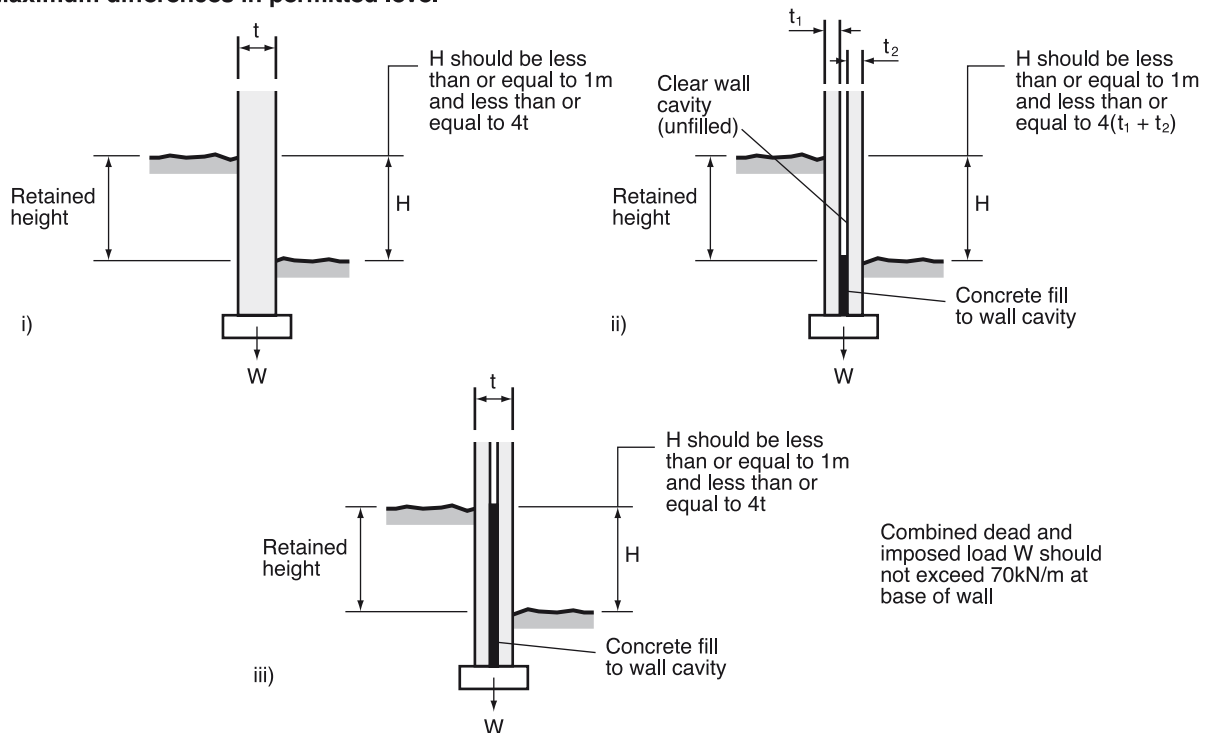
**Diagram 11 Differences in ground levels**

See para 2C24b

**a. Situations where differences in level may occur**



**b. Maximum differences in permitted level**



**Notes**

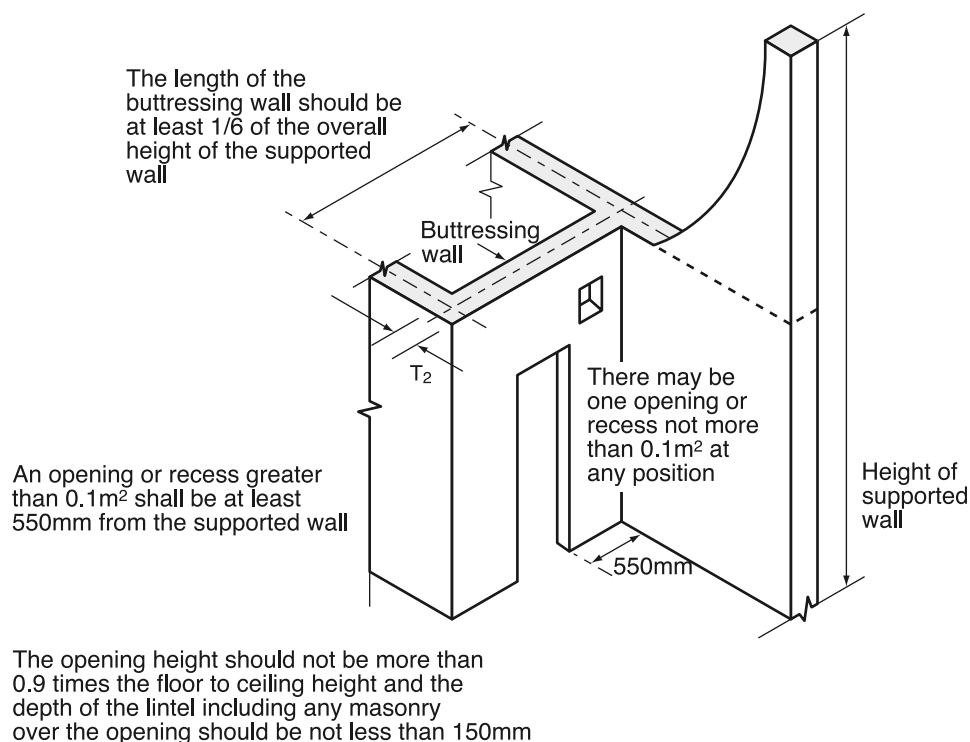
**1** Floor slabs in figure b have been omitted for clarity and may be on either side of the walls shown.

**2** Cavity walls should be tied in accordance with Table 5.

**3** These recommendations apply only to circumstances where there is a full storey height of masonry above the upper retained level.

Diagram 12 Openings in a buttressing wall

See para 2C26

**Notes**

- 1** The buttressing wall should be bonded or securely tied to the supported wall and at the other end to a buttressing wall, pier or chimney.
- 2** Openings or recesses in the buttressing wall should be as shown – the

position and shape of the openings should not impair the lateral support to be given by the buttressing wall.

- 3** Refer to Diagram 8 for the rules for measuring the height of the supported wall.

- a. half the thickness required by this section for an external or separating wall of similar height and length less 5mm; or
- b. 75mm if the wall forms part of a dwelling house and does not exceed 6m in total height and 10m in length; and
- c. 90mm in other cases.

The length of the buttressing wall should be at least  $\frac{1}{6}$  of the overall height of the supported wall and be bonded or securely tied to the supporting wall and at the other end to a buttressing wall, pier or chimney.

The size of any opening in the buttressing wall should be restricted as shown in Diagram 12.

**2C27 Design criteria for piers and chimneys providing restraint:**

- a. piers should measure at least 3 times the thickness of the supported wall and chimneys twice the thickness, measured at right angles

to the wall. Piers should have a minimum width of 190mm (see Diagram 13);

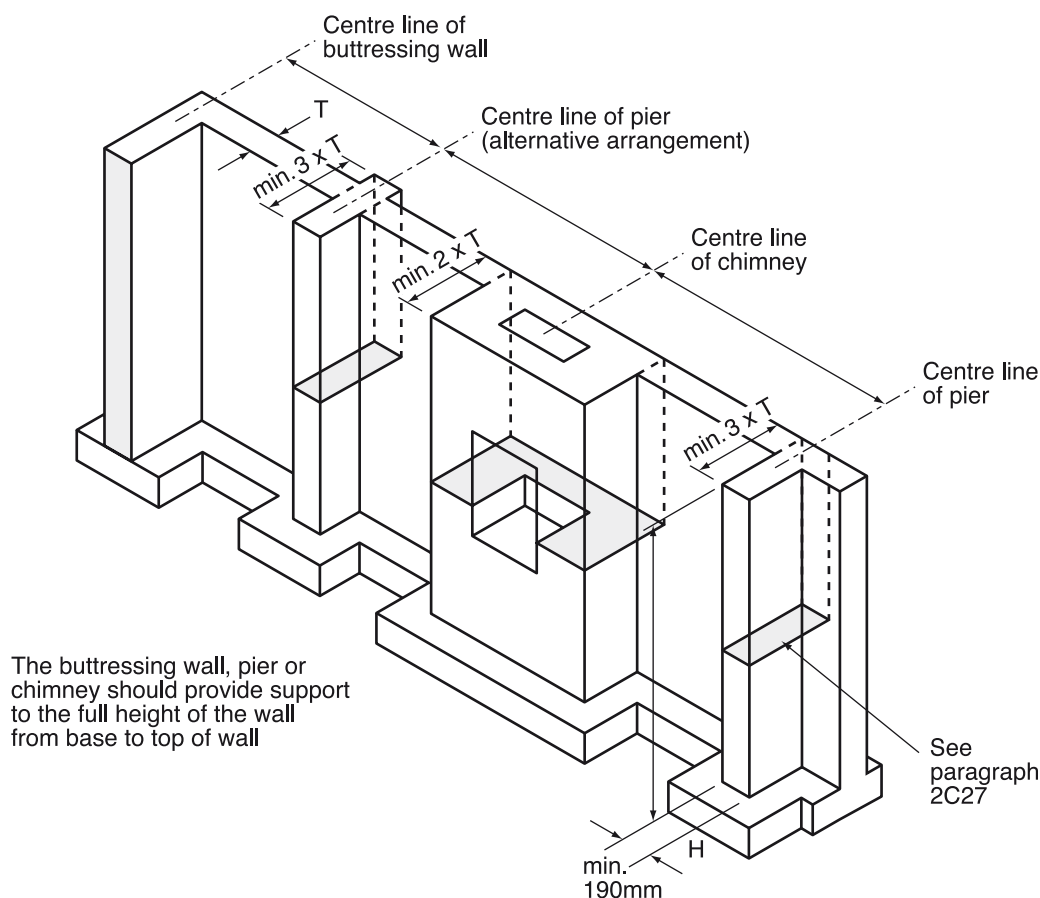
- b. the sectional area on plan of chimneys (excluding openings for fireplaces and flues) should be not less than the area required for a pier in the same wall, and the overall thickness should not be less than twice the required thickness of the supported wall (see Diagram 13).

**Openings, recesses, overhangs and chases****2C28 General:**

The number, size and position of openings and recesses should not impair the stability of a wall or the lateral restraint afforded by a buttressing wall to a supported wall. Construction over openings and recesses should be adequately supported.

Diagram 13 **Buttressing**

See para 2C27



## 2C29 Dimensional criteria for openings and recesses:

The dimensional criteria are given in Diagram 14 and Table 8.

No openings should be provided in walls below ground floor except for small holes for services and ventilation, etc. which should be limited to a maximum area of 0.1m<sup>2</sup> at not less than 2m centres.

## 2C30 Chases:

- vertical chases should not be deeper than 1/3 of the wall thickness or, in cavity walls, 1/3 of the thickness of the leaf;
- horizontal chases should not be deeper than 1/6 of the thickness of the leaf of the wall;
- chases should not be so positioned as to impair the stability of the wall, particularly where hollow blocks are used.

## 2C31 Overhangs:

The amount of any projection should not impair the stability of the wall.

## Lateral support by roofs and floors

**2C32** A wall in each storey of a building should extend to the full height of that storey, and have horizontal lateral supports to restrict movement of the wall at right angles to its plane.

## 2C33 Floors and roofs should:

- act to transfer lateral forces from walls to buttressing walls, piers or chimneys; and
- be secured to the supported wall by connections specified in paragraphs **2C34** and **2C35**.

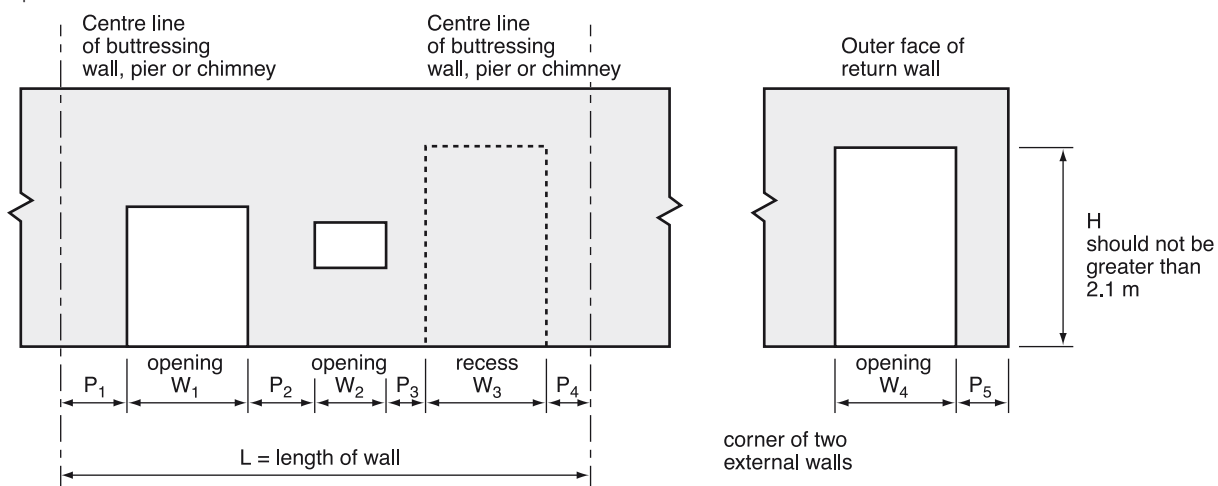
**2C34** The requirements for lateral restraint of walls at roof and floor levels are given in Table 9 and guidance on satisfying the requirements is given in paragraphs **2C35** and **2C36**.

**2C35** Walls should be strapped to floors above ground level, at intervals not exceeding 2m and as shown in Diagram 15, by tension straps conforming to BS EN 845-1. For corrosion resistance purposes, the tension straps should be material reference 14 or 16.1 or 16.2 (galvanised steel) or other more resistant

*Continued on page 30*

Diagram 14 Sizes of openings and recesses

See para 2C29

**Notes**

Requirements (refer to Table 8 for values of Factor X).

- 1  $W_1 + W_2 + W_3$  should not exceed  $\frac{2L}{3}$
- 2  $W_1, W_2$  or  $W_3$  should not exceed 3m
- 3  $P_1$  should be greater than or equal to  $\frac{W_1}{X}$
- 4  $P_2$  should be greater than or equal to  $\frac{W_1 + W_2}{X}$

- 5  $P_3$  should be greater than or equal to  $\frac{W_2 + W_3}{X}$

- 6  $P_4$  should be greater than or equal to  $\frac{W_3}{X}$

- 7  $P_5$  should be greater than or equal to  $\frac{W_4}{X}$  but should not be less than 665mm.

- 8 Take the value of the Factor X from Table 8, or it can be given the value 6, provided the declared compressive strength of the bricks or blocks (in the case of a cavity wall – in the loaded leaf) is not less than 7.3N/mm<sup>2</sup>.

Table 8 Value of Factor 'X' (see Diagram 14)

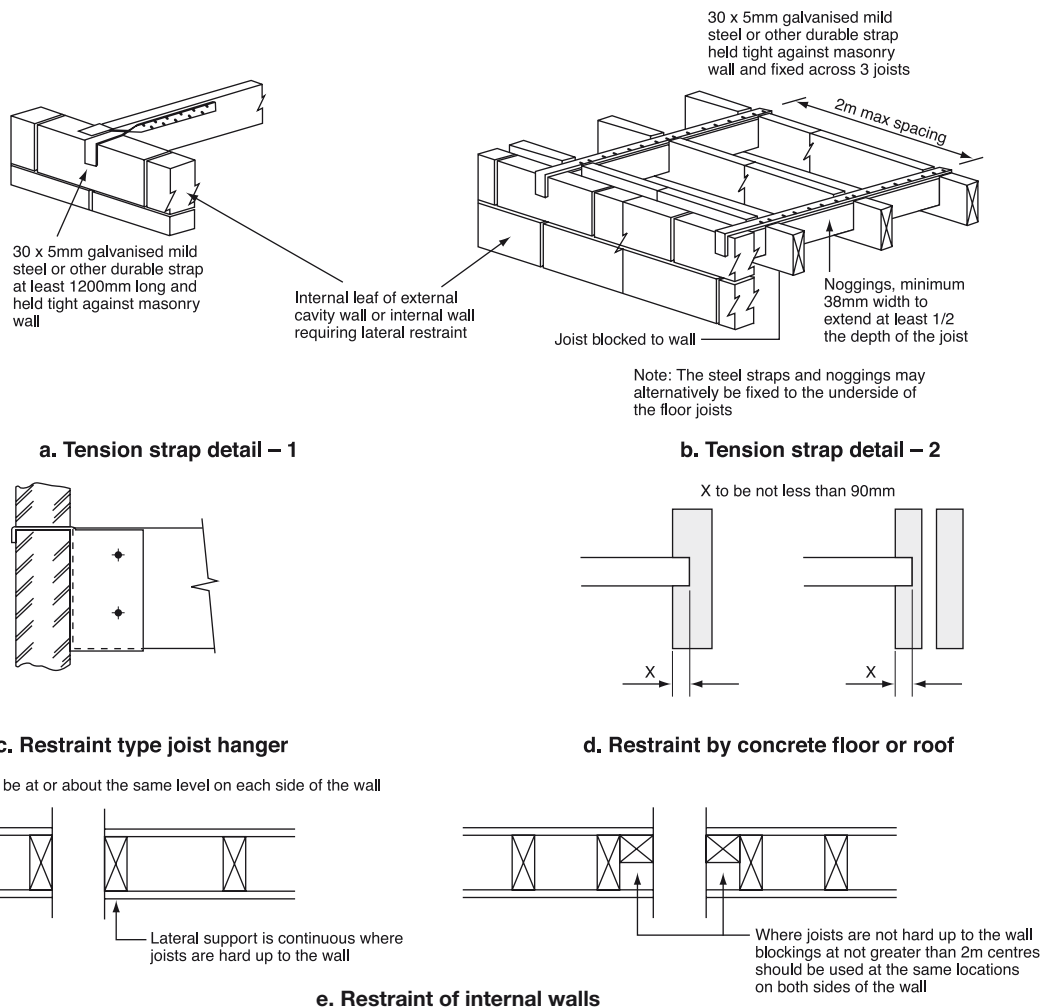
Nature of roof span	Maximum roof span (m)	Minimum thickness of wall inner (mm)	Span of floor is parallel to wall	Span of timber floor into wall		Span of concrete floor into wall	
				max 4.5m	max 6.0m	max 4.5m	max 6.0m
Value of Factor 'X'							
Roof spans parallel to wall	Not applicable	100	6	6	6	6	6
		90	6	6	6	6	5
Timber roof spans into wall	9	100	6	6	5	4	3
		90	6	4	4	3	3

Table 9 Lateral support for walls

Wall type	Wall length	Lateral support required
Solid or cavity: external compartment separating	Any length	Roof lateral support by every roof forming a junction with the supported wall
	Greater than 3m	Floor lateral support by every floor forming a junction with the supported wall
Internal load-bearing wall (not being a compartment or separating wall)	Any length	Roof or floor lateral support at the top of each storey

Diagram 15 **Lateral support by floors**

See para 2C35



specifications including material references 1 or 3 (austenitic stainless steel). The declared tensile strength of tension straps should not be less than 8kN.

Tension straps need not be provided:

- in the longitudinal direction of joists in houses of not more than 2 storeys, if the joists are at not more than 1.2m centres and have at least 90mm bearing on the supported walls or 75mm bearing on a timber wall-plate at each end, and
- in the longitudinal direction of joists in houses of not more than 2 storeys, if the joists are carried on the supported wall by joist hangers in accordance with BS EN 845-1 of the restraint type described by additional guidance given in BSI Published Document PD 6697:2010 and shown in Diagram 15(c), and are incorporated at not more than 2m centres, and
- when a concrete floor has at least 90mm bearing on the supported wall (see Diagram 15(d)), and

- where floors are at or about the same level on each side of a supported wall, and contact between the floors and wall is either continuous or at intervals not exceeding 2m. Where contact is intermittent, the points of contact should be in line or nearly in line on plan (see Diagram 15(e)).

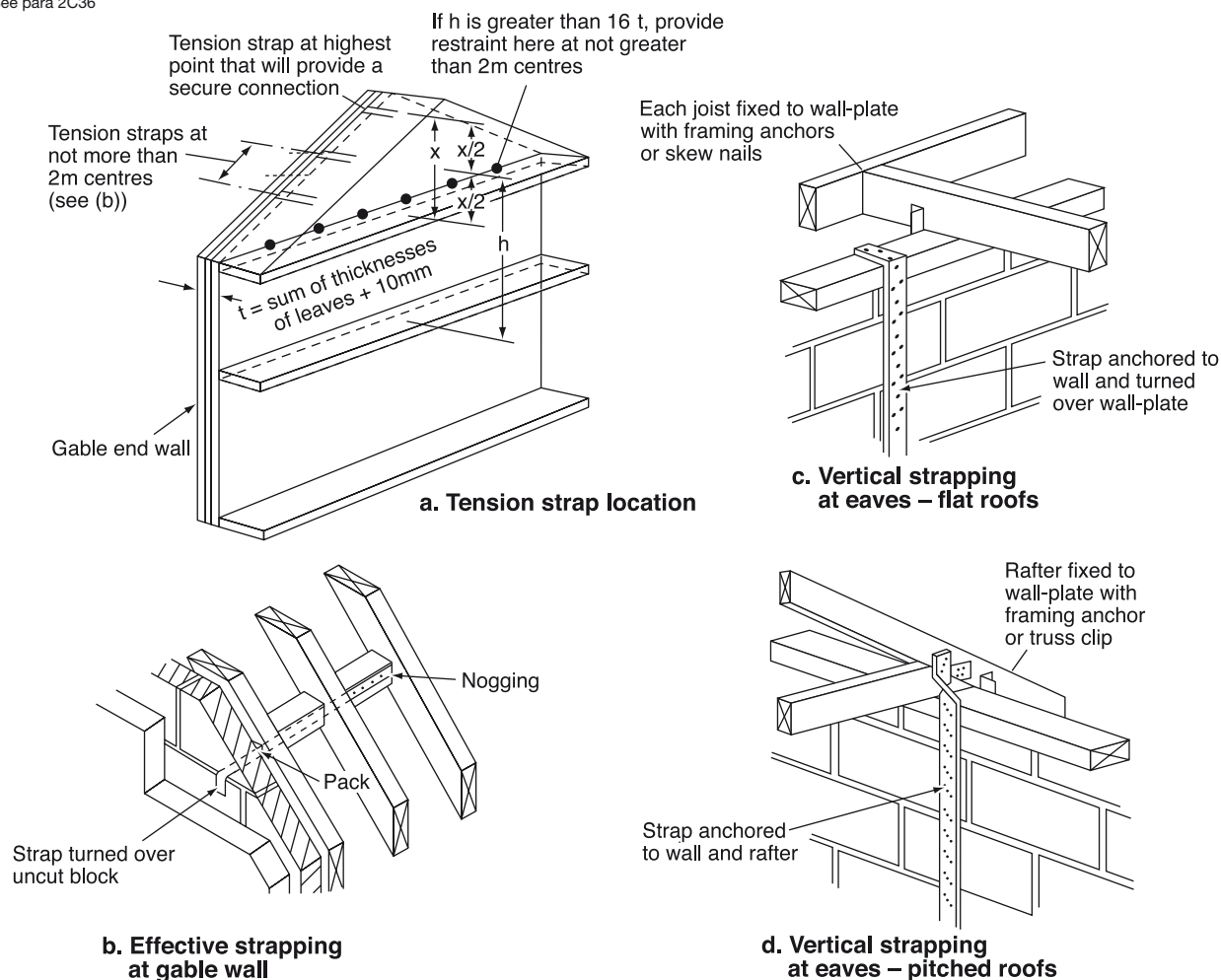
**2C36** Gable walls should be strapped to roofs as shown in Diagram 16(a) and (b) by tension straps as described in **2C35**.

Vertical strapping at least 1m in length should be provided at eaves level at intervals not exceeding 2m as shown in Diagram 16(c) and (d). Vertical strapping may be omitted if the roof:

- has a pitch of 15° or more, and
- is tiled or slated, and
- is of a type known by local experience to be resistant to wind gusts, and
- has main timber members spanning onto the supported wall at not more than 1.2m centres.

Diagram 16 Lateral support at roof level

See para 2C36



## Interruption of lateral support

**2C37** Where an opening in a floor or roof for a stairway or the like adjoins a supported wall and interrupts the continuity of lateral support, the following conditions should be satisfied for the purposes of Section 2C:

- the maximum permitted length of the opening is to be 3m, measured parallel to the supported wall, and
- where a connection is provided by means other than by anchor, this should be provided throughout the length of each portion of the wall situated on each side of the opening, and
- where a connection is provided by mild steel anchors, these should be spaced closer than 2m on each side of the opening to provide the same number of anchors as if there were no opening, and
- there should be no other interruption of lateral support.

## Small single-storey non-residential buildings and annexes

### 2C38 Size and proportion

#### i. General

The guidance given applies in the following circumstances:

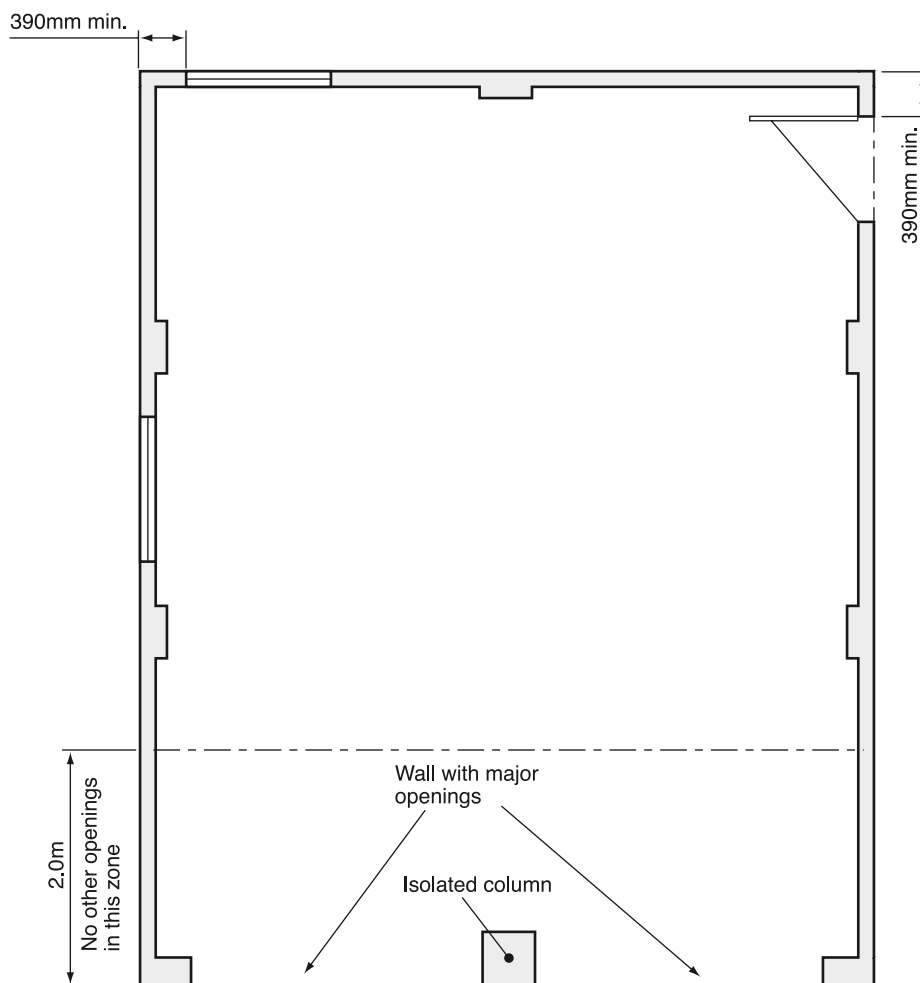
- The floor area of the building or annexe does not exceed 36m<sup>2</sup>.
- The walls are solidly constructed in brickwork or blockwork using materials which comply with paragraphs 2C19 to 2C22.
- Where the floor area of the building or annexe exceeds 10m<sup>2</sup> the walls have a mass of not less than 130kg/m<sup>2</sup>.

Note: There is no surface mass limitation recommended for floor areas of 10m<sup>2</sup> or less.

- Access to the roof is only for the purposes of maintenance and repair.
- The only lateral loads are wind loads.

Diagram 17 Size and location of openings

See para 2C38



## Notes

**1** Major openings should be restricted to one wall only. Their aggregate width should not exceed 5.0m and their height should not be greater than 2.1m.

**2** There should be no other openings within 2.0m of a wall containing a major opening.

**3** The aggregate size of openings in a wall not containing a major opening should not exceed 2.4m<sup>2</sup>.

**4** There should not be more than one opening between piers.

**5** Unless there is a corner pier the distance from a window or a door to a corner should not be less than 390mm.

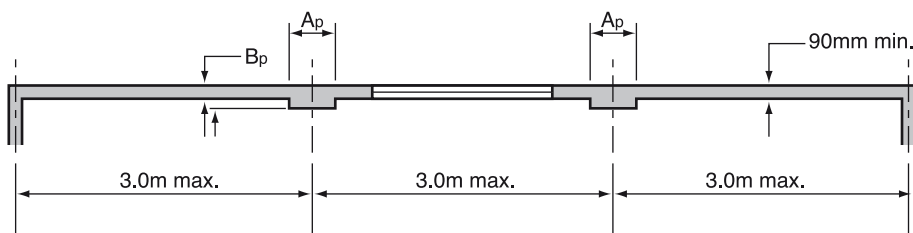
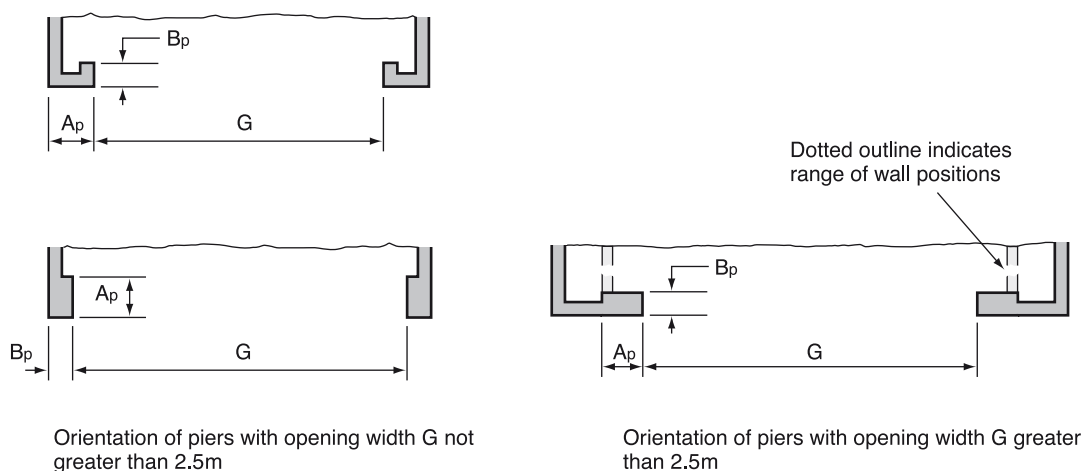
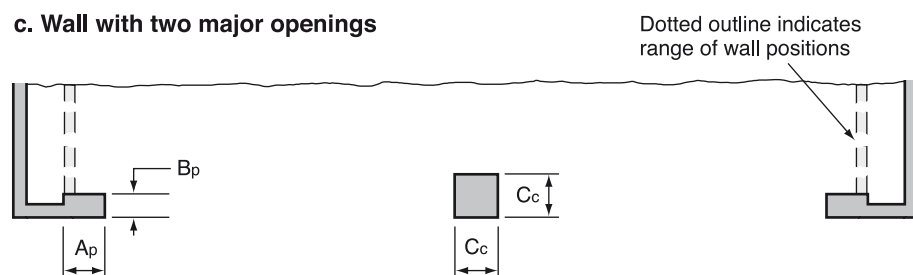
- f. The maximum length or width of the building or annexe does not exceed 9m.
- g. The height of the building or annexe does not exceed the lower value derived from Diagram 2.
- h. The roof is braced at rafter level, horizontally at eaves level and at the base of any gable by roof decking, rigid sarking or diagonal timber bracing, as appropriate, in accordance with BS EN 1995-1-1:2004 with its UK National Annex and additional guidance given in BSI

Published Document PD 6693-1:2012 or BS 8103-3:2009.

- i. Walls are tied to the roof structure vertically and horizontally in accordance with paragraphs **2C32** to **2C36** and with horizontal lateral restraint at roof level in accordance with paragraph (iv) below.
- j. The roof structure of an annexe is secured to the structure of the main building at both rafter and eaves level.

Diagram 18 Wall thickness

See para 2C38

**a. Wall without a major opening****b. Wall with a single major opening****c. Wall with two major openings****Notes**

**1** In all cases the minimum pier size ( $A_p \times B_p$ ) should be 390mm x 190mm or 327mm x 215mm depending on the size of the masonry units.

**2** Isolated column (Case c) to be 325mm x 325mm minimum ( $C_c \times C_c$ ).

**(ii) Size and location of openings**

One or two major openings not more than 2.1m in height are permitted in one wall of the building or annexe only. The width of a single opening or the combined width of two openings should not exceed 5m.

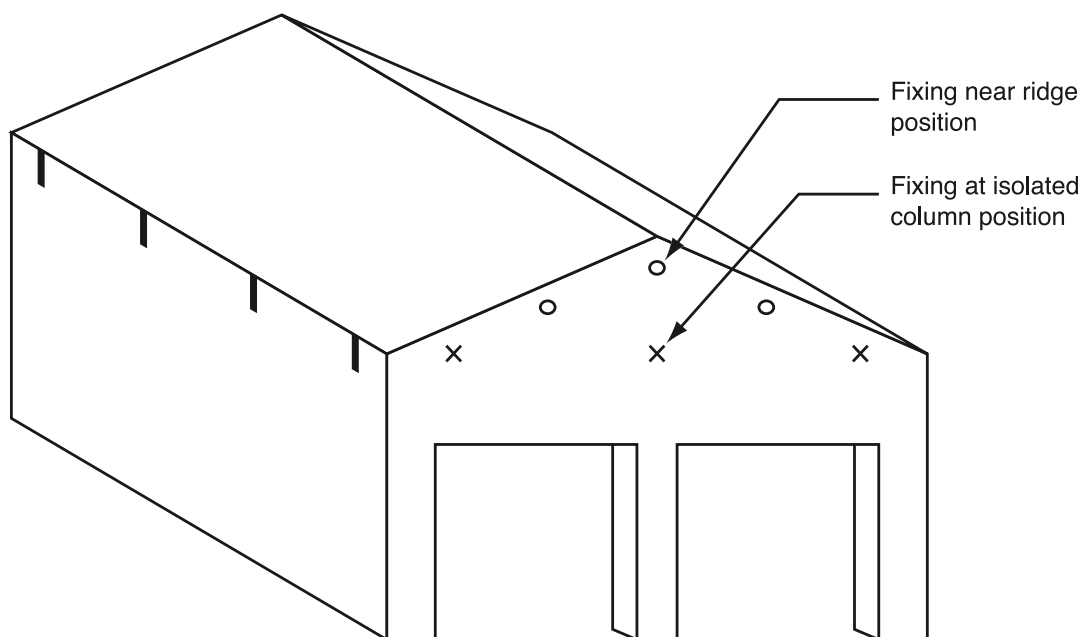
The only other openings permitted in a building or annexe are for windows and a single leaf door. The size and location of these openings should be in accordance with Diagram 17.

**(iii) Wall thickness and recommendations for piers**

The walls should have a minimum thickness of 90mm.

Diagram 19 **Lateral restraint at roof level**

See para 2C38



## Key

- ┆ denotes fixings at eaves level.
- × denotes fixings at base of gable.
- denotes fixings along roof slope.

Note: Fixings should be in accordance with Diagram 16.

Walls which do not contain a major opening but exceed 2.5m in length or height should be bonded or tied to piers for their full height at not more than 3m centres as shown in Diagram 18a. Walls which contain one or two major openings should in addition have piers as shown in Diagrams 18b and 18c. Where ties are used to connect piers to walls they should be flat, 20mm x 3mm in cross section, be in stainless steel in accordance with paragraph **2C19**, be placed in pairs and be spaced at not more than 300mm centre vertically.

## (iv) Horizontal lateral restraint at roof level

Walls should be tied horizontally at no more than 2m centres to the roof structure at eaves level, base of gables and along roof slopes as shown in Diagram 19 with straps fixed in accordance with paragraphs **2C35** and **2C36**. Where straps cannot pass through a wall they should be adequately secured to the masonry using suitable fixings. Isolated columns should also be tied to the roof structure (see Diagram 19).

## Section 2D: Proportions for masonry chimneys above the roof surface

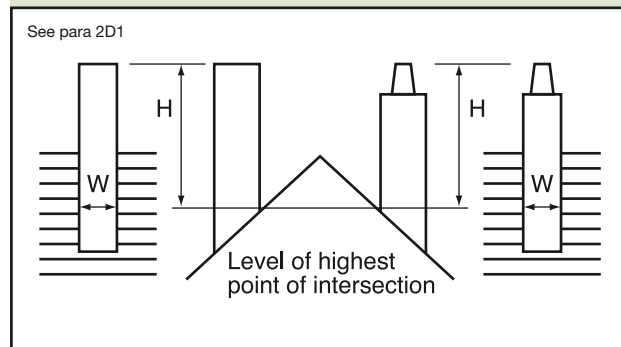
### Height to width relationship

**2D1** Where a chimney is not adequately supported by ties or securely restrained in any way, its height if measured from the highest point of intersection with the roof surface, gutter, etc. should not exceed  $4.5W$ , provided the density of the masonry is greater than  $1500\text{kg/m}^3$ , where:

**W** is the least horizontal dimension of the chimney measured at the same point of intersection, and

**H** is measured to the top of any chimney pot or other flue terminal (see Diagram 20).

**Diagram 20 Proportions for masonry chimneys**



# Section 2E: Foundations of plain concrete

## Conditions relating to the ground

**2E1** There should not be:

- non-engineered fill (as described in BRE Digest 427) or wide variation in ground conditions within the loaded area; nor
- weaker or more compressible ground at such a depth below the foundation as could impair the stability of the structure.

## Design provisions

**2E2** The following design provisions relate to foundations:

- the foundations should be situated centrally under the wall;
- for foundations in chemically aggressive soil conditions guidance in BS 8500-1 and BRE Special Digest 1 should be followed. In non-aggressive soils, concrete should be composed of Portland cement to BS EN 197-1 and -2 and fine and coarse aggregate conforming to BS EN 12620 and the mix should comply with one of the following recommendations:
  - in proportion of 50kg of Portland cement to not more than 200kg (0.1m<sup>3</sup>) of fine aggregate and 400kg (0.2m<sup>3</sup>) of coarse aggregate; or
  - grade ST2 or grade GEN I concrete to BS 8500-2;
- minimum thickness  $T$  of concrete foundation should be 150mm or  $P$ , whichever is the greater, where  $P$  is derived using Table 10 and Diagram 23. Trench fill foundations may be used as an acceptable alternative to strip foundations;
- foundations stepped on elevation should overlap by twice the height of the step, by the thickness of the foundation, or 300mm, whichever is greater (see Diagram 21).  
For trench fill foundations the overlap should be twice the height of the step or 1m, whichever is greater;
- steps in foundations should not be of greater height than the thickness of the foundation (see Diagram 21);
- foundations for piers, buttresses and chimneys should project as indicated in Diagram 22 and the projection  $X$  should never be less than the value of  $P$  where there is no local thickening of the wall.

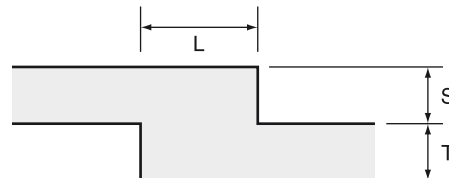
## Minimum width of strip foundations

**2E3** The recommended minimum widths of foundations given in Table 10 may be used.

**Diagram 21 Elevation of stepped foundation**

See paras 2E2d and e

Foundations should unite at each change in level



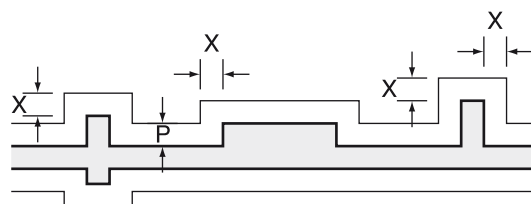
Minimum overlap  $L$  = twice height of step, or thickness of foundation or 300mm, whichever is greater

$S$  should not be greater than  $T$

(For trench fill foundations, minimum overlap  $L$  = twice height of step, or 1m, whichever is greater)

**Diagram 22 Piers and chimneys**

See para 2E2f



Projection  $X$  should not be less than  $P$

**Diagram 23 Foundation dimensions**

See para 2E2c

Wall should be central on foundation



The minimum thickness of the foundation ( $T$ ) should either be  $P$  or 150mm, whichever is greater

Foundation width should be not less than the appropriate dimension in Table 10

Trench fill foundations may be used as an alternative to strip foundations.

Table 10 Minimum width of strip footings

Type of ground (including engineered fill)	Condition of ground	Field test applicable	Total load of load-bearing walling not more than (kN/linear metre)					
			20	30	40	50	60	70
			Minimum width of strip foundations (mm)					
I Rock	Not inferior to sandstone, limestone or firm chalk	Requires at least a pneumatic or other mechanically operated pick for excavation	In each case equal to the width of wall					
II Gravel or sand	Medium dense	Requires pick for excavation. Wooden peg 50mm square in cross section hard to drive beyond 150mm	250	300	400	500	600	650
III Clay Sandy clay	Stiff Stiff	Can be indented slightly by thumb	250	300	400	500	600	650
IV Clay Sandy clay	Firm Firm	Thumb makes impression easily	300	350	450	600	750	850
V Sand Silty sand Clayey sand	Loose Loose Loose	Can be excavated with a spade. Wooden peg 50mm square in cross section can be easily driven	400	600	Note: Foundations on soil types V and VI do not fall within the provisions of this section if the total load exceeds 30kN/m.			
VI Silt Clay Sandy clay Clay or silt	Soft Soft Soft Soft	Finger pushed in up to 10mm	450	650				
VII Silt Clay Sandy clay Clay or silt	Very soft Very soft Very soft Very soft	Finger easily pushed in up to 25mm	Refer to specialist advice					

The table is applicable only within the strict terms of the criteria described within it.

## Minimum depth of strip foundations

**2E4** Except where strip foundations are founded on rock, the strip foundations should have a minimum depth of 0.45m to their underside to avoid the action of frost. This depth, however, will commonly need to be increased in areas subject to long periods of frost or in order to transfer the loading onto satisfactory ground.

In clay soils subject to volume change on drying ('shrinkable clays', with Modified Plasticity Index greater than or equal to 10%), strip foundations should be taken to a depth where anticipated ground movements will not impair the stability of any part of the building taking due consideration of the influence of vegetation and trees on the ground. The depth to the underside of foundations on clay soils should not be less than 0.75m on low shrinkage clay soils, 0.9m on medium shrinkage clay soils and 1.0m on high shrinkage clay soils, although these depths may need to be increased in order to transfer the loading onto satisfactory ground, or where there are trees nearby.

# Section 3: Wall cladding

## General

**3.1** Wall cladding presents a hazard if it becomes detached from the building. This section provides guidance on the support and fixing of wall cladding. An acceptable level of safety can be achieved by different means depending on the type and location of the cladding. The guidance given relates to all forms of cladding, including curtain walling and glass facades. It is not intended to provide guidance concerning the weather resistance of wall cladding which is included in Approved Document C, Site preparation and resistance to contaminants and moisture, or guidance on resistance to spread of fire which is included in Approved Document B, Fire safety, or guidance in relation to sound insulation, which is included in Approved Document E, Resistance to the passage of sound.

## Technical approach

**3.2** The cladding will meet the safety requirement if:

- the cladding is capable of safely sustaining and transmitting to the supporting structure of the building all dead, imposed and wind loads, and
- the cladding is securely fixed to and supported by the structure of the building. This shall comprise both vertical support and horizontal restraint, and
- provision is made, where necessary, to accommodate differential movement of the cladding and the supporting structure of the building, and
- the cladding and its fixings (including any support components) are of durable materials; the design life of the fixings being not less than that of the cladding. Fixings shall be corrosion resistant and of a material type appropriate for the local environment.

## Loading

**3.3** Wind loading on the cladding should be derived from BS EN 1991-1-4:2005 with its UK National Annex with due consideration given to local increases in wind suction arising from funnelling of the wind through gaps between buildings.

**3.4** Where the cladding is required to support other fixtures, e.g. handrails, and fittings, e.g. antennae and signboards, account should be taken of the loads and forces arising from such fixtures and fittings.

**3.5** Where the wall cladding is required to function as pedestrian guarding to stairs, ramps, vertical drops of more than 600mm in dwellings or more than the height of two risers (or 380mm if not part of a stair) in other buildings, or as a

vehicle barrier, then account should be taken of the additional imposed loading, as stipulated in Approved Document K, Protection from falling, collision and impact.

**3.6** Where the wall cladding is required to safely withstand lateral pressures from crowds, an appropriate design loading is given in BS EN 1991-1-1:2002 with its UK National Annex and the Guide to Safety at Sports Grounds (4th Edition, 1997).

## Fixings

**3.7** The selection of fixings for supporting cladding should be determined from a consideration of the proven performance of the fixing and the risks associated with the particular application. In this regard applications should be designated as being either non-redundant (where the failure of a single fixing could lead to the detachment of the cladding) or redundant (where failure or excessive movement of one fixing results in load sharing by adjacent fixings) and the required reliability of the fixing determined accordingly.

Note: Attention is drawn to the availability of anchors with an ETA gained in accordance with the requirements of ETAG 001 Guideline for European Technical Approval *Metal Anchors for use in Concrete* Parts 1-5, which cover both redundant and non-redundant applications, and Part 6 which covers 'Anchors for multiple use in non-structural applications' and which can effectively be regarded as covering redundant use. The UK definition of 'multiple use' is contained in an annexe to ETAG Part 6 and is framed in such a way that all applications can be validated as to whether or not they conform to this category without calculation. All ETAG parts may be downloaded in English from [www.eota.be](http://www.eota.be).

**3.8** The strength of fixings should be derived from tests using materials representative of the material into which the fixing is to be anchored, taking account of any inherent weaknesses that may affect the strength of the fixing, e.g. cracks in concrete due to shrinkage and flexure, or voids in masonry construction. The design loads will generally be available from the manufacturer's test data determined from an ETA or an extant British Standard.

Note: ETAs are available which cover use either in both cracked and non-cracked concrete or in non-cracked concrete only. Those which cover both cracked and non-cracked concrete allow higher loads for use in non-cracked than in cracked concrete.

## Further guidance

**3.9** The use of large panels of glass in cladding of walls and roofs where the cladding is not divided into small areas by load-bearing framing requires special consideration. Guidance is given in the following documents:

The Institution of Structural Engineers' Report on 'Structural use of glass in buildings' dated 1999, available from 11 Upper Belgrave Street, London SW1X 8BH.

'Nickel sulfide in toughened glass' published by the Centre for Window Cladding and Technology dated 2000.

**3.10** Further guidance on cladding is given in the following documents:

The Institution of Structural Engineers' Report on 'Aspects of Cladding' dated 1995.

The Institution of Structural Engineers' Report on 'Guide to the structural use of adhesives' dated 1999.

BS 8297:2000 Code of practice for the design and installation of non-load-bearing precast concrete cladding.

BS 8298:2010 Code of practice for the design and installation of natural stone cladding and lining.

**3.11** Additional guidance on fixings is given in the following documents:

ETAG No. 001 1997 Guideline for European Technical Approvals of Metal Anchors for use in Concrete, European Organisation for Technical Assessment (EOTA), Brussels. All EOTA parts may be downloaded in English from [www.eota.be](http://www.eota.be).

Part 1 Anchors in general.

Part 2 Torque controlled anchors.

Part 3 Undercut anchors.

Part 4 Deformation controlled anchors.

Part 5 Bonded anchors.

Part 6 Metal anchors for redundant use in concrete for lightweight systems.

BS 5080-1:1993 Structural fixings in concrete and masonry. Method of test for tensile loading.

CIRIA Report RP 566 Cladding Fixings: Good practice guidance.

CIRIA Reports C579 and C589 Retention of masonry facades – Best practice guide.

Guidance notes published by the Construction Fixings Association [www.fixingscfa.co.uk](http://www.fixingscfa.co.uk).

Guidance Note: Procedure for Site Testing Construction Fixings (1994).

Guidance Note: European Technical Approvals for Construction Fixings (1998).

Guidance Note: Anchor Selection (1995).

Guidance Note: Fixings and Fire (1998).

Guidance Note: Anchor Installation (1996).

Guidance Note: Bonded Anchors (1999).

Guidance Note: Heavy Duty Expansion Anchors (1997).

Guidance Note: Fixings for Brickwork and Blockwork (1997).

Guidance Note: Undercut Anchors (1998).

Guidance Note: Fixings and Corrosion (2002).

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## Section 4: Roof covering

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### Materials

**4.1** All materials used to cover roofs, excluding windows of glass in residential buildings with roof pitches of not less than 15°, shall be capable of safely withstanding the concentrated imposed loads upon roofs specified in BS EN 1991-1-1:2002 with its UK National Annex. Transparent or translucent covering materials for roofs not accessible except for normal maintenance and repair are excluded from the requirement to carry the concentrated imposed load upon roofs if they are non-fragile or are otherwise suitably protected against collapse.

### Re-covering of roofs

**4.2** The re-covering of roofs is commonly undertaken to extend the useful life of buildings. Roof structures may be required to carry underdrawing or insulation provided at a time later than their initial construction. This section provides guidance on determining whether such work to a roof constitutes a material alteration under the Building Regulations.

**4.3** Where the work involves a significant change in the applied loading the structural integrity of the roof structure and the supporting structure should be checked to ensure that upon completion of the work the building is not less compliant with Requirement A1 than the original building.

**4.4** A significant change in roof loading is when the loading upon the roof is increased by more than 15%. Consideration might also be given to whether the roof covering being replaced is the original as-built covering.

**4.5** Where such checking of the existing roof structure indicates that the construction is unable to sustain any proposed increase in loading (e.g. due to overstressed members or unacceptable deflection leading to ponding), appropriate strengthening work or replacement of roofing members should be undertaken. This is classified as a material alteration.

**4.6** In carrying out the checks mentioned in paragraph 4.3 an increase of stress in a structural member arising from increased loading does not necessarily indicate that the roof structure is less compliant than the original roof provided an adequate factor of safety is maintained.

**4.7** Where work will significantly decrease the roof dead loading, the roof structure and its anchorage to the supporting structure should be checked to ensure that an adequate factor of safety is maintained against uplift of the roof under imposed wind loading.

## The Requirement

This Approved Document deals with the following Requirements which are contained in the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>Disproportionate collapse</b>	
<b>A3.</b> The building shall be constructed so that in the event of an accident the building will not suffer collapse to an extent disproportionate to the cause.	

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# Guidance

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## Performance

In the Secretary of State's view the Requirement of A3 will be met by an appropriate choice of measures to reduce the sensitivity of a building to disproportionate collapse should an accident occur.

## Introduction

**0.1** The guidance in Section 5 deals with the means of meeting this performance criterion.

## Section 5: Reducing the sensitivity of the building to disproportionate collapse in the event of an accident

**5.1** The requirement will be met by adopting the following approach for ensuring that the building is sufficiently robust to sustain a limited extent of damage or failure, depending on the consequence class of the building, without collapse.

- a. Determine the building's consequence class from Table 11.
- b. **For Consequence Class 1 buildings** – Provided the building has been designed and constructed in accordance with the rules given in this Approved Document, or other guidance referenced under Section 1, for meeting compliance with Requirement A1 and A2 in normal use, no additional measures are likely to be necessary.
- c. **For Consequence Class 2a buildings** – In addition to the Consequence Class 1 measures, provide effective horizontal ties, or effective anchorage of suspended floors to walls, as described in the Standards listed under paragraph 5.2 for framed and load-bearing wall construction (the latter being defined in paragraph 5.3 below).
- d. **For Consequence Class 2b buildings** – In addition to the Consequence Class 1 measures, provide effective horizontal ties, as described in the Standards listed under paragraph 5.2 for framed and load-bearing wall construction (the latter being defined in paragraph 5.3 below), together with effective vertical ties, as defined in the Standards listed under paragraph 5.2, in all supporting columns and walls.

Alternatively, check that upon the notional removal of each supporting column and each beam supporting one or more columns, or any nominal length of load-bearing wall (one at a time in each storey of the building), the building remains stable and that the area of floor at any storey at risk of collapse does not exceed 15% of the floor area of that storey or 100m<sup>2</sup>, whichever is smaller, and does not extend further than the immediate adjacent storeys (see Diagram 24).

Where the notional removal of such columns and lengths of walls would result in an extent of damage in excess of the above limit, then such elements should be designed as a 'key element' as defined in paragraph 5.3 below.

- e. **For Consequence Class 3 buildings** – A systematic risk assessment of the building should be undertaken taking into account all the normal hazards that may reasonably be foreseen, together with any abnormal hazards.

Critical situations for design should be selected that reflect the conditions that can reasonably be foreseen as possible during the life of the building. The structural form and concept and any protective measures should then be chosen and the detailed design of the structure and its elements undertaken in accordance with the recommendations given in the Standards given in paragraph 5.2.

Further guidance is given in Annexes A and B to BS EN 1991-1-7:2006 Eurocode 1: Actions on structures – Part 1.7: General actions – Accidental actions; with UK National Annex to BS EN 1991-1-7:2006 and BS EN 1990:2002+A1:2005 Eurocode – Basis of structural design; with UK National Annex to BS EN 1990:2002+A1:2005.

**5.2** Details of the effective horizontal and vertical ties including tie force determination, together with the design approaches for checking the integrity of the building following the notional removal of vertical members and the design of key elements, are given in the following Standards:

BS EN 1990:2002+A1:2005 Eurocode – Basis of structural design; with UK National Annex to BS EN 1990:2002+A1:2005

BS EN 1991-1-7:2006 Eurocode 1: Actions on structures – Part 1.7: General actions – Accidental actions; with UK National Annex to BS EN 1991-1-7: 2006 and BSI PD 6688-1-7: 2009

BS EN 1992-1-1:2004 Eurocode 2: Design of concrete structures – Part 1.1: General rules and rules for buildings; with UK National Annex to BS EN 1992-1-1:2004 and BSI PD 6687-1:2010

BS EN 1993-1-1:2005 Eurocode 3: Design of steel structures – Part 1.1: General rules and rules for buildings; with UK National Annex to BS EN 1993-1-1:2005

BS EN 1994-1-1:2004 Eurocode 4: Design of composite steel and concrete structures – Part 1.1: General rules and rules for buildings; with UK National Annex to BS EN 1994-1-1:2004

BS EN 1995-1-1:2004+A1:2008 Eurocode 5: Design of timber structures – Part 1.1: General – Common rules and rules for buildings; with UK National Annex to BS EN 1995-1-1:2004+A1:2008 and BSI PD 6693-1:2012

BS EN 1996-1-1:2005+A1:2012 Eurocode 6: Design of masonry structures – Part 1.1: General rules for reinforced and unreinforced masonry structures; with UK National Annex to BS EN 1996-1-1:2005+A1:2012 and BSI PD 6697:2010

BS EN 1999-1-1:2007+A1:2009 Eurocode 9: Design of aluminium structures – Part 1.1: General structural rules; with UK National Annex to BS EN 1999-1-1:2007+A1:2009 and BSI PD 6702-1:2009

### 5.3 Definitions

#### Nominal length of load-bearing wall

The nominal length of load-bearing wall construction referred to in **5.1d** should be taken as follows:

- in the case of a reinforced concrete wall, the distance between lateral supports subject to a maximum length not exceeding  $2.25H$ ,
- in the case of an external masonry wall, or timber or steel stud wall, the length measured between vertical lateral supports,

- in the case of an internal masonry wall, or timber or steel stud wall, a length not exceeding  $2.25H$ ,

where  $H$  is the storey height in metres.

Note: Annex A of BS EN 1991-1-7:2006 with its UK National Annex provides corresponding guidance.

#### Key elements

A 'key element', as referred to in paragraph **5.1d**, should be capable of sustaining an accidental design loading of  $34\text{kN/m}^2$  applied in the horizontal and vertical directions (in one direction at a time) to the member and any attached components (e.g. cladding etc.) having regard to the ultimate strength of such components and their connections. Such accidental design loading should be assumed to act simultaneously with all other design loadings (i.e. wind and imposed loading) in accidental actions loading combination.

**Table 11 Building consequence classes**

Consequence Classes	Building type and occupancy
1	Houses not exceeding 4 storeys Agricultural buildings Buildings into which people rarely go, provided no part of the building is closer to another building, or area where people do go, than a distance of 1.5 times the building height
2a Lower Risk Group	5 storey single occupancy houses Hotels not exceeding 4 storeys Flats, apartments and other residential buildings not exceeding 4 storeys Offices not exceeding 4 storeys Industrial buildings not exceeding 3 storeys Retailing premises not exceeding 3 storeys of less than $2000\text{m}^2$ floor area in each storey Single-storey educational buildings All buildings not exceeding 2 storeys to which members of the public are admitted and which contain floor areas not exceeding $2000\text{m}^2$ at each storey
2b Upper Risk Group	Hotels, blocks of flats, apartments and other residential buildings greater than 4 storeys but not exceeding 15 storeys Educational buildings greater than 1 storey but not exceeding 15 storeys Retailing premises greater than 3 storeys but not exceeding 15 storeys Hospitals not exceeding 3 storeys Offices greater than 4 storeys but not exceeding 15 storeys All buildings to which members of the public are admitted which contain floor areas exceeding $2000\text{m}^2$ but less than $5000\text{m}^2$ at each storey Car parking not exceeding 6 storeys
3	All buildings defined above as Consequence Class 2a and 2b that exceed the limits on area and/or number of storeys Grandstands accommodating more than 5000 spectators Buildings containing hazardous substances and/or processes

#### Notes:

1. For buildings intended for more than one type of use the Consequence Class should be that pertaining to the most onerous type.
2. In determining the number of storeys in a building, basement storeys may be excluded provided such basement storeys fulfil the robustness requirements of Consequence Class 2b buildings.
3. BS EN 1991-1-7:2006 with its UK National Annex also provides guidance that is comparable to Table 11.

BS EN 1990:2002+A1:2005 with its UK National Annex provides guidance on accidental design loading and accidental actions loading combination for 'key elements' and expressions 6.11a and 6.11b of that Standard are relevant.

Note: Annex A of BS EN 1991-1-7:2006 with its UK National Annex provides corresponding guidance for 'key elements'.

## Load-bearing construction

For the purposes of this Guidance the term 'load-bearing wall construction' includes masonry cross-wall construction and walls comprising close centred timber or lightweight steel section studs.

## Alternative approach

**5.4** As an alternative to Table 11, for any building which does not fall into the classes listed under Table 11, or for which the consequences of collapse may warrant particular examination of the risks involved, performance may be demonstrated using the recommendations given in the following Reports and Publication:

'Guidance on Robustness and Provision against Accidental Actions', dated July 1999.

'Proposed Revised Guidance on meeting Compliance with the requirements of Building Regulation Part A3'. Revision of the Allott and Lomax proposals. Project Report No. 205966.

Both of the above documents are available on [www.planningportal.gov.uk](http://www.planningportal.gov.uk)

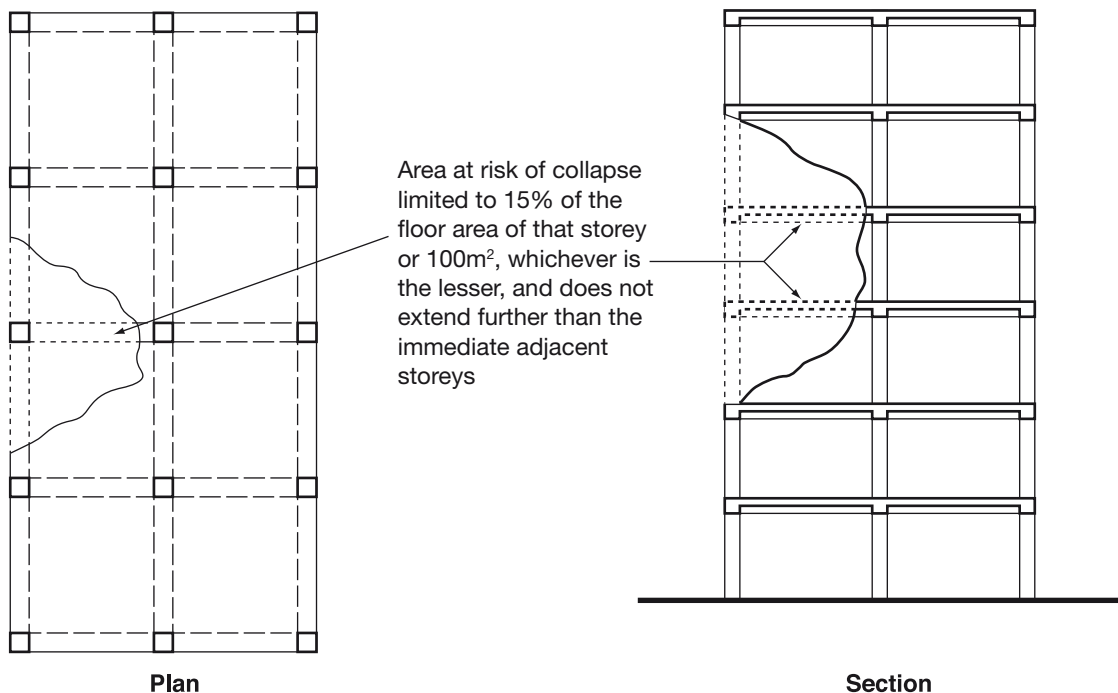
'Practical Guide to Structural Robustness and Disproportionate Collapse in Buildings' dated October 2010. Published by The Institution of Structural Engineers, London.

## Seismic design

**5.5** Seismic design is not usually required for buildings classified by Table 11 as being in Consequence Classes 1, 2a and 2b. For buildings classified as Consequence Class 3 the risk assessment should consider if there is any need to carry out seismic design, although such a need is not an explicit requirement for these buildings.

**Diagram 24 Area at risk of collapse in the event of an accident**

See para 5.1d



# Standards referred to

## A1/2

### BS 5080-1:1993

Structural fixings in concrete and masonry.  
Method of test for tensile loading.

### BS 8103-1:2011

Structural design of low-rise buildings. Code of practice for stability, site investigation, foundations, precast concrete floors and ground floor slabs for housing.

### BS 8103-2:2005

Structural design of low-rise buildings. Code of practice for masonry walls for housing.

### BS 8103-3:2009

Structural design of low-rise buildings. Code of practice for timber floors and roofs for housing.

### BS 8297:2000

Code of practice for design and installation of non-loadbearing precast concrete cladding.  
AMD 11064 2000, AMD 13018 2000.

### BS 8298-1:2010

Code of practice for the design and installation of natural stone cladding and lining. General.

### BS 8298-2:2010

Code of practice for the design and installation of natural stone cladding and lining. Traditional handset external cladding.

### BS 8298-3:2010

Code of practice for the design and installation of natural stone cladding and lining. Stone-faced pre-cast concrete cladding systems.

### BS 8298-4:2010

Code of practice for the design and installation of natural stone cladding and lining. Rainscreen and stone on metal frame cladding systems.

### BS 8500-1:2006+A1:2012

Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier.

### BS 8500-2:2006+A1:2012

Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete.

### BS EN 197-1:2011

Cement. Composition, specifications and conformity criteria for common elements.

### BS EN 197-2:2000

Cement. Conformity evaluation.

### BS EN 771-1:2011

Specification for masonry units. Clay masonry units.

### BS EN 771-2:2011

Specification for masonry units. Calcium silicate masonry units.

### BS EN 771-3:2011

Specification for masonry units. Aggregate concrete masonry units (dense and light-weight aggregates). AMD 16001.

### BS EN 771-4:2011

Specification for masonry units. Autoclaved aerated concrete masonry units.

### BS EN 771-5:2011

Specification for masonry units. Manufactured stone masonry units.

### BS EN 771-6:2011

Specification for masonry units. Natural stone masonry units.

### BS EN 845-1:2003+A1:2008

Specification for ancillary components for masonry. Ties, tension straps, hangers and brackets. AMD 14736 2003, AMD 15539 2006.

### BS EN 845-2:2003

Specification for ancillary components for masonry. Lintels.

### BS EN 845-3:2003+A1:2008

Specification for ancillary components for masonry. Bed joint reinforcement of steel meshwork.

### BS EN 998-2:2010

Specification for mortar for masonry. Masonry mortar. AMD July 2011.

### BS EN 1090-2:2008+A1:2011

Execution of steel structures and aluminium structures – Part 2: Technical requirements for the execution of steel structures.

### BS EN 1090-3:2008

Execution of steel structures and aluminium structures – Part 3: Technical requirements for aluminium structures.

### BS EN 1990:2002+A1:2005

Eurocode – Basis of structural design; with UK National Annex to BS EN 1990:2002+A1:2005.

### BS EN 1991-1-1:2002

Eurocode 1: Actions on structures – Part 1.1: General actions – Densities, self weight, imposed loads for buildings; with UK National Annex to BS EN 1991-1-1:2002.

### BS EN 1991-1-3:2003

Eurocode 1: Actions on structures – Part 1.3: General actions – Snow loads; with UK National Annex to BS EN 1991-1-3:2003.

### BS EN 1991-1-4:2005+A1:2010

Eurocode 1: Actions on structures – Part 1.4: General actions – Wind actions; with UK National Annex to BS EN 1991-1-4:2005+A1:2010.

### BS EN 1991-1-5:2003

Eurocode 1: Actions on structures – Part 1.5: General actions – Thermal actions; with UK National Annex to BS EN 1991-1-5:2003.

**BS EN 1991-1-6:2005**

Eurocode 1: Actions on structures – Part 1.6: General actions – Actions during execution; with UK National Annex to BS EN 1996-1-6:2005.

**BS EN 1991-1-7:2006**

Eurocode 1: Actions on structures – Part 1.7: General actions – Accidental actions; with UK National Annex to BS EN 1991-1-7:2006.

**BS EN 1991-3:2006**

Eurocode 1: Actions on structures – Part 3: Actions induced by cranes and machinery; with UK National Annex to BS EN 1991-3:2006.

**BS EN 1992-1-1:2004**

Eurocode 2: Design of concrete structures – Part 1.1: General rules and rules for buildings; with UK National Annex to BS EN 1992-1-1:2004.

**BS EN 1993-1-1:2005**

Eurocode 3: Design of steel structures – Part 1.1: General rules and rules for buildings; with UK National Annex to BS EN 1993-1-1:2005.

**BS EN 1993-1-3:2006**

Eurocode 3: Design of steel structures – Part 1.3: General rules – Supplementary rules for cold-formed members and sheeting; with UK National Annex to BS EN 1993-1-3:2006.

**BS EN 1993-1-4:2006**

Eurocode 3: Design of steel structures – Part 1.4: General rules – Supplementary rules for stainless steels; with UK National Annex to BS EN 1993-1-4:2006.

**BS EN 1993-1-5:2006**

Eurocode 3: Design of steel structures – Part 1.5: Plated structural elements; with UK National Annex to BS EN 1993-1-5:2006.

**BS EN 1993-1-6:2007**

Eurocode 3: Design of steel structures – Part 1.6: Strength and stability of shell structures.

**BS EN 1993-1-7:2007**

Eurocode 3: Design of steel structures – Part 1.7: Plated structures subject to out of plane loading.

**BS EN 1993-1-8:2005**

Eurocode 3: Design of steel structures – Part 1.8: Design of joints; with UK National Annex to BS EN 1993-1-8:2005.

**BS EN 1993-1-9:2005**

Eurocode 3: Design of steel structures – Part 1.9: Fatigue; with UK National Annex to BS EN 1993-1-9:2005.

**BS EN 1993-1-10:2005**

Eurocode 3: Design of steel structures – Part 1.10: Material toughness and through-thickness properties; with UK National Annex to BS EN 1993-1-10:2005.

**BS EN 1993-1-11:2006**

Eurocode 3: Design of steel structures – Part 1.11: Design of structures with tension components; with UK National Annex to BS EN 1993-1-11:2006.

**BS EN 1993-1-12:2007**

Eurocode 3: Design of steel structures – Part 1.12: Additional rules for the extension of EN 1993 up to steel grades S 700; with UK National Annex to BS EN 1993-1-12:2007.

**BS EN 1993-5:2007**

Eurocode 3: Design of steel structures – Part 5: Piling; with UK National Annex to BS EN 1993-5:2007+A1:2012.

**BS EN 1993-6:2007**

Eurocode 3: Design of steel structures – Part 6: Crane supporting structures; with UK National Annex to BS EN 1993-6:2007.

**BS EN 1994-1-1:2004**

Eurocode 4: Design of composite steel and concrete structures – Part 1.1: General rules and rules for buildings; with UK National Annex to BS EN 1994-1-1:2004.

**BS EN 1995-1-1:2004+A1:2008**

Eurocode 5: Design of timber structures – Part 1.1: General – Common rules and rules for buildings; with UK National Annex to BS EN 1995-1-1:2004+A1:2008.

**BS EN 1996-1-1:2005+A1:2012**

Eurocode 6: Design of masonry structures – Part 1.1: General rules for reinforced and unreinforced masonry structures; with UK National Annex to BS EN 1996-1-1:2005+A1:2012.

**BS EN 1996-2:2006**

Eurocode 6: Design of masonry structures – Part 2: Design considerations, selection of materials and execution of masonry; with UK National Annex to BS EN 1996-2:2006.

**BS EN 1996-3:2006**

Eurocode 6: Design of masonry structures – Part 3: Simplified calculation methods for unreinforced masonry structures; with UK National Annex to BS EN 1996-3:2006.

**BS EN 1997-1:2004**

Eurocode 7: Geotechnical design – Part 1: General rules; with UK National Annex to BS EN 1997-1:2004.

**BS EN 1997-2:2007**

Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing; with UK National Annex to BS EN 1997-2:2007.

**BS EN 1998-1:2004+A1:2013**

Eurocode 8: Design of structures for earthquake resistance – Part 1: General rules, seismic actions and rules for buildings; with UK National Annex to BS EN 1998-1:2004.

**BS EN 1998-5:2004**

Eurocode 8: Design of structures for earthquake resistance – Part 5: Foundations, retaining structures and geotechnical aspects; with UK National Annex to BS EN 1998-5:2004.

**BS EN 1999-1-1:2007+A1:2009**

Eurocode 9: Design of aluminium structures – Part 1.1: General structural rules; with UK National Annex to BS EN 1999-1-1:2007+A1:2009.

**BS EN 1999-1-3:2007+A1:2011**

Eurocode 9: Design of aluminium structures – Part 1.3: Structures susceptible to fatigue; with UK National Annex to BS EN 1999-1-3:2007+A1:2011.

**BS EN 1999-1-4:2007+A1:2011**

Eurocode 9: Design of aluminium structures – Part 1.4: Cold-formed structural sheeting; with UK National Annex to BS EN 1999-1-4:2007.

**BS EN 1999-1-5:2007**

Eurocode 9: Design of aluminium structures – Part 1.5: Shell structures; with UK National Annex to BS EN 1999-1-5:2007.

**BS EN 12620:2002+A1:2008**

Aggregates for concrete. AMD 15333 2004.

**BS EN 13670:2009**

Execution of concrete structures.

**BSI PD 6687-1:2010**

Published Document – Background paper to the UK National Annexes to BS EN 1992-1 and BS EN 1992-3.

**BSI PD 6688-1-1:2011**

Published Document – Recommendations for the design of structures to BS EN 1991-1-1.

**BSI PD 6688-1-4:2009**

Published Document – Background information the National Annex to BS EN 1991-1-4 and additional guidance.

**BSI PD 6688-1-7:2009**

Published Document – Recommendations for the design of structures to BS EN 1991-1-7.

**BSI PD 6693-1:2012**

Published Document – Recommendations for the design of timber structures to Eurocode 5: Design of timber structures Part 1: General – Common rules and rules for buildings.

**BSI PD 6695-1-9:2008**

Published Document – Recommendations for the design of structures to BS EN 1993-1-9.

**BSI PD 6695-1-10:2009**

Published Document – Recommendations for the design of structures to BS EN 1993-1-10.

**BSI PD 6697:2010**

Published Document – Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2.

**BSI PD 6698:2009**

Published Document – Recommendations for the design of structures for earthquake resistance to BS EN 1998.

**BSI PD 6702-1:2009**

Published Document – Structural use of aluminium – Part 1: Recommendations for the design of aluminium structures to BS EN 1999.

**BSI PD 6705-3:2009**

Published Document – Structural use of steel and aluminium – Part 3: Recommendations for the execution of aluminium structures to BS EN 1090-3.

**A3****BS EN 1990:2002+A1:2005**

Eurocode – Basis of structural design; with UK National Annex to BS EN 1990:2002+A1:2005.

**BS EN 1991-1-7:2006**

Eurocode 1: Actions on structures – Part 1.7: General actions – Accidental actions; with UK National Annex to BS EN 1991-1-7:2006.

**BS EN 1992-1-1:2004**

Eurocode 2: Design of concrete structures – Part 1.1: General rules and rules for buildings; with UK National Annex to BS EN 1992-1-1:2004.

**BS EN 1993-1-1:2005**

Eurocode 3: Design of steel structures – Part 1.1: General rules and rules for buildings; with UK National Annex to BS EN 1993-1-1:2005.

**BS EN 1994-1-1:2004**

Eurocode 4: Design of composite steel and concrete structures – Part 1.1: General rules and rules for buildings; with UK National Annex to BS EN 1994-1-1:2004.

**BS EN 1995-1-1:2004+A1:2008**

Eurocode 5: Design of timber structures – Part 1.1: General – Common rules and rules for buildings; with UK National Annex to BS EN 1995-1-1:2004+A1:2008.

**BS EN 1996-1-1:2005+A1:2012**

Eurocode 6: Design of masonry structures – Part 1.1: General rules for reinforced and unreinforced masonry structures; with UK National Annex to BS EN 1996-1-1:2005+A1:2012.

**BS EN 1999-1-1:2007+A1:2009**

Eurocode 9: Design of aluminium structures – Part 1.1: General structural rules; with UK National Annex to BS EN 1999-1-1:2007+A1:2009.

**BSI PD 6687-1:2010**

Published Document – Background paper to the UK National Annexes to BS EN 1992-1 and BS EN 1992-3.

**BSI PD 6688-1-7:2009**

Published Document – Recommendations for the design of structures to BS EN 1991-1-7.

**BSI PD 6693-1:2012**

Published Document – Recommendations for the design of timber structures to Eurocode 5: Design of timber structures Part 1: General – Common rules and rules for buildings.

**BSI PD 6697:2010**

Published Document – Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2.

**BSI PD 6702-1:2009**

Published Document – Structural use of aluminium – Part 1. Recommendations for the design of aluminium structures to BS EN 1999.

# 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 incorporating 2020 amendments –  
for use in England

# Main changes made by the 2020 amendments

The changes focus on the following fire safety provisions in blocks of flats:

- a. Sprinklers:  
A reduction in the trigger height from 30m to 11m.
- b. Wayfinding signage for the fire service:  
A new recommendation for floor identification and flat indication signage within blocks of flats with storeys over 11m.

In addition a typographical error is corrected in both volumes. Purpose group number 2 is now included in reference to 'residential' buildings in the guidance on boundaries.

The changes are set out in the May 2020 AD B amendments.

# The approved documents

## What is an approved document?

The Secretary of State has approved a series of documents that give practical guidance about how to meet the requirements of the Building Regulations 2010 for England. These approved documents give guidance on each of the technical parts of the regulations and on regulation 7 (see the back of this document). The approved documents provide guidance for common building situations.

It is the responsibility of those carrying out building works to meet the requirements of the Buildings Regulations 2010. Although it is ultimately for the courts to determine whether those requirements have been met, the approved documents provide practical guidance on potential ways to achieve compliance with the requirements of the regulations in England.

Although approved documents cover common building situations, compliance with the guidance set out in the approved documents does not provide a guarantee of compliance with the requirements of the regulations because the approved documents cannot cater for all circumstances, variations and innovations. Those with responsibility for meeting the requirements of the regulations will need to consider for themselves whether following the guidance in the approved documents is likely to meet those requirements in the particular circumstances of their case.

Note that there may be other ways to comply with the requirements than the methods described in an approved document. If you prefer to meet a relevant requirement in some other way than that described in an approved document, you should seek to agree this with the relevant building control body at an early stage.

Where the guidance in the approved document has been followed, a court or inspector will tend to find that there is no breach of the regulations. However, where the guidance in the approved document has not been followed, this may be relied upon as tending to establish breach of the regulations and, in such circumstances, the person carrying out building works should demonstrate that the requirements of the regulations have been complied with by some other acceptable means or method.

In addition to guidance, some approved documents include provisions that must be followed exactly, as required by regulations or where methods of test or calculation have been prescribed by the Secretary of State.

Each approved document relates only to the particular requirements of the Building Regulations 2010 that the document addresses. However, building work must also comply with all other applicable requirements of the Building Regulations 2010 and all other applicable legislation.

## How to use this approved document

This document uses the following conventions.

- a. **Text against a green background** is an extract from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations.
- b. **Key terms, printed in green**, are defined in Appendix A.

- c. References are made to appropriate standards or other documents, which can provide further useful guidance. When this approved document refers to a named standard or other reference document, the standard or reference document has been clearly identified in this document. Standards are highlighted in **bold** throughout. The full name and version of the document referred to is listed in Appendix F (standards) or Appendix G (other documents). However, if the issuing body has revised or updated the listed version of the standard or document, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations.
- d. Standards and technical approvals also address aspects of performance or matters that are not covered by the Building Regulations and may recommend higher standards than required by the Building Regulations. Nothing in this approved document precludes you from adopting higher standards.

## User requirements

The approved documents provide technical guidance. Users of the approved documents should have adequate knowledge and skills to understand and apply the guidance correctly to the building work being undertaken.

## Where you can get further help

If you are not confident that you possess adequate knowledge and skills to apply the guidance correctly or if you do not understand the technical guidance or other information in this approved document or the additional detailed technical references to which it directs you, you should seek further help. Help can be obtained through a number of routes, some of which are listed below.

- a. If you are the person undertaking the building work: either from your local authority building control service or from an approved inspector.
- b. If you are registered with a competent person scheme: from the scheme operator.
- c. If your query is technical: from a specialist or an industry technical body for the relevant subject.

# The Building Regulations

The following is a high level summary of the Building Regulations relevant to most types of building work. Where there is any doubt you should consult the full text of the regulations, available at [www.legislation.gov.uk](http://www.legislation.gov.uk).

## Building work

Regulation 3 of the Building Regulations defines ‘building work’. Building work includes:

- a. the erection or extension of a building
- b. the provision or extension of a controlled service or fitting
- c. the material alteration of a building or a controlled service or fitting.

Regulation 4 states that building work should be carried out in such a way that, when work is complete:

- a. For new buildings or work on a building that complied with the applicable requirements of the Building Regulations: the building complies with the applicable requirements of the Building Regulations.
- b. For work on an existing building that did not comply with the applicable requirements of the Building Regulations:
  - i. the work itself must comply with the applicable requirements of the Building Regulations, and
  - ii. the building must be no more unsatisfactory in relation to the requirements than before the work was carried out.

## Material change of use

Regulation 5 defines a ‘material change of use’ in which a building or part of a building that was previously used for one purpose will be used for another.

The Building Regulations set out requirements that must be met before a building can be used for a new purpose. To meet the requirements, the building may need to be altered in some way.

## Materials and workmanship

In accordance with regulation 7, building work must be carried out in a workmanlike manner using adequate and proper materials. Guidance on regulation 7(1) is given in Approved Document 7 and guidance on regulation 7(2) is provided in Approved Document B.

## Independent third party certification and accreditation

Independent schemes of certification and accreditation of installers can provide confidence that the required level of performance for a system, product, component or structure can be achieved.

Building control bodies may accept certification under such schemes as evidence of compliance with a relevant standard. However, a building control body should establish before the start of the building work that a scheme is adequate for the purposes of the Building Regulations.

## Energy efficiency requirements

Part 6 of the Building Regulations imposes additional specific requirements for energy efficiency.

If a building is extended or renovated, the energy efficiency of the existing building or part of it may need to be upgraded.

## Notification of work

Most building work and material changes of use must be notified to a building control body unless one of the following applies.

- a. It is work that will be self-certified by a registered competent person or certified by a registered third party.
- b. It is work exempted from the need to notify by regulation 12(6A) of, or Schedule 4 to, the Building Regulations.

## Responsibility for compliance

People who are responsible for building work (e.g. agent, designer, builder or installer) must ensure that the work complies with all applicable requirements of the Building Regulations. The building owner may also be responsible for ensuring that work complies with the Building Regulations. If building work does not comply with the Building Regulations, the building owner may be served with an enforcement notice.

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# Section 0: Approved Document B:

## Fire safety – dwellings

### Summary

- 0.1** This approved document has been published in two volumes. Volume 1 deals solely with dwellings, including blocks of flats, while Volume 2 deals with all other types of building covered by the Building Regulations.

### Arrangement of sections

- 0.2** Requirements B1–B5 of Schedule 1 to the Building Regulations are dealt with separately in one or more sections. Each requirement is shown at the start of the relevant sections.

- 0.3** The provisions in this document have the following aims.

**Requirement B1:** When there is a fire, ensure both:

- a. satisfactory means of sounding an alarm
- b. satisfactory means of escape for people.

**Requirement B2:** Inhibit the spread of fire over internal linings of buildings.

**Requirement B3:** The building must be built such that all of the following are achieved in the event of a fire:

- a. the premature collapse of the building is avoided
- b. sufficient fire separation is provided within buildings and between adjoining buildings
- c. automatic fire suppression is provided where necessary
- d. the unseen spread of fire and smoke in cavities is restricted.

**Requirement B4:** Restrict both:

- a. the potential for fire to spread over external walls and roofs (including compliance with regulations 6(4) and 7(2))
- b. the spread of fire from one building to another.

**Requirement B5:** Ensure both:

- a. satisfactory access for the fire service and its appliances
- b. facilities in buildings to help firefighters save the lives of people in and around buildings.

**Regulation 38:** Provide fire safety information to building owners.

- 0.4** Guidance is given on each aspect separately, though many are closely interlinked. The document should be considered as a whole. The relationship between different requirements and their interdependency should be recognised. Particular attention should be given to the situation where one part of the guidance is not fully followed, as this could have a negative effect on other provisions.

## Appendices: Information common to more than one requirement of Part B

**0.5** Guidance on matters that refer to more than one section of this document can be found in the following appendices.

Appendix A: Key terms

Appendix B: Performance of materials, products and structures

Appendix C: Fire doorsets

Appendix D: Methods of measurement

Appendix E: Sprinklers

Appendix F: Standards referred to

Appendix G: Documents referred to

## Management of premises

**0.6** The Building Regulations do not impose any requirements on the management of a **building**, but do assume that it will be properly managed. This includes, for example, keeping protected **escape routes** virtually 'fire sterile'.

Appropriate fire safety design considers the way in which a **building** will be managed. Any reliance on an unrealistic or unsustainable management regime cannot be considered to have met the requirements of the regulations.

Once the **building** is in use, the management regime should be maintained and a suitable risk assessment undertaken for any variation in that regime. Failure to take proper management responsibility may result in the prosecution of an employer, **building** owner or occupier under legislation such as the Regulatory Reform (Fire Safety) Order 2005.

## Property protection

**0.7** The Building Regulations are intended to ensure a reasonable standard of life safety in a fire. The protection of property, including the **building** itself, often requires additional measures. Insurers usually set higher standards before accepting the insurance risk.

Many insurers use the *RISCAuthority Design Guide for the Fire Protection of Buildings* by the Fire Protection Association (FPA) as a basis for providing guidance to the **building** designer on what they require.

Further information on the protection of property can be obtained from the FPA website: [www.thefpa.co.uk](http://www.thefpa.co.uk).

## Inclusive design

**0.8** The fire safety aspects of the Building Regulations aim to achieve reasonable standards of health and safety for people in and around **buildings**.

People, regardless of ability, age or gender, should be able to access **buildings** and use their facilities. The fire safety measures incorporated into a **building** should take account of the needs of everyone who may access the **building**, both as visitors and as people who live or work in it. It is not appropriate, except in exceptional circumstances, to assume that certain groups of people will be excluded from a **building** because of its use.

The provisions in this approved document are considered to be of a reasonable standard for most buildings. However, some people's specific needs might not be addressed. In some situations, additional measures may be needed to accommodate these needs. This should be done on a case-by-case basis.

## 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.

## Buildings of special architectural or historic interest

- 0.10** Where Part B applies to existing buildings, particularly buildings of special architectural or historic interest for which the guidance in this document might prove too restrictive, some variation of the 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.

## Purpose groups

- 0.14** Building uses are classified within different purpose groups, which represent different levels of hazard (see Table 0.1). A purpose group can apply to a whole building or a compartment within the building, and should relate to the main use of the building or compartment.
- 0.15** Where a building or compartment has more than one use, it is appropriate to assign each different use to its own purpose group in the following situations.
- a. If the ancillary use is a flat.
  - b. If both of the following apply.
    - i. The building or compartment has an area of more than 280m<sup>2</sup>.
    - ii. The ancillary use relates to an area that is more than one-fifth of the total floor area of the building or compartment.
  - c. In 'shop and commercial' (purpose group 4) buildings or compartments, if the ancillary use is storage and both of the following apply.
    - i. The building or compartment has an area of more than 280m<sup>2</sup>.
    - ii. The storage area comprises more than one-third of the total floor area of the building or compartment.
- 0.16** Where there are multiple main uses that are not ancillary to one another (for example, shops with independent offices above), each use should be assigned to a purpose group in its own right. Where there is doubt as to which purpose group is appropriate, the more onerous guidance should be applied.
- 0.17** In sheltered housing, the guidance in Approved Document B Volume 2 should be consulted for the design of communal facilities, such as a common lounge.

**Table 0.1 Classification of purpose groups****Volume 1 purpose groups**

Title	Group	Purpose for which the building or compartment of a building is intended to be used
Residential (dwellings)	1(a) <sup>(1)</sup>	Flat.
	1(b) <sup>(2)</sup>	Dwellinghouse that contains a habitable storey with a floor level a minimum of 4.5m above ground level up to a maximum of 18m. <sup>(3)</sup>
	1(c) <sup>(2)(4)</sup>	Dwellinghouse that does not contain a habitable storey with a floor level a minimum of 4.5m above ground level.

**Volume 2 purpose groups**

Residential (institutional)	2(a)	<p>Hospital, home, school or other similar establishment, where people sleep on the premises. The building may be either of the following.</p> <ul style="list-style-type: none"><li>• Living accommodation for, or accommodation for the treatment, care or maintenance of, either:<ul style="list-style-type: none"><li>– people suffering from disabilities due to illness or old age or other physical or mental incapacity</li><li>– people under the age of 5 years.</li></ul></li><li>• A place of lawful detention.</li></ul>
Residential (other)	2(b)	Hotel, boarding house, residential college, hall of residence, hostel or any other residential purpose not described above.
Office	3	<p>Offices or premises used for any of the following and their control:</p> <ul style="list-style-type: none"><li>• administration</li><li>• clerical work (including writing, bookkeeping, sorting papers, filing, typing, duplicating, machine calculating, drawing and the editorial preparation of matter for publication, police and fire and rescue service work)</li><li>• handling money (including banking and building society work)</li><li>• communications (including postal, telegraph and radio communications)</li><li>• radio, television, film, audio or video recording</li><li>• performance (premises not open to the public).</li></ul>
Shop and commercial	4	<p>Shops or premises used for either of the following.</p> <ul style="list-style-type: none"><li>• A retail trade or business (including selling food or drink to the public for immediate consumption, retail by auction, self-selection and over-the-counter wholesale trading, the business of lending books or periodicals for gain, the business of a barber or hairdresser, and the rental of storage space to the public).</li><li>• Premises to which the public are invited either:<ul style="list-style-type: none"><li>– to deliver or collect goods in connection with their hire, repair or other treatment</li><li>– (except in the case of repair of motor vehicles) where the public themselves may carry out such repairs or other treatments.</li></ul></li></ul>

**Table 0.1 Continued**

Title	Group	Purpose for which the building or compartment of a building is intended to be used
Assembly and recreation	5	<p>Place of assembly, entertainment or recreation, including any of the following:</p> <ul style="list-style-type: none"> <li>• bingo halls, broadcasting, recording and film studios open to the public, casinos, dance halls</li> <li>• entertainment, conference, exhibition and leisure centres</li> <li>• funfairs and amusement arcades</li> <li>• museums and art galleries, non-residential clubs, theatres, cinemas, concert halls</li> <li>• educational establishments, dancing schools, gymnasia, swimming pool buildings, riding schools, skating rinks, sports pavilions, sports stadia</li> <li>• law courts</li> <li>• churches and other buildings of worship, crematoria</li> <li>• libraries open to the public, non-residential day centres, clinics, health centres and surgeries</li> <li>• passenger stations and termini for air, rail, road or sea travel</li> <li>• public toilets</li> <li>• zoos and menageries.</li> </ul>
Industrial	6	<p>Factories and other premises used for any of the following:</p> <ul style="list-style-type: none"> <li>• manufacturing, altering, repairing, cleaning, washing, breaking up, adapting or processing any article</li> <li>• generating power</li> <li>• slaughtering livestock.</li> </ul>
Storage and other non-residential <sup>(4)</sup>	7(a)	<p>Either of the following:</p> <ul style="list-style-type: none"> <li>• place (other than described under 7(b)) for the storage or deposit of goods or materials</li> <li>• any building not within purpose groups 1 to 6.</li> </ul>
	7(b)	<p>Car parks designed to admit and accommodate only cars, motorcycles and passenger or light goods vehicles that weigh a maximum of 2500kg gross.</p>

**NOTES:**

This table only applies to Part B.

See Approved Document B Volume 2 for guidance on buildings other than dwellings (purpose groups 2, 3, 4, 5, 6 and 7).

1. Includes live/work units that meet the provisions of paragraph 3.24.
2. Includes any surgeries, consulting rooms, offices or other accommodation that meets all of the following conditions.
  - a. A maximum of 50m<sup>2</sup> in total.
  - b. Part of a dwellinghouse.
  - c. Used by an occupant of the dwellinghouse in a professional or business capacity.
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.
4. All of the following are included in purpose group 1(c).
  - a. A detached garage a maximum of 40m<sup>2</sup> in area.
  - b. A detached open carport a maximum 40m<sup>2</sup> in area.
  - c. A detached building that consists of a garage and open carport, each a maximum of 40m<sup>2</sup> in area.

## Mixed use buildings

- 0.18** This approved document includes reference to selected guidance for **buildings** other than **dwelling**s. For the design of mixed use **buildings**, Approved Document B Volume 2 should be consulted in addition to the guidance contained in this approved document.
- 0.19** Where a complex mix of uses exists, the effect that one use may have on another in terms of risk should be considered. It could be necessary to use guidance from both volumes, apply other guidance (such as from HTM 05-02 or *Building Bulletin 100*), and/or apply special measures to reduce the risk.

## Requirement B1: Means of warning and escape

These sections deal with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
<b>Means of warning and escape</b>	
<b>B1.</b> The building shall be designed and constructed so that there are appropriate provisions for the early warning of fire, and appropriate means of escape in case of fire from the building to a place of safety outside the building capable of being safely and effectively used at all material times.	<p>Requirement B1 does not apply to any prison provided under section 33 of the Prison Act 1952<sup>(a)</sup> (power to provide prisons, etc.).</p> <p>(a) 1952 c. 52; section 33 was amended by section 100 of the Criminal Justice and Public Order Act 1994 (c. 33) and by S.I. 1963/597.</p>

### Intention

In the Secretary of State's view, requirement B1 is met by achieving all of the following.

- There are sufficient means for giving early warning of fire to people in the **building**.
- All people can escape to a place of safety without external assistance.
- Escape routes** are suitably located, sufficient in number and of adequate capacity.
- Where necessary, **escape routes** are sufficiently protected from the effects of fire and smoke.
- Escape routes** are adequately lit and exits are suitably signed.
- There are appropriate provisions to limit the ingress of smoke to the **escape routes**, or to restrict the spread of fire and remove smoke.
- For buildings containing **flats**, there are appropriate provisions to support a stay put evacuation strategy.

The extent to which any of these measures are necessary is dependent on the use of the **building**, its size and its **height**.

Building work and material changes of use subject to requirement B1 include both new and existing **buildings**.

# Section 1: Fire detection and alarm systems

## 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.

## 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**.

## Extensions and material alterations

- 1.8** Where new **habitable rooms** are provided, a fire detection and alarm system should be installed where either of the following applies.
- The **room** is provided above or below the ground **storey**.
  - The **room** is provided at the ground **storey**, without a **final exit**.
- 1.9** Smoke alarms should be provided in the **circulation spaces** of the **dwelling** in accordance with paragraphs 1.1 to 1.4.
- NOTE:** This does not apply where **inner rooms** are provided (see paragraph 2.11 for **inner room** requirements).

## Blocks of flats

- 1.10** Each flat in a block should have alarms as set out in paragraphs 1.1 to 1.4. With effective compartmentation, a communal fire alarm system is not normally needed. In some buildings, detectors in common parts of the building may need to operate smoke control or other fire protection systems but do not usually sound an audible warning.

## Student accommodation

- 1.11** In student residences that are designed and occupied as a block of flats, separate automatic detection should be provided in each self-contained flat where all of the following apply.

- a. A group of up to six students shares the flat.
- b. Each flat has its own entrance door.
- c. The compartmentation principles for flats in Section 7 have been followed.

Where a total evacuation strategy is adopted, the alarm system should follow the guidance for buildings other than dwellings in Volume 2 of Approved Document B.

## Sheltered housing

- 1.12** The fire detection and alarm systems in flats should connect to a central monitoring point or alarm receiving centre. The systems should alert the warden or supervisor and identify the individual flat where a fire has been detected.

- 1.13** These provisions do not apply to the following.

- a. The common parts of a sheltered housing development, such as communal lounges.
- b. Sheltered accommodation in the 'residential (institutional)' or 'residential (other)' purpose groups (purpose group 2(a) or 2(b)).

In these parts, means of warning should follow the guidance for buildings other than dwellings in Volume 2 of Approved Document B.

## Design and installation of systems

- 1.14** Fire detection and alarm systems must be properly designed, installed and maintained. A design, installation and commissioning certificate should be provided for fire detection and alarm systems. Third party certification schemes for fire protection products and related services are an effective means of providing assurances of quality, reliability and safety.

## Interface between fire detection and alarm systems and other systems

- 1.15** Fire detection and alarm systems sometimes trigger other systems. The interface between systems must be reliable. Particular care should be taken if the interface is facilitated via another system. Where any part of BS 7273 applies to the triggering of other systems, the recommendations of that part of BS 7273 should be followed.

## Section 2: Means of escape – dwellinghouses

### Escape from the ground storey

- 2.1 See Diagram 2.1a. All **habitable rooms** (excluding kitchens) should have either of the following.
- An opening directly onto a hall leading to a **final exit**.
  - An emergency escape window or door, as described in paragraph 2.10.

### Escape from upper storeys a maximum of 4.5m above ground level

- 2.2 See Diagram 2.1b. Where served by only one stair, all **habitable rooms** (excluding kitchens) should have either of the following.
- An emergency escape window or external door, as described in paragraph 2.10.
  - Direct access to a **protected stairway**, as described in paragraph 2.5a.
- 2.3 Two **rooms** may be served by a single window. A door between the **rooms** should provide access to the window without passing through the stair enclosure. Both **rooms** should have their own access to the internal stair.

### Escape from upper storeys more than 4.5m above ground level

- 2.4 **Dwellinghouses** with one internal stair should comply with paragraphs 2.5 and 2.6. In **dwellinghouses** with more than one stair, the stairs should provide effective alternative **means of escape**. The stairs should be physically separated by either of the following.
- Fire resisting** construction (minimum REI 30).
  - More than one **room**.

### Dwellinghouses with one storey more than 4.5m above ground level

- 2.5 See Diagram 2.1c. The **dwellinghouse** should have either of the following.
- Protected stairway** – a stair separated by **fire resisting** construction (minimum REI 30) at all **storeys**, that complies with one of the following.
    - Extends to a **final exit** (Diagram 2.2a).
    - Gives access to a minimum of two ground level **final exits** that are separated from each other by **fire resisting** construction (minimum REI 30) and **fire doorsets** (minimum E 20) (Diagram 2.2b).
- Cavity barriers** or a **fire resisting ceiling** (minimum EI 30) should be provided above a **protected stairway** enclosure (Diagram 2.3).

- b. **Alternative escape route** – a top storey separated from lower storeys by fire resisting construction (minimum REI 30) and with an alternative escape route leading to its own final exit.

See paras 2.1 to 2.6

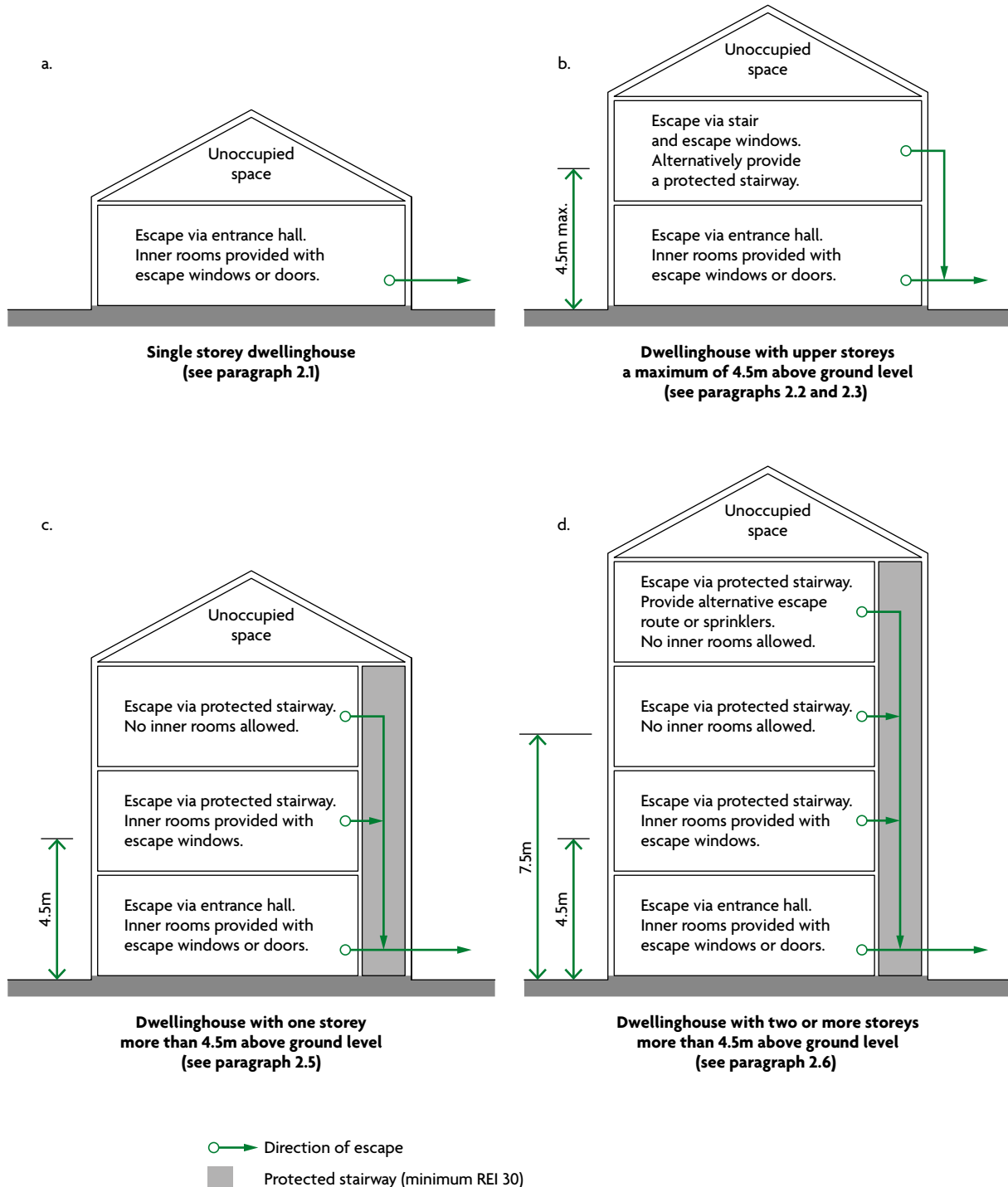


Diagram 2.1 Means of escape from dwellinghouses

See para 2.5

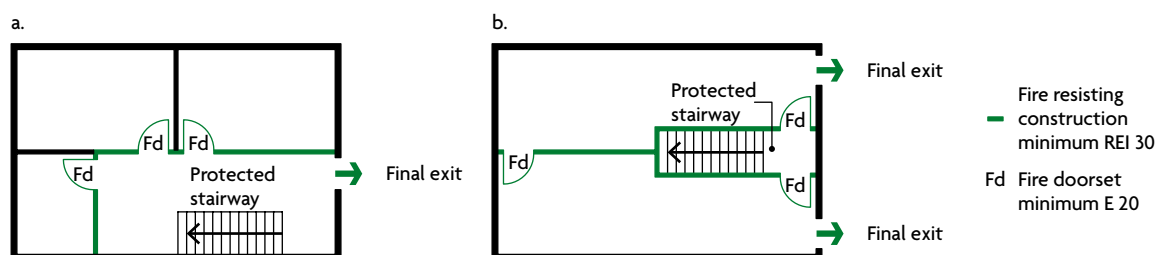


Diagram 2.2 Alternative arrangements for final exits

See para 2.5

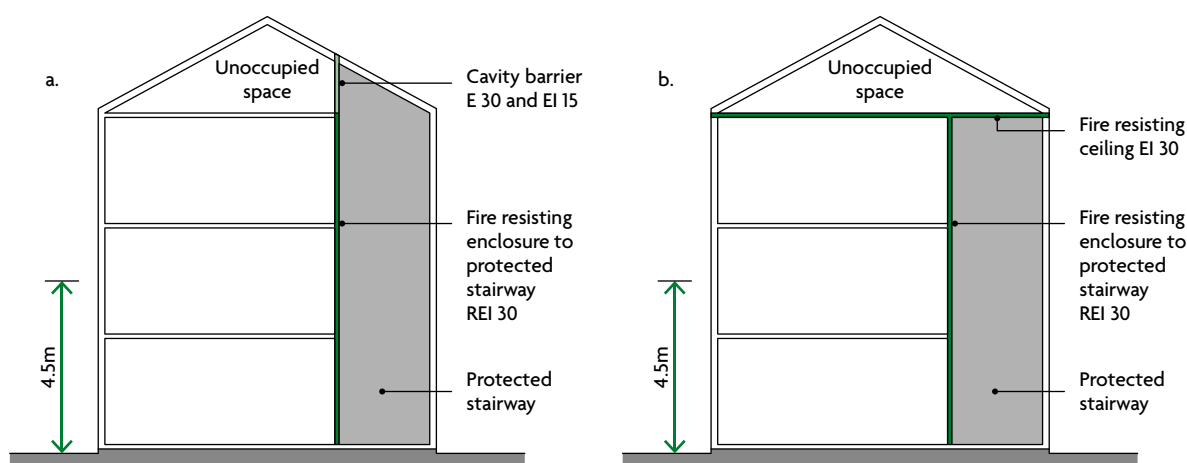
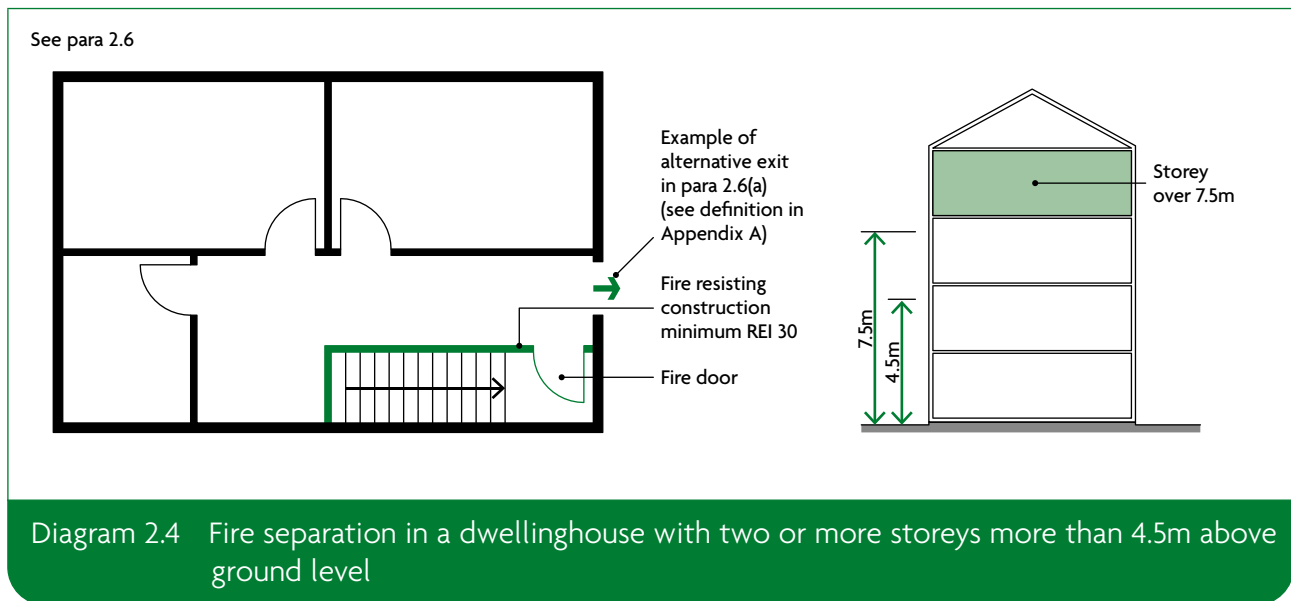


Diagram 2.3 Alternative cavity barrier arrangements in roof space over protected stairway in a house with a storey more than 4.5m above ground level

## Dwellinghouses with two or more storeys more than 4.5m above ground level

**2.6** See Diagram 2.1d. In addition to meeting the provisions in paragraph 2.5, the dwellinghouse should comply with either of the following.

- Provide an alternative escape route from each storey more than 7.5m above ground level. At the first storey above 7.5m, the protected stairway should be separated from the lower storeys by fire resisting construction (minimum REI 30) if the alternative escape route is accessed via either of the following.
  - The protected stairway to an upper storey.
  - A landing within the protected stairway enclosure to an alternative escape route on the same storey. The protected stairway at or about 7.5m above ground level should be separated from the lower storeys or levels by fire resisting construction (see Diagram 2.4).
- Provide a sprinkler system throughout, designed and installed in accordance with **BS 9251**.



## Passenger lifts

**2.7** A passenger lift serving any storey more than 4.5m above ground level should be in either of the following.

- The enclosure to the protected stairway, as described in paragraph 2.5.
- A fire resisting lift shaft (minimum REI 30).

## Air circulation systems

**2.8** Air circulation systems which circulate air within an individual dwellinghouse with a floor more than 4.5m above ground level should meet the guidance given in paragraph 2.9.

**2.9** All of the following precautions should be taken to avoid the spread of smoke and fire to the protected stairway.

- Transfer grilles should not be fitted in any wall, door, floor or ceiling of the stair enclosure.
- Any duct passing through the stair enclosure should be rigid steel. Joints between the ductwork and stair enclosure should be fire-stopped.
- Ventilation ducts supplying or extracting air directly to or from a protected stairway should not serve other areas as well.
- Any system of mechanical ventilation which recirculates air and which serves both the stair and other areas should be designed to shut down on the detection of smoke within the system.
- For ducted warm air heating systems, a room thermostat should be sited in the living room. It should be mounted at a height between 1370mm and 1830mm above the floor. The maximum setting should be 27°C.

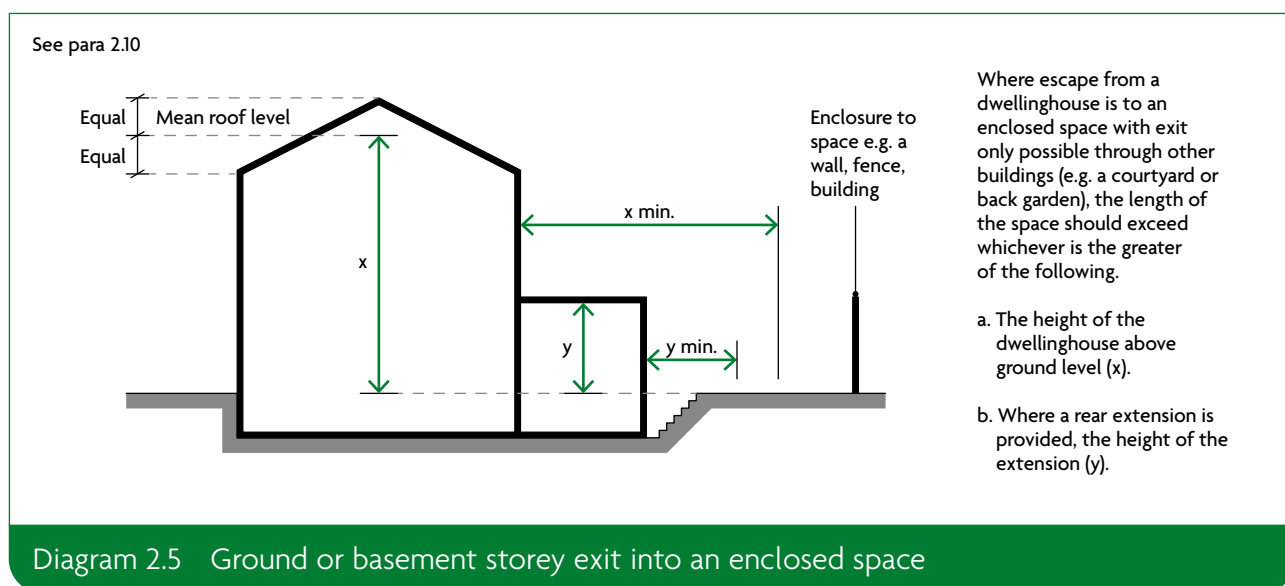
**NOTE:** Ventilation ducts passing through compartment walls should comply with the guidance in Section 9.

## General provisions

### 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.



### Inner rooms

**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.

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

## Balconies and flat roofs

**2.13** Where a flat roof forms part of a means of escape, it should comply with all of the following.

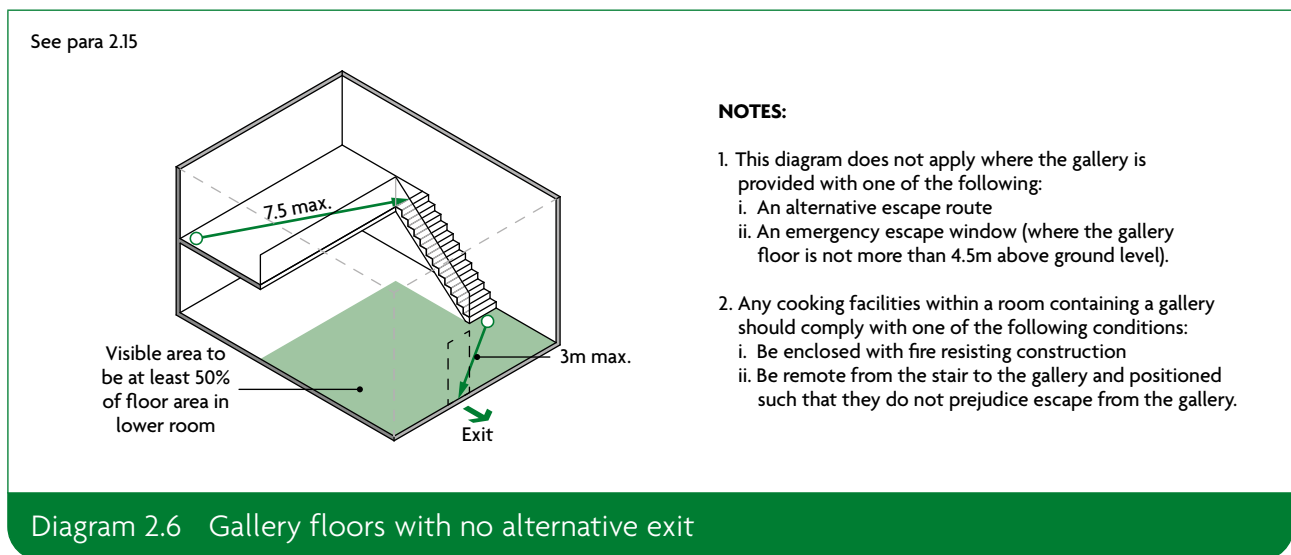
- It should be part of the same building from which escape is being made.
- The route across the roof should lead to a storey exit or external escape route.
- The part of the roof (including its supporting structure) forming the escape route, and any opening within 3m of the escape route, should be of fire resisting construction (minimum REI 30).

**2.14** A balcony or flat roof intended to form part of an escape route should be provided with guarding etc. in accordance with Approved Document K.

## Galleries

**2.15** A gallery should comply with one of the following.

- It should be provided with an alternative exit.
- It should be provided with an emergency escape window, as described in paragraph 2.10, where the gallery floor is a maximum of 4.5m above ground level.
- It should meet all the conditions shown in Diagram 2.6.



## Basements

**2.16** Basement storeys containing habitable rooms should have one of the following.

- An emergency escape window or external door providing escape from the basement (paragraph 2.10).
- A protected stairway (paragraph 2.5a) leading from the basement to a final exit.

## External escape stairs

**2.17** Any external escape stair should meet all of the following conditions (Diagram 2.7).

- a. Doors to the stair should be **fire resisting** (minimum E 30), except for a single exit door from the **building** to the top landing of a downward-leading external stair.
- b. **Fire resisting** construction (minimum RE 30) is required for the **building** envelope within the following zones, measured from the flights and landings of the external stair.
  - i. 1800mm horizontally.
  - ii. 9m vertically below.
  - iii. 1100mm above the top landing of the stair (except where the stair leads from basement to ground level).
- c. **Fire resisting** construction (minimum RE 30) should be provided for any part of the **building** (including doors) within 1800mm of the **escape route** from the foot of the stair to a place of safety. This does not apply if there are **alternative escape routes** from the foot of the external escape stair.
- d. Stairs more than 6m in **height** should be protected from adverse weather. Protection should prevent the build-up of snow or ice but does not require full enclosure.
- e. Glazing in areas of **fire resisting** construction should be fixed shut and **fire resisting** (in terms of integrity, but not insulation) (minimum E 30).

See para 2.17

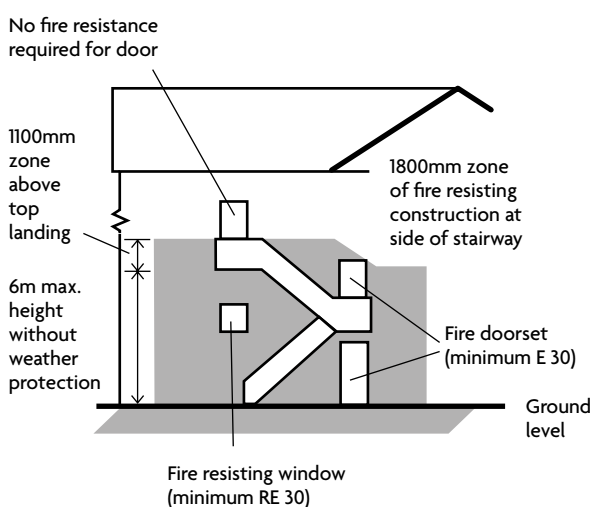


Diagram 2.7 Fire resistance of areas near to external stairs

## Work on existing dwellinghouses

### Replacement windows

- 2.18** Work should comply with Parts K and L of Schedule 1 to the Building Regulations. When complete, the **building** should comply with other applicable parts of Schedule 1 to at least the same level as before.
- 2.19** Where an existing window would be an escape window in a new **dwellinghouse**, and is big enough to be used for escape purposes, then the replacement should comply with one of the following.
- The replacement window should be sized to provide at least the same potential for escape.
  - If the existing window was larger than required for escape purposes, the opening can be reduced to the minimum described in paragraph 2.10.
- 2.20** If windows are replaced, it may be necessary to provide **cavity barriers** around the opening in accordance with Section 5.

### 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.
- The full extent of the **escape route** should be addressed.
  - 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.
- Provide sprinkler protection to the open-plan areas.
  - 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.
  - Separate cooking facilities from the open-plan area with **fire resisting** construction (minimum REI 30).

## Section 3: Means of escape – flats

### Introduction

- 3.1** Separate guidance applies to **means of escape** within the **flat** and within the common parts of the **building** that lead to a place of safety. **Flats** at ground level are treated similarly to **dwellinghouses**. With increasing **height**, more complex provisions are needed.
- 3.2** The provisions in this section make the following assumptions.
- Any fire is likely to be in a **flat**.
  - There is no reliance on external rescue.
  - Simultaneous evacuation of all **flats** is unlikely to be necessary due to compartmentation.
  - Fires in common parts of the **building** should not spread beyond the fabric in the immediate vicinity. In some cases, however, communal facilities exist that require additional measures to be taken.
- 3.3** Provisions are recommended to support a stay put evacuation strategy for blocks of **flats**. It is based on the principle that a fire is contained in the **flat** of origin and common **escape routes** are maintained relatively free from smoke and heat. It allows occupants, some of whom may require assistance to escape in the event of a fire, in other **flats** that are not affected to remain.
- Sufficient protection to common **means of escape** is necessary to allow occupants to escape should they choose to do so or are instructed/aided to by the fire service. A higher standard of protection is therefore needed to ensure common **escape routes** remain available for a longer period than is provided in other **buildings**.
- 3.4** Paragraphs 3.6 to 3.23 deal with the **means of escape** within each **flat**. Paragraphs 3.25 to 3.89 deal with the **means of escape** in common areas of the **building** (including mixed use **buildings** in paragraphs 3.76 and 3.77). Guidance for **live/work units** is given in paragraph 3.24.

### General provisions

#### Mixed use buildings

- 3.5** In mixed use **buildings**, separate **means of escape** should be provided from any **storeys** or parts of **storeys** used for the 'residential' or 'assembly and recreation' **purpose groups** (**purpose groups** 1, 2 and 5), other than in the case of certain small **buildings** or **buildings** in which the residential accommodation is ancillary (see paragraphs 3.76 and 3.77)

#### Emergency escape windows and external doors

- 3.6** Windows or external doors providing emergency escape should comply with all of the following.
- Windows should have an unobstructed openable area that complies with all of the following.
    - A minimum area of 0.33m<sup>2</sup>.

- 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.
- 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.

## Inner rooms

**3.7** 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 3.6.
- f. A **gallery** that complies with paragraph 3.13.

**3.8** 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 3.7.
- b. The **access rooms** each have a smoke alarm (see Section 1).
- c. None of the **access rooms** is a kitchen.

## Basements

**3.9** **Basement storeys** containing **habitable rooms** should have one of the following.

- a. An emergency escape window or external door providing escape from the basement (see paragraph 3.6).
- b. A **protected stairway** (minimum REI 30) leading from the basement to a **final exit**.

## Balconies and flat roofs

**3.10** Where a flat roof forms part of a **means of escape**, it should comply with all of the following.

- a. It should be part of the same **building** from which escape is being made.
- b. The route across the roof should lead to a **storey exit** or external **escape route**.
- c. The part of the roof (including its supporting structure) forming the **escape route**, and any opening within 3m of the **escape route**, should be of **fire resisting** construction (minimum REI 30).

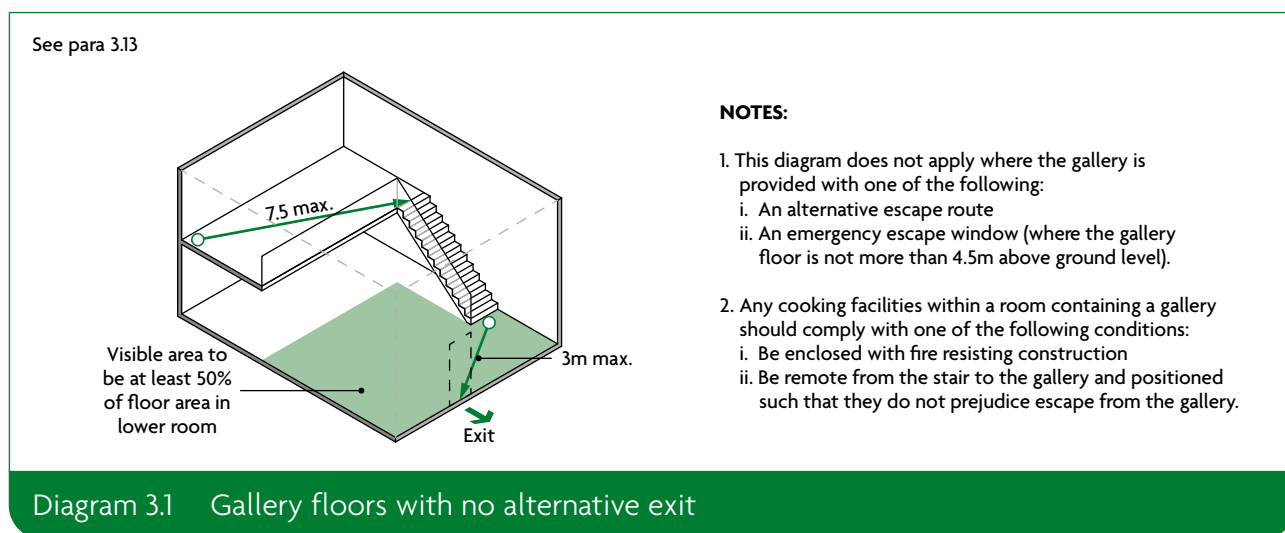
**3.11** A balcony or flat roof intended to form part of an **escape route** should be provided with guarding etc. in accordance with Approved Document K.

**3.12** For **flats** more than 4.5m above ground level, a balcony outside an **alternative exit** should be a **common balcony** meeting the conditions described in paragraph 3.22.

## Galleries

**3.13** A gallery should comply with one of the following.

- It should be provided with an alternative exit.
- It should be provided with an emergency escape window, as described in paragraph 3.6, where the gallery floor is a maximum of 4.5m above ground level.
- It should meet the conditions shown in Diagram 3.1.



## Flats with upper storeys a maximum of 4.5m above ground level

**3.14** The internal arrangement of single storey or multi-storey flats should comply with paragraphs 3.15 to 3.17. Alternatively, the guidance in paragraphs 3.18 to 3.22 may be followed.

A flat accessed via the common parts of the building should also comply with the provisions for small single stair buildings in paragraph 3.28 and Diagram 3.9. A protected entrance hall may be required as a result.

### Escape from the ground storey

**3.15** All habitable rooms (excluding kitchens) should have either of the following.

- An opening directly onto a hall leading to a final exit.
- An emergency escape window or door, as described in paragraph 3.6.

### Escape from upper storeys a maximum of 4.5m above ground level

**3.16** All habitable rooms (excluding kitchens) should have either of the following.

- An emergency escape window or external door, as described in paragraph 3.6.
- In multi-storey flats, direct access to a protected internal stairway (minimum REI 30) leading to an exit from the flat.

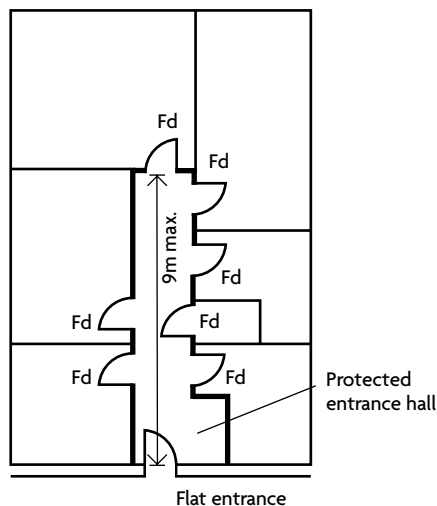
**3.17** Two rooms may be served by a single escape window. A door between rooms should provide access to the escape window without passing through the stair enclosure. Both rooms should have their own access to the internal stair.

## Flats with storeys more than 4.5m above ground level

### Internal planning of single storey flats

- 3.18** One of the following approaches should be adopted, observing the **inner room** restrictions described in paragraphs 3.7 and 3.8.
- Provide a **protected entrance hall** (minimum REI 30) serving all **habitable rooms** that meets the conditions shown in Diagram 3.2.
  - Plan the **flat** to meet the conditions shown in Diagram 3.3, so that both of the following apply.
    - The **travel distance** from the **flat** entrance door to any point in any **habitable room** is a maximum of 9m.
    - Cooking facilities are remote from the main entrance door and do not impede the **escape route** from anywhere in the **flat**.
  - Provide an **alternative exit** from the **flat** complying with paragraph 3.22.

See para 3.18



**NOTE:** Bathrooms do not need to have fire doorsets provided that the bathroom is separated by fire resisting construction from the adjacent rooms.

Fd Fire doorset  
 — Fire resisting construction (minimum REI 30)

Diagram 3.2 Flat where all habitable rooms have direct access to an entrance hall

See para 3.18

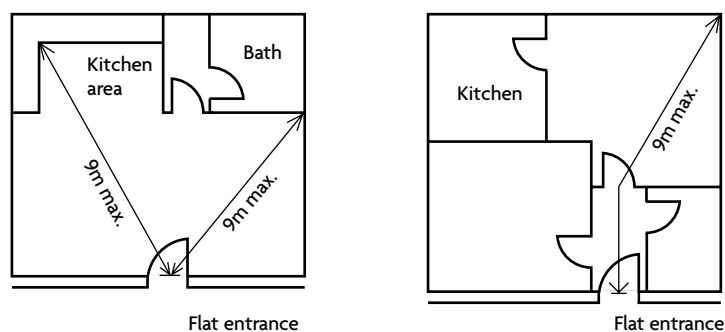
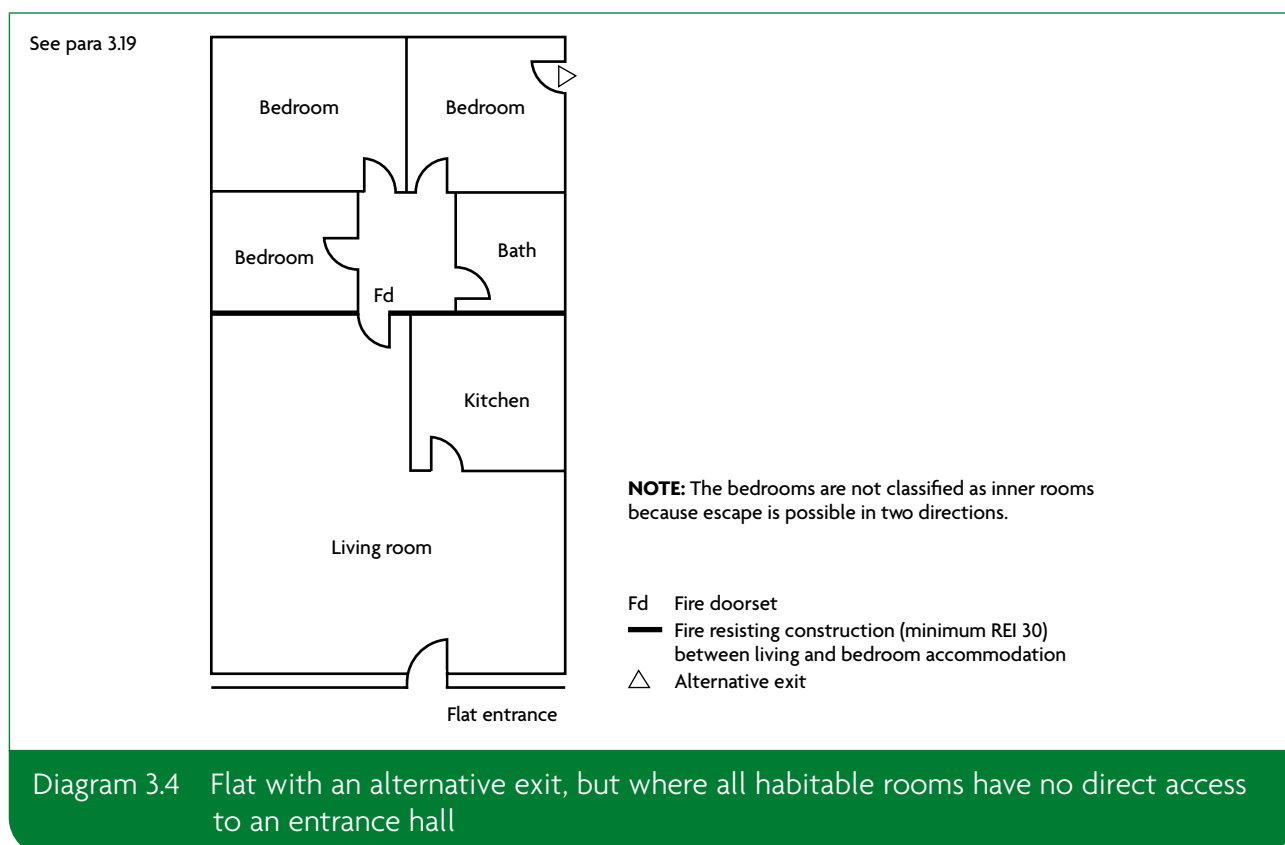


Diagram 3.3 Flat with restricted travel distance from furthest point to entrance

## Flats with an alternative exit

- 3.19** Where access from any **habitable room** to the entrance hall or **flat** entrance is impossible without passing through another **room**, all of the following conditions should be met (Diagram 3.4).
- Bedrooms should be separated from living accommodation by **fire resisting** construction (minimum REI 30) and **fire doorsets** (minimum E 20).
  - The **alternative exit** should be in the part of the **flat** that contains the bedrooms.



## Internal planning of multi-storey flats

- 3.20** A multi-storey **flat** with an independent external entrance at ground level is similar to a **dwellinghouse** and **means of escape** should be planned on the basis of Section 2, depending on the **height** of the top **storey** above ground level.
- 3.21** When multi-storey **flats** do not have their own external entrance at ground level, adopt one of the following approaches.
- Approach 1** – provide at least one **alternative exit** from each **habitable room** that is not on the entrance **storey** of the **flat** (Diagram 3.5 and paragraph 3.22).
  - Approach 2** – provide at least one **alternative exit** from each **storey** that is not the entrance **storey** of the **flat**. All **habitable rooms** should have direct access to a **protected landing** (Diagram 3.6 and paragraph 3.22).
  - Approach 3** – provide a **protected stairway** plus a sprinkler system in accordance with Appendix E and provide smoke alarms in accordance with **BS 5839-6**.

- d. **Approach 4** – if the vertical distance between the entrance storey of the flat and any of the storeys above or below does not exceed 7.5m, provide all of the following.
- A protected stairway.
  - Additional smoke alarms in all habitable rooms.
  - A heat alarm in any kitchen.

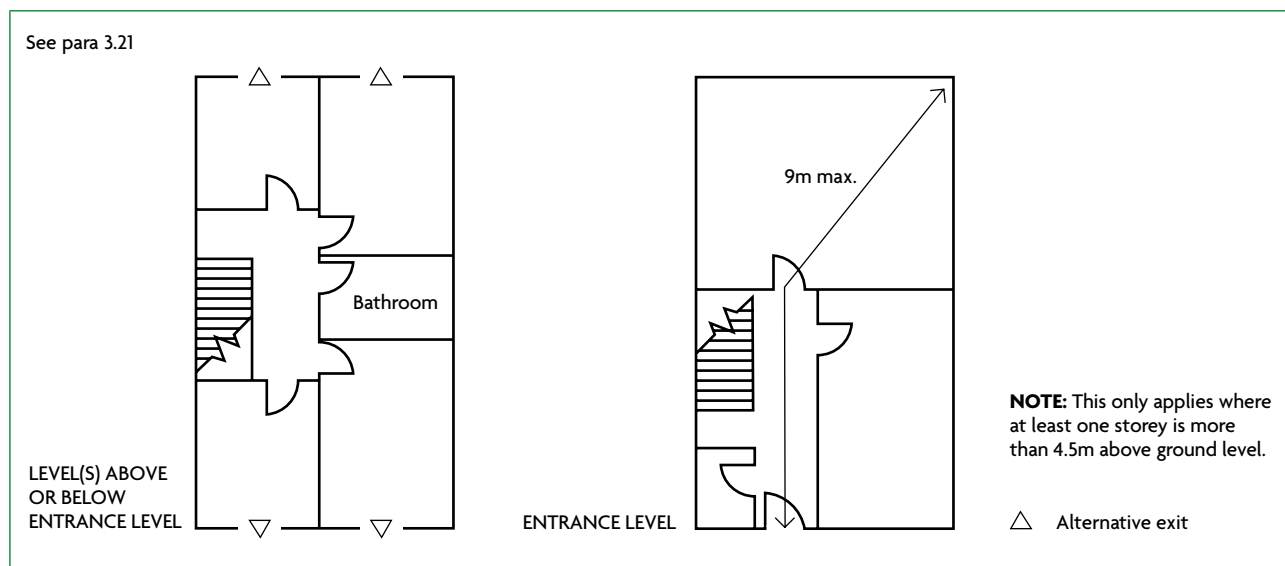


Diagram 3.5 Multi-storey flat with alternative exits from each habitable room, except at entrance level

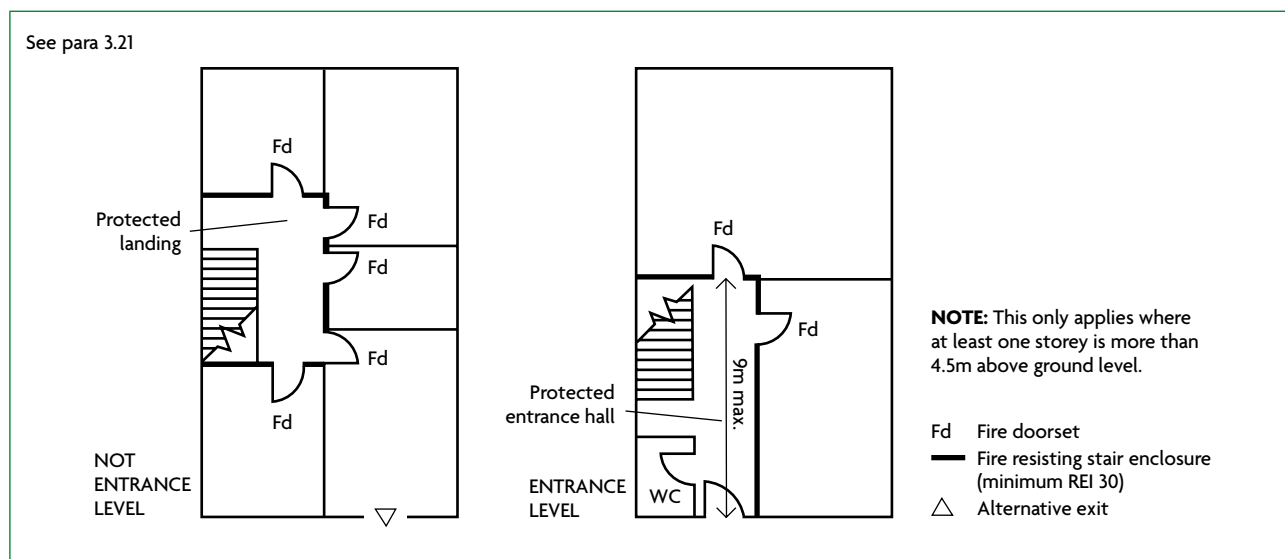


Diagram 3.6 Multi-storey flat with protected entrance hall and landing

## Alternative exits

**3.22** Any **alternative exit** from a **flat** should comply with all of the following.

- a. It should be remote from the main entrance door to the **flat**.
- b. It should lead to a **final exit**, via a **common stair** if necessary, through one of the following.
  - i. A door to an access corridor, access lobby or **common balcony**.
  - ii. An internal private stair leading to an access corridor, access lobby or **common balcony** at another level.
  - iii. A door to a **common stair**.
  - iv. A door to an external stair.
  - v. A door to an **escape route** over a flat roof.

Any access route leading to a **final exit** or **common stair** should comply with the provisions for means of escape in the common parts of a flat (see paragraph 3.25).

## Air circulation systems in flats with a protected stairway or entrance hall enclosure

**3.23** For systems circulating air only within an individual **flat**, take all of the following precautions.

- a. Transfer grilles should not be fitted in any wall, door, floor or **ceiling** of the enclosure.
- b. Any duct passing through the enclosure should be rigid steel. Joints between the ductwork and enclosure should be **fire-stopped**.
- c. Ventilation ducts serving the enclosure should not serve any other areas.
- d. Any system of mechanical ventilation which recirculates air and which serves both the stair and other areas should be designed to shut down on the detection of smoke within the system.
- e. For ducted warm air heating systems, a room thermostat should be sited in the living **room**. It should be mounted at a height between 1370mm and 1830mm above the floor. The maximum setting should be 27°C.

**NOTE:** Ventilation ducts passing through **compartment walls** should comply with the guidance in Section 9.

## Live/work units

**3.24** For **flats** serving as a workplace for both occupants and people who do not live on the premises, provide both of the following.

- a. A maximum **travel distance** of 18m between any part of the working area and either of the following.
  - i. The **flat** entrance door.
  - ii. An alternative **means of escape** that is not a window.

If the **travel distance** is over 18m, the assumptions in paragraph 3.2 may not be valid. The design should be considered on a case-by-case basis.

- b. **Escape lighting** to windowless accommodation in accordance with **BS 5266-1**.

## Means of escape in the common parts of flats

**3.25** The following paragraphs deal with means of escape from the entrance doors of flats to a final exit. They do not apply to flats with a top storey that is a maximum of 4.5m above ground level (designed in accordance with paragraphs 3.16 and 3.17).

Reference should also be made to the following.

- a. Requirement B3 regarding compartment walls and protected shafts.
- b. Requirement B5 regarding access for the fire and rescue service.

## Number of escape routes

**3.26** A person escaping through the common area, if confronted by the effects of a fire in another flat, should be able to turn away from it and make a safe escape via an alternative route.

**3.27** From the flat entrance door, a single escape route is acceptable in either of the following cases.

- a. The flat is on a storey served by a single common stair and both of the following apply.
  - i. Every flat is separated from the common stair by a protected lobby or common protected corridor (see Diagram 3.7).
  - ii. The maximum travel distance in Table 3.1, for escape in one direction only, is not exceeded.
- b. The flat is in a dead end of a common corridor served by two (or more) common stairs and the maximum travel distance given in Table 3.1, for escape in one direction only, is not exceeded (Diagram 3.8).

**Table 3.1 Limitations on travel distance in common areas of blocks of flats**

Maximum travel distance from flat entrance door to common stair or stair lobby<sup>(1)</sup>

Escape in one direction

Escape in more than one direction

7.5m<sup>(2)(3)</sup>

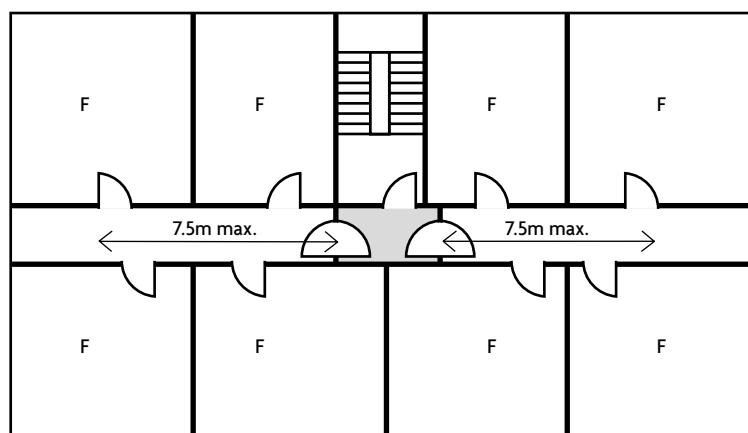
30m<sup>(3)(4)</sup>

**NOTES:**

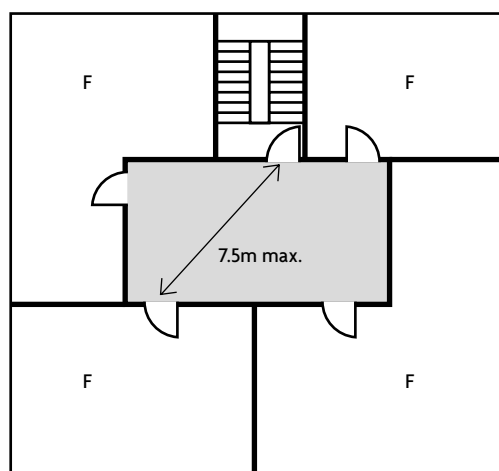
1. If travel distance is measured to a stair lobby, the lobby must not provide direct access to any storage room, flat or other space containing a fire hazard.
2. In the case of a small single stair building in accordance with Diagram 3.9, this is reduced to 4.5m.
3. Does not apply if all flats on a storey have independent alternative means of escape.
4. Sheltered housing may require reduced maximum travel distances.

See paras 3.27 and 3.36

## a. CORRIDOR ACCESS FLATS



## b. LOBBY ACCESS FLATS



### NOTES:

1. The arrangements shown also apply to the top storey.
2. See Diagram 3.9 for small single stair buildings.
3. All doors shown are fire doorsets.
4. Where travel distance is measured to a stair lobby, the lobby must not provide direct access to any storage room, flat or other space containing a potential fire hazard.
5. For further guidance on the fire rating of the fire doorsets from the corridor to the flat and/or stairway refer to Appendix C, Table C1.

F Flat

■ Shaded areas indicate zones where ventilation should be provided in accordance with paragraphs 3.50 to 3.53 (An external wall vent or smoke shaft located anywhere in the shaded area)

Diagram 3.7 Flats served by one common stair

See paras 3.27 and 3.36

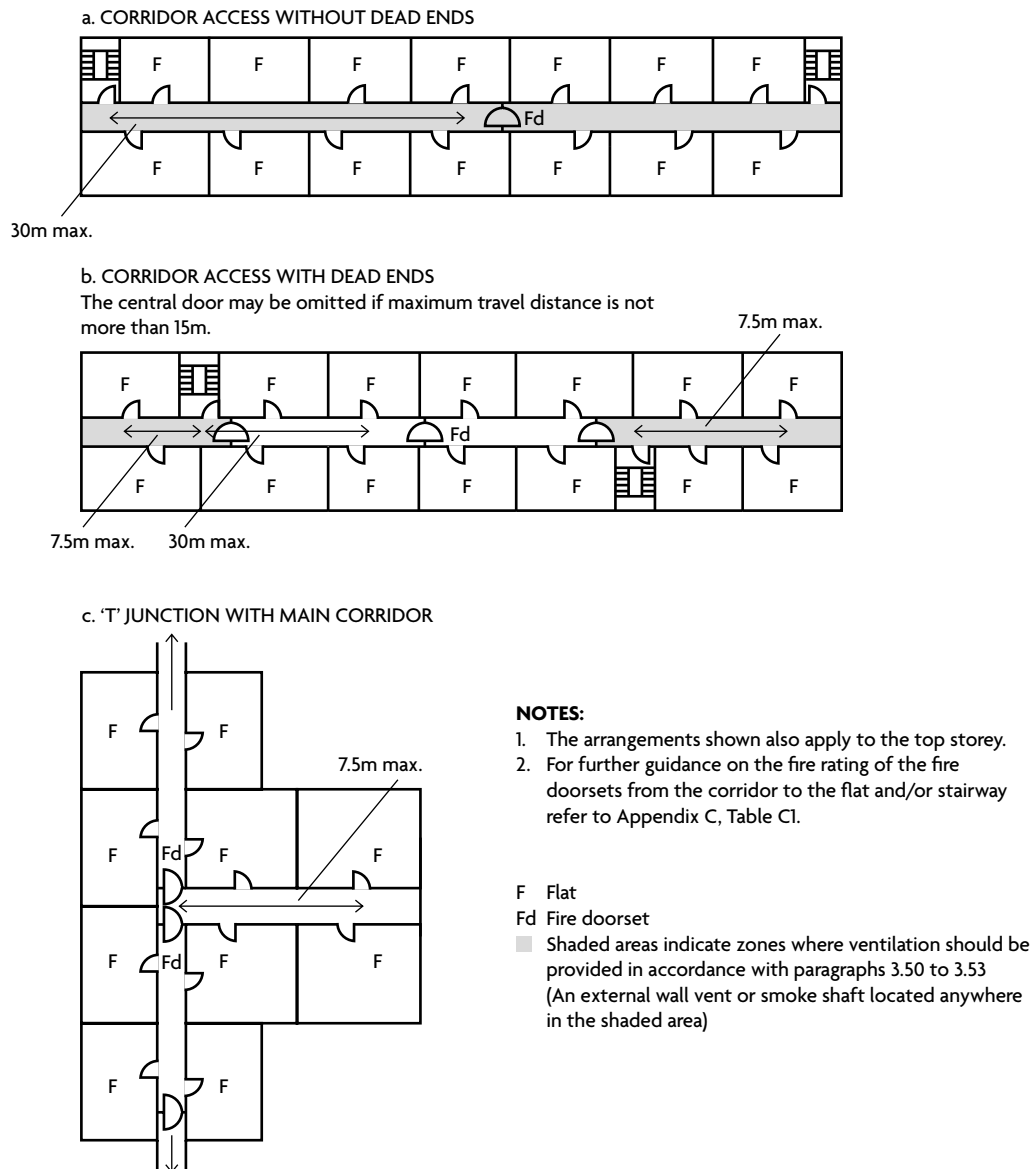


Diagram 3.8 Flats served by more than one common stair

## Small single stair buildings

**3.28** For some low rise buildings, the provisions in paragraphs 3.26 and 3.27 may be modified and the use of a single stair, protected in accordance with Diagram 3.9, may be permitted where all of the following apply.

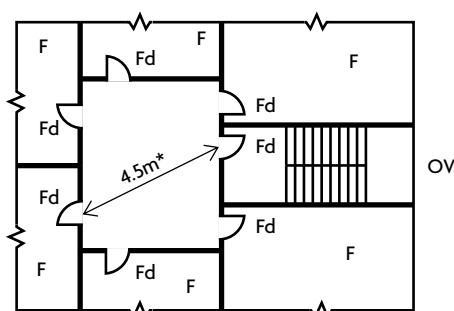
- a. The top storey of the building is a maximum of 11m above ground level.
- b. No more than three storeys are above the ground storey.
- c. The stair does not connect to a covered car park, unless the car park is open sided (as defined in Section 11 of Approved Document B Volume 2).

- d. The stair does not serve offices, stores or other ancillary accommodation. If it does, they should be separated from the stair by a **protected lobby** or **protected corridor** (minimum REI 30) with a minimum 0.4m<sup>2</sup> of permanent ventilation, or be protected from the ingress of smoke by a mechanical smoke control system.

**NOTE:** For refuse chutes and storage see paragraphs 3.55 to 3.58.

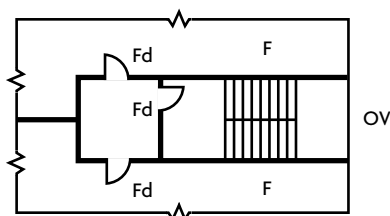
- e. Either of the following is provided for the fire and rescue service.
- A high-level openable vent with a free area of at least 1m<sup>2</sup> at each **storey**.
  - A single openable vent with a free area of at least 1m<sup>2</sup> at the head of the stair, operable remotely at the fire and rescue service access level.

See para 3.28



a. SMALL SINGLE STAIR BUILDING

\*If smoke control is provided in the lobby, the travel distance can be increased to 7.5m maximum (see Diagram 3.7, example b).



b. SMALL SINGLE STAIR BUILDING WITH NO MORE THAN TWO FLATS PER STOREY

The door between stair and lobby should be free from security fastenings.

If the flats have protected entrance halls, the lobby between the common stair and flat entrance is not essential.

#### NOTES:

- The arrangements shown also apply to the top storey.
- If the travel distance across the lobby in diagram (a) exceeds 4.5m, Diagram 3.7 applies.
- Where, in Diagram (b), the lobby between the common stair and the dwelling is omitted in small single stair buildings, an automatic opening vent with a free area of at least 1m<sup>2</sup> is required at the top of the stair, which is operated automatically on detection of smoke at any storey in the stair.
- For further guidance on the fire rating of the fire doorsets from the corridor to the flat and/or stairway refer to Appendix C, Table C1.

— Fire resisting construction

OV Openable vent at high level for fire service use (1.0m<sup>2</sup> minimum free area); see paragraph 3.28e

F Flat

Fd Fire doorset

Diagram 3.9 Common escape route in small single stair building

## Flats with balcony or deck access

**3.29** Paragraph 3.27 may be modified using the guidance in clause 7.3 of **BS 9991**.

## Escape routes over flat roofs

- 3.30** Where a **storey** or part of a **building** has multiple **escape routes** available, one may be over a flat roof that complies with all of the following.
- It should be part of the same **building** from which escape is being made.
  - The route across the roof should lead to a **storey exit** or external **escape route**.
  - The part of the roof (including its supporting structure) forming the **escape route**, and any opening within 3m of the **escape route**, should be of **fire resisting** construction (minimum REI 30).
  - The route should be clearly defined and guarded by walls and/or protective barriers to protect against falling.

## Common escape routes

- 3.31** The following paragraphs deal with **means of escape** from the entrance doors of **flats** to a **final exit**.
- 3.32** **Escape route travel distances** should comply with Table 3.1.
- 3.33** An **escape route** should not pass through one stair enclosure to reach another. It may pass through a **protected lobby** (minimum REI 30) of one stair to reach another.
- 3.34** Common corridors should be **protected corridors**. The wall between each **flat** and the corridor should be a **compartment wall** (minimum REI 30 where the top **storey** is up to 5m above ground level, otherwise REI 60).
- 3.35** Divide a common corridor connecting two or more **storey exits** with a **fire doorset** fitted with a **self-closing device** (minimum E 30 S<sub>a</sub>). See Diagram 3.8. Associated screens should be **fire resisting**. Site doors so that smoke does not affect access to more than one stair.
- 3.36** A **fire doorset** (minimum E 30 S<sub>a</sub>) fitted with a **self-closing device** (and **fire resisting** screen, where required) should separate the **dead-end** portion of a common corridor from the rest of the corridor (Diagrams 3.7a, 3.8b and 3.8c).
- 3.37** Ancillary accommodation should not be located in, or entered from, a **protected lobby** or **protected corridor** forming the only common **escape route** on that **storey**.

## Headroom in common escape routes

- 3.38** **Escape routes** should have a minimum clear headroom of 2m. The only projections allowed below this height are door frames.

## Flooring of common escape routes

- 3.39** **Escape route** floor finishes should minimise their slipperiness when wet. Finishes include the treads of steps and surfaces of ramps and landings.

## Ramps and sloping floors

- 3.40** A ramp forming part of an **escape route** should meet the provisions in Approved Document M. Any sloping floor or tier should have a pitch of not more than 35 degrees to the horizontal.

## Lighting of common escape routes

- 3.41** All **escape routes** should have adequate artificial lighting. If the mains electricity power supply fails, **escape lighting** should illuminate the route (including external **escape routes**).

**3.42** In addition, **escape lighting** should be provided to all of the following.

- a. Toilet accommodation with a minimum floor area of 8m<sup>2</sup>.
- b. Electricity and generator **rooms**.
- c. Switch **room**/battery **room** for emergency lighting system.
- d. Emergency control **rooms**.

**3.43** Escape stair lighting should be on a separate circuit from the electricity supply to any other part of the **escape route**.

**3.44** **Escape lighting** should conform to **BS 5266-1**.

### Exit signs on common escape routes

**3.45** Every doorway or other exit providing access to a **means of escape**, other than exits in ordinary use (e.g. main entrances), should be distinctively and conspicuously marked by an exit sign in accordance with **BS ISO 3864-1** and **BS 5499-4**. For this reason, blocks of **flats** with a single stair in regular use would not usually require any fire exit signage.

Advice on fire safety signs, including emergency escape signs, is given in the HSE publication *Safety Signs and Signals: Guidance on Regulations*.

Some **buildings** may require additional signs to comply with other legislation.

### Protected power circuits

**3.46** To limit potential damage to cables in **protected circuits**, all of the following should apply.

- a. Cables should be sufficiently robust.
- b. Cable routes should be carefully selected and/or physically protected in areas where cables may be exposed to damage.
- c. Methods of cable support should be class A1 rated and offer at least the same integrity as the cable. They should maintain circuit integrity and hold cables in place when exposed to fire.

**3.47** A **protected circuit** to operate equipment during a fire should achieve all of the following.

- a. Cables should achieve PH 30 classification when tested in accordance with **BS EN 50200** (incorporating Annex E) or an equivalent standard.
- b. It should only pass through parts of the **building** in which the fire risk is negligible.
- c. It should be separate from any circuit provided for another purpose.

**3.48** Guidance on cables for large and complex **buildings** is given in **BS 5839-1**, **BS 5266-1** and **BS 8519**.

### Smoke control in common escape routes

**3.49** Despite the provisions described, it is probable that some smoke will get into the common corridor or lobby from a fire in a **flat**.

There should therefore be some means of ventilating the common corridors/lobbies to control smoke and so protect the **common stairs**. This means of ventilation offers additional protection to that provided by the fire doors to the stair, as well as some protection to the corridors/lobbies.

Ventilation can be natural (paragraphs 3.50 to 3.53) or mechanical (paragraph 3.54).

### Smoke control of common escape routes by natural smoke ventilation

**3.50** Except in **buildings** that comply with Diagram 3.9, the corridor or lobby next to each stair should have a smoke vent. The location of the vent should comply with both of the following.

- a. Be as high as practicable.
- b. Be positioned so the top edge is at least as high as the top of the door to the stair.

**3.51** Smoke vents should comply with one of the following.

- a. They should be located on an **external wall** with minimum free area of 1.5m<sup>2</sup>.
- b. They should discharge into a vertical smoke shaft, closed at the base, that meets all of the following criteria.
  - i. The shaft should conform to the following conditions.
    - Have a minimum cross-sectional area of 1.5m<sup>2</sup> (minimum dimension 0.85m in any direction).
    - Open at roof level, minimum 0.5m above any surrounding structures within 2m of it horizontally.
    - Extend a minimum of 2.5m above the **ceiling** of the highest **storey** served by the shaft.
  - ii. The free area of all the following vents should be a minimum of 1m<sup>2</sup> in the following places.
    - From the corridor or lobby into the shaft.
    - At the opening at the head of the shaft.
    - At all internal locations within the shaft (e.g. safety grilles).
  - iii. The smoke shaft should be constructed from a class A1 material. All vents should either be a **fire doorset** (see Appendix C, Table C1, item 2.e for minimum **fire resistance**) or fitted with a smoke control damper achieving the same period of **fire resistance** and designed to operate as described below. The shaft should be vertical from base to head, with a maximum of 4m at a maximum inclined angle of 30 degrees.
  - iv. If smoke is detected in the common corridor or lobby, both of the following should occur.
    - Simultaneous opening of vents on the **storey** where the fire is located, at the top of the smoke shaft and to the stair.
    - Vents from the corridors or lobbies on all other **storeys** should remain closed, even if smoke is subsequently detected on **storeys** other than where the fire is located.

**3.52** A vent to the outside with a minimum free area of 1m<sup>2</sup> should be provided from the top **storey** of the stair.

**3.53** In single stair **buildings**, smoke vents on the **storey** where the fire is initiated, and the vent at the head of the stair, should be activated by smoke detectors in the common parts.

In **buildings** with more than one stair, smoke vents may be activated manually. The control system should open the vent at the head of the stair before, or at the same time as, the vent on the **storey** where the fire is located. Smoke detection is not required for ventilation purposes in this instance.

### Smoke control of common escape routes by mechanical ventilation

**3.54** Guidance on the design of smoke control systems that use pressure differentials is available in **BS EN 12101-6**.

## Refuse chutes and storage

- 3.55** Refuse storage chambers, refuse chutes and refuse hoppers should be sited and constructed in accordance with **BS 5906**.
- 3.56** Refuse chutes and rooms for storing refuse should meet both of the following conditions.
- Be separated from other parts of the building by fire resisting construction (minimum REI 30 in buildings with a top storey up to 5m above ground level; otherwise REI 60).
  - Not be situated within a protected stairway or protected lobby.
- 3.57** The approach to rooms containing refuse chutes or for storing refuse should comply with one of the following conditions.
- Be directly from the open air.
  - Be through a protected lobby with a minimum of 0.2m<sup>2</sup> of permanent ventilation.
- 3.58** Access openings to refuse storage chambers should *not* be sited in the following areas.
- Next to escape routes or final exits.
  - Near the windows of flats.

## Common stairs

### Number of common stairs

- 3.59** A building should provide access to more than one common stair if it does not meet the criteria for a single common stair (see paragraph 3.26 and 3.27).

### Width of common stairs

- 3.60** A stair of acceptable width for everyday use will be sufficient for escape purposes. If it is also a firefighting stair, it should be at least 1100mm wide. The width is the clear width between the walls or balustrades. Any handrails and strings intruding into that width by a maximum of 100mm on each side may be ignored.

### Protection of common stairs

- 3.61** Section 7 provides guidance on avoiding the spread of fire between storeys. For a stair that is also a firefighting stair, guidance in Section 15 should be followed.

### Enclosure of common stairs

- 3.62** Every common stair should be a protected stairway, within a fire resisting enclosure (minimum REI 30).

### External walls adjacent to protected stairways

- 3.63** With some configurations of external wall, a fire in one part of a building could subject the external wall of a protected stairway to heat (for example, where the two are adjacent at an internal angle in the façade, as shown in Diagram 3.10).
- 3.64** If a protected stairway projects beyond, is recessed from or is in an internal angle of the adjoining external wall of the building, then the minimum distance between an unprotected area of the building enclosure and an unprotected area of the stair enclosure should be 1800mm.

See para 3.63

Configurations of stairs and external wall

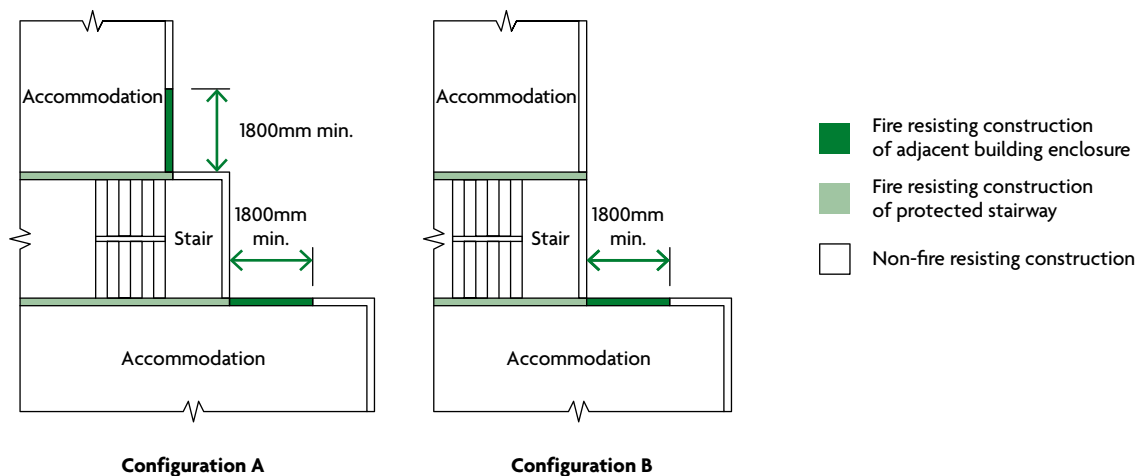


Diagram 3.10 External protection to protected stairways

## External escape stairs

**3.65** Flats may be served by an external stair if the provisions in paragraphs 3.66 to 3.69 are followed.

**3.66** Where a storey (or part of a building) is served by a single access stair, that stair may be external provided both of the following conditions are met.

- The stair serves a floor not more than 6m above the ground level.
- The stair meets the provisions in paragraph 3.62.

**3.67** Where more than one escape route is available from a storey (or part of a building), then some of the escape routes from that storey or part of the building may be by way of an external stair provided all of the following conditions are met:

- There is at least one internal escape stair from every part of each storey (excluding plant areas).
- The stair serves a floor not more than 6m above either the ground level or a roof podium which is itself served by an independent protected stairway.
- The stair meets the provisions in paragraph 3.68.

See para 3.68

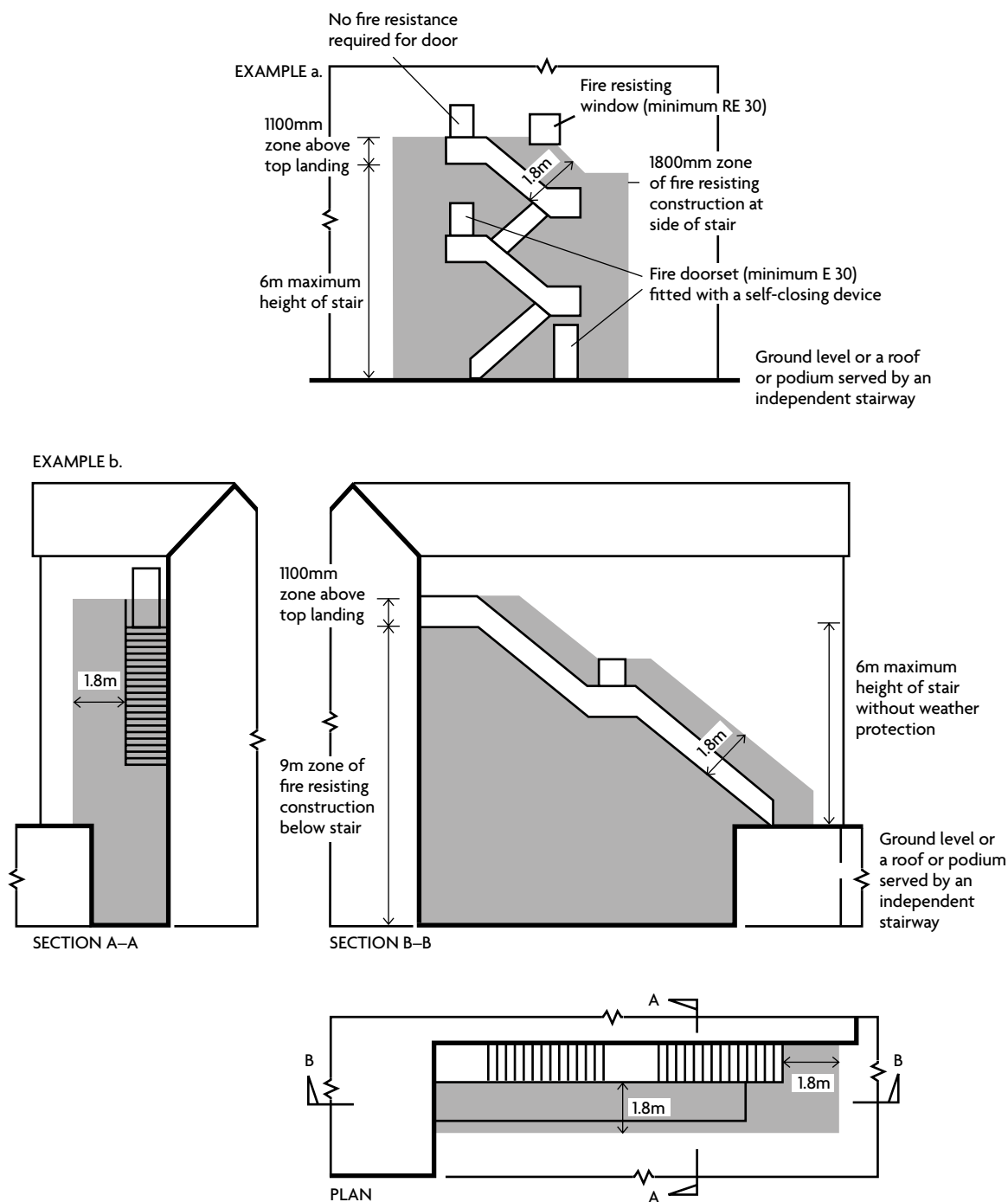


Diagram 3.11 Fire resistance of areas near to external stairs

**3.68** Any external escape stair should meet all of the following conditions (Diagram 3.11).

- Doors to the stair should be **fire resisting** (minimum E 30) and be fitted with a **self-closing device**, except for a single exit door from the **building** to the top landing of a downward-leading external stair, provided it is the only door onto the landing.

- b. **Fire resisting** construction (minimum RE 30) is required for the **building** envelope within the following zones, measured from the flights and landings of the external stair.
  - i. 1800mm above and horizontally.
  - ii. 9m vertically below.
  - iii. 1100mm above the top landing of the stair (except where the stair leads from basement to ground level).
- c. **Fire resisting** construction (minimum RE 30) should be provided for any part of the **building** (including doors) within 1800mm of the **escape route** from the foot of the stair to a place of safety. This does not apply if there are **alternative escape routes** from the foot of the external escape stair.
- d. Glazing in areas of **fire resisting** construction should be fixed shut and **fire resisting** (in terms of integrity but not insulation) (minimum E 30).
- e. Stairs more than 6m in height above ground level (e.g. where they are provided above a podium) should be protected from adverse weather. Protection should prevent the build-up of snow or ice but does not require full enclosure.

**3.69** Access to an external escape stair may be via a flat roof, provided the flat roof meets the requirements of paragraph 3.30.

### Separation of adjoining protected stairways

**3.70** The construction separating two adjacent **protected stairways** (or **exit passageways** leading to different **final exits**) should be imperforate.

### Basement stairs

- 3.71** If a **building** does not meet the criteria of paragraph 3.28, an escape stair forming part of the only **escape route** from an upper **storey** should *not* continue down to serve a **basement storey**. The **basement storey** should be served by a separate escape stair.
- 3.72** Where multiple escape stairs serve the upper **storeys**, only one needs to end at ground level. Other stairs may connect with the **basement storeys** if there is a **protected lobby** or a **protected corridor** between the stairs and accommodation at each basement level.

### Stairs serving ancillary accommodation

- 3.73** Except in **buildings** described in paragraph 3.28, **common stairs** forming part of the only **escape route** from a **flat** should not serve any of the following.
  - a. Covered car park.
  - b. Boiler **room**.
  - c. Fuel storage space.
  - d. Other ancillary accommodation of similar fire risk.
- 3.74** Where a **common stair** is not part of the only **escape route** from a **flat**, it may also serve ancillary accommodation from which it is separated by a **protected lobby** or **protected corridor** (minimum REI 30).
- 3.75** Where a stair serves an enclosed car park or **place of special fire hazard**, the lobby or corridor should have a minimum 0.4m<sup>2</sup> of permanent ventilation or be protected from the ingress of smoke by a mechanical smoke control system.

**NOTE:** For refuse chutes and storage see paragraphs 3.55 to 3.58.

## Flats in mixed use buildings

- 3.76** In buildings with a maximum of three storeys above the ground storey, stairs may serve both flats and other occupancies, provided that the stairs are separated from each occupancy by protected lobbies (minimum REI 30) at each storey.
- 3.77** In buildings with more than three storeys above the ground storey, stairs may serve the flats and other occupancies if all of the following apply.
- The flat is ancillary to the main use of the building.
  - The flat has an independent alternative escape route.
  - The stair is separated from occupancies on lower storeys by a protected lobby (minimum REI 30) at each of those storeys.
  - The stair enclosure has at least the same standard of fire resistance as the structural elements of the building (see Appendix B, Table B4); if the stair is a firefighting stair, it should comply with the provisions in Section 15 (see also paragraph 3.60).
  - Any automatic fire detection and alarm system fitted in the main part of the building also covers all flats.
  - Any security measures in any parts of the building do not prevent escape at all material times.

## Use of space within protected stairways

- 3.78** A protected stairway should not be used for anything else, except a lift well or electricity meters.

### Electricity meter(s) in protected stairways

- 3.79** In single stair buildings, electricity meters should be in securely locked cupboards. Cupboards should be separated from the escape route by fire resisting construction.

### Gas service and installation pipes in protected stairways

- 3.80** Gas service and installation pipes and meters should not be within a protected stairway, unless installed in accordance with the Pipelines Safety Regulations 1996 and the Gas Safety (Installation and Use) Regulations 1998.

## Exits from protected stairways

- 3.81** Every protected stairway should lead to a final exit, either directly or via a protected exit passageway. Any protected exit corridor or stair should have the same standard of fire resistance and lobby protection as the stair it serves.

## Construction of escape stairs

- 3.82** The flights and landings of escape stairs should be constructed of materials achieving class A2-s3, d2 or better in all of the following situations.
- If the escape stair is the only stair in a building with more than three storeys.
  - If the escape stair is within a basement storey.
  - If the escape stair serves any storey that has a floor level more than 18m above ground or access level.
  - If the escape stair is an external escape stair, except where the stair connects the ground storey or ground level with a floor or flat roof a maximum of 6m above or below ground level.
  - If the escape stair is a firefighting stair.

Materials achieving class B-s3, d2 or worse may be added to the top horizontal surface, except on **firefighting stairs**.

**3.83** Further guidance on the construction of **firefighting stairs** is given in Section 15 (see also paragraph 3.60). Dimensional constraints on the design of stairs are given in Approved Document K.

### Single steps

**3.84** Single steps on **escape routes** should be prominently marked. A single step on the line of a doorway is acceptable, subject to paragraph 3.107.

### Fixed ladders

**3.85** Fixed ladders should not be provided as a **means of escape** for members of the public. They should only be provided where a conventional stair is impractical, such as for access to plant **rooms** which are not normally occupied.

### Helical stairs and spiral stairs

**3.86** Helical stairs and spiral stairs may form part of an **escape route** provided they are designed in accordance with **BS 5395-2**. If they are intended to serve members of the public, stairs should be type E (public) stairs.

### Fire resistance of doors

**3.87** **Fire resistance** test criteria are set out in Appendix C. Standards of performance are summarised in Table C1.

### Fire resistance of glazed elements

**3.88** If glazed elements in **fire resisting** enclosures and doors can only meet the required integrity performance, their use is limited. These limitations depend on whether the enclosure forms part of a **protected shaft** (see Section 7) and the provisions set out in Appendix B, Table B5. If both integrity and insulation performance can be met, there is no restriction in this document on the use or amount of glass.

**3.89** Glazed elements should also comply with the following, where necessary.

- a. If the enclosure forms part of a **protected shaft**: Section 7.
- b. Appendix B, Table B5.
- c. Guidance on the safety of glazing: Approved Document K.

### Doors on escape routes

**3.90** Doors should be readily openable to avoid undue delay to people escaping. Doors on **escape routes** (both within and from the **building**) should comply with paragraphs 3.91 to 3.98. Guidance on door closing and 'hold open' devices for **fire doorsets** is set out in Appendix C.

**NOTE:** Paragraphs 3.91 to 3.98 do not apply to **flat** entrance doors.

### Door fastenings

**3.91** In general, doors on **escape routes** (whether or not the doors are **fire doorsets**) should be either of the following.

- a. Not fitted with a lock, latch or bolt fastenings.
- b. Fitted only with simple fastenings that are all of the following.

- i. Easy to operate; it should be apparent how to undo the fastening.
- ii. Operable from the side approached by people escaping.
- iii. Operable without a key.
- iv. Operable without requiring people to manipulate more than one mechanism.

Doors may be fitted with hardware to allow them to be locked when **rooms** are empty.

If a secure door is operated by code or combination keypad, swipe or proximity card, biometric data, etc., a security mechanism override should be possible from the side approached by people escaping.

**3.92** Electrically powered locks should return to the unlocked position in all of the following situations.

- a. If the fire detection and alarm system operates.
- b. If there is loss of power or system error.
- c. If the security mechanism override is activated.

Security mechanism overrides for electrically powered locks should be a Type A call point, as described in **BS 7273-4**. The call point should be positioned on the side approached by people escaping. If the door provides escape in either direction, a call point should be installed on both sides of the door.

**3.93** Guidance on door closing and 'hold open' devices for **fire doorsets** is set out in Appendix C.

## Direction of opening

**3.94** The door of any doorway or exit should be hung to open in the direction of escape whenever reasonably practicable. It should always be hung to open in the direction of escape if more than 60 people might be expected to use it during a fire.

## Amount of opening and effect on associated escape routes

**3.95** All doors on **escape routes** should be hung to meet both of the following conditions.

- a. Open by a minimum of 90 degrees.
- b. Open with a swing that complies with both of the following.
  - i. Is clear of any change of floor level, other than a threshold or single step on the line of the doorway.
  - ii. Does not reduce the effective width of any **escape route** across a landing.

**3.96** Any door opening towards a corridor or a stair should be recessed to prevent its swing encroaching on the effective width.

## Vision panels in doors

**3.97** Doors should contain vision panels in both of the following situations.

- a. Where doors on **escape routes** divide corridors.
- b. Where doors are hung to swing both ways.

Approved Document M contains guidance about vision panels in doors across accessible corridors and Approved Document K contains guidance about the safety of glazing.

## Revolving and automatic doors

- 3.98** Where revolving doors, automatic doors and turnstiles are placed across **escape routes** they should comply with one of the following.
- a. They are automatic doors of the required width and comply with one of the following conditions.
    - i. Their failsafe system provides outward opening from any open position.
    - ii. They have a monitored failsafe system to open the doors if the mains electricity supply fails.
    - iii. They failsafe to the open position if the power fails.
  - b. Non-automatic swing doors of the required width are provided immediately adjacent to the revolving or automatic door or turnstile.

## Lifts

### Fire protection of lift installations

- 3.99** Lift wells should comply with one of the following conditions.
- a. Be sited within the enclosures of a **protected stairway**.
  - b. Be enclosed with **fire resisting** construction (minimum REI 30) when in a position that might prejudice the **means of escape**.
- 3.100** A lift well connecting different **compartments** should form a **protected shaft** (see Section 7).
- 3.101** In **buildings** designed for phased evacuation or progressive horizontal evacuation, if the lift well is not within the enclosures of a **protected stairway**, its entrance should be separated at every **storey** by a **protected lobby** (minimum REI 30).
- 3.102** In basements and enclosed car parks, the lift should be within the enclosure of a **protected stairway**. Otherwise, the lift should be approached only via a **protected lobby** or **protected corridor** (minimum REI 30).
- 3.103** If a lift delivers into a **protected corridor** or **protected lobby** serving sleeping accommodation and also serves a **storey** containing a high fire risk (such as a kitchen, communal areas, stores, etc.) then the lift should be separated from the high fire risk area(s) by a **protected lobby** or **protected corridor** (minimum REI 30).
- 3.104** A lift shaft serving storeys above ground level should not serve any basement, if either of the following applies.
- a. There is only one escape stair serving **storeys** above ground level and smoke from a basement fire would adversely affect **escape routes** in the upper **storeys**.
  - b. The lift shaft is within the enclosure to an escape stair that terminates at ground level.
- 3.105** Lift machine **rooms** should be sited over the lift well where possible. Where **buildings** or part of a **building** with only one stairway make this arrangement impractical, the lift machine **room** should be sited outside the **protected stairway**.

## Final exits

- 3.106** People should be able to rapidly leave the area around the **building**. Direct access to a street, passageway, walkway or open space should be available. The route away from the **building** should comply with the following.
- Be well defined.
  - If necessary, have suitable guarding.
- 3.107** **Final exits** should not present a barrier for disabled people. Where the route to a **final exit** does not include stairs, a level threshold and, where necessary, a ramp should be provided.
- 3.108** **Final exit** locations should be clearly visible and recognisable.
- 3.109** **Final exits** should avoid outlets of basement smoke vents and openings to transformer chambers, refuse chambers, boiler rooms and similar risks.

## Requirement B2: Internal fire spread (linings)

This section deals with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
<b>Internal fire spread (linings)</b>	
<b>B2.</b> (1) To inhibit the spread of fire within the building, the internal linings shall— <ul style="list-style-type: none"> <li>(a) adequately resist the spread of flame over their surfaces; and</li> <li>(b) have, if ignited, either a rate of heat release or a rate of fire growth, which is reasonable in the circumstances.</li> </ul> (2) In this paragraph “internal linings” means the materials or products used in lining any partition, wall, ceiling or other internal structure.	

### Intention

In the Secretary of State’s view, requirement B2 is met by achieving a restricted spread of flame over internal linings. The **building** fabric should make a limited contribution to fire growth, including a low rate of heat release.

It is particularly important in **circulation spaces**, where linings may offer the main means by which fire spreads and where rapid spread is most likely to prevent occupants from escaping.

Requirement B2 *does not* include guidance on the following.

- a. Generation of smoke and fumes.
- b. The upper surfaces of floors and stairs.
- c. Furniture and fittings.

## Section 4: Wall and ceiling linings

### Classification of linings

4.1 The surface linings of walls and ceilings should meet the classifications in Table 4.1.

**Table 4.1 Classification of linings**

Location	Classification
Small rooms of maximum internal floor area of 4m <sup>2</sup>	D-s3, d2
Garages (as part of a dwellinghouse) of maximum internal floor area of 40m <sup>2</sup>	
Other rooms (including garages)	C-s3, d2
Circulation spaces within a dwelling	
Other circulation spaces (including the common areas of blocks of flats)	B-s3, d2 <sup>(1)</sup>
<b>NOTE:</b>	
1. Wallcoverings which conform to <b>BS EN 15102</b> , achieving at least class C-s3, d2 and bonded to a class A2-s3, d2 substrate, will also be acceptable.	

### Walls

4.2 For the purposes of this requirement, a wall includes both of the following.

- The internal surface of internal and external glazing (except glazing in doors).
- Any part of a ceiling which slopes at an angle greater than 70 degrees to the horizontal.

4.3 For the purposes of this requirement, a wall *does not* include any of the following.

- Doors and door frames.
- Window frames and frames in which glazing is fitted.
- Architraves, cover moulds, picture rails, skirtings and similar narrow members.
- Fireplace surrounds, mantle shelves and fitted furniture.

4.4 Parts of walls in rooms may be of lower performance than stated in Table 4.1, but no worse than class D-s3, d2. In any one room, the total area of lower performance wall lining should be less than an area equivalent to half of the room's floor area, up to a maximum of 20m<sup>2</sup> of wall lining.

### Ceilings

4.5 For the purposes of this requirement, a ceiling includes all of the following.

- Glazed surfaces.
- Any part of a wall at 70 degrees or less to the horizontal.
- The underside of a gallery.
- The underside of a roof exposed to the room below.

- 4.6** For the purposes of this requirement, a **ceiling** *does not* include any of the following.
- Trap doors and their frames.
  - The frames of windows or **rooflights** and frames in which glazing is fitted.
  - Architraves, cover moulds, picture rails, exposed beams and similar narrow members.

## Rooflights

- 4.7** **Rooflights** should meet the following classifications, according to material. No guidance for European fire test performance is currently available, because there is no generally accepted test and classification procedure.
- Non-plastic **rooflights** should meet the relevant classification in Table 4.1.
  - Plastic **rooflights**, if the limitations in Table 4.2 and Table 12.2 are observed, should be a minimum class D-s3, d2 rating. Otherwise they should meet the relevant classification in Table 4.1.

## Special applications

- 4.8** Any flexible membrane covering a structure, other than an air-supported structure, should comply with Appendix A of **BS 7157**.
- 4.9** Guidance on the use of PTFE-based materials for tension-membrane roofs and structures is given in the BRE report BR 274.

## Fire behaviour of insulating core panels used internally

- 4.10** Insulating core panels consist of an inner core of insulation sandwiched between, and bonded to, a membrane, such as galvanised steel or aluminium.

Where they are used internally they can present particular problems with regard to fire spread and should meet all of the following conditions.

- Panels should be sealed to prevent exposure of the core to a fire. This includes at joints and where services penetrate the panel.
- In high fire risk areas, such as kitchens, **places of special fire hazard**, or in proximity to where hot works occur, only class A1 cored panels should be used.
- Fixing systems for all panels should be designed to take account of the potential for the panel to delaminate. For instance, where panels are used to form a **suspended ceiling**, the fixing should pass through the panel and support it from the lower face.

## Other controls on internal surface properties

- 4.11** Guidance on the control of flame spread is given in the following sections.
- Stairs and landings: Sections 2 and 3 (escape stairs) and Section 15 (**firefighting shafts**).
  - Exposed surfaces above fire-protecting **suspended ceilings**: Section 8.
  - Enclosures to above-ground drainage system **pipes**: Section 9.

# Thermoplastic materials

## General provisions

**4.12** Thermoplastic materials that do not meet the classifications in Table 4.1 can be used as described in paragraphs 4.13 to 4.17. No guidance for European fire test performance is currently available, because there is no generally accepted test and classification procedure.

Thermoplastic materials are defined in Appendix B, paragraph B11. Classifications used here are explained in paragraph B13.

## Windows

**4.13** Thermoplastic material classified as a TP(a) rigid product may be used to glaze external windows to rooms, *but not* external windows to circulation spaces. Approved Document K includes guidance on the safety of glazing.

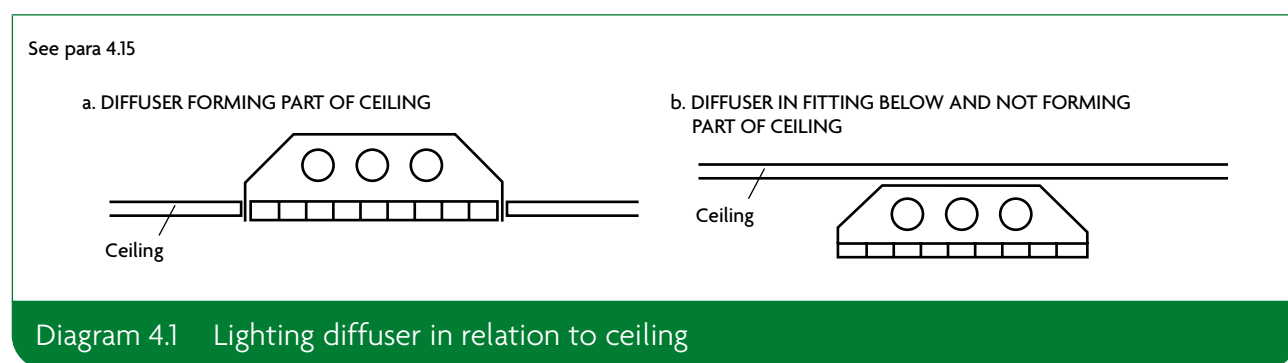
## Rooflights

**4.14** In rooms and circulation spaces other than protected stairways, rooflights may be constructed of thermoplastic material if they comply with both of the following.

- a. The lower surface is classified as TP(a) rigid or TP(b).
- b. The size and location of the rooflights follow the limits in Table 4.2, Table 12.2 and Table 12.3.

## Lighting diffusers

**4.15** The following paragraphs apply to lighting diffusers forming part of a ceiling. Diffusers may be part of a luminaire or used below sources of light. The following paragraphs *do not* apply to diffusers of light fittings attached to the soffit of a ceiling or suspended beneath a ceiling (Diagram 4.1).



**4.16** Diffusers constructed of thermoplastic material may be incorporated in ceilings to rooms and circulation spaces, but not to protected stairways, if both the following conditions are met.

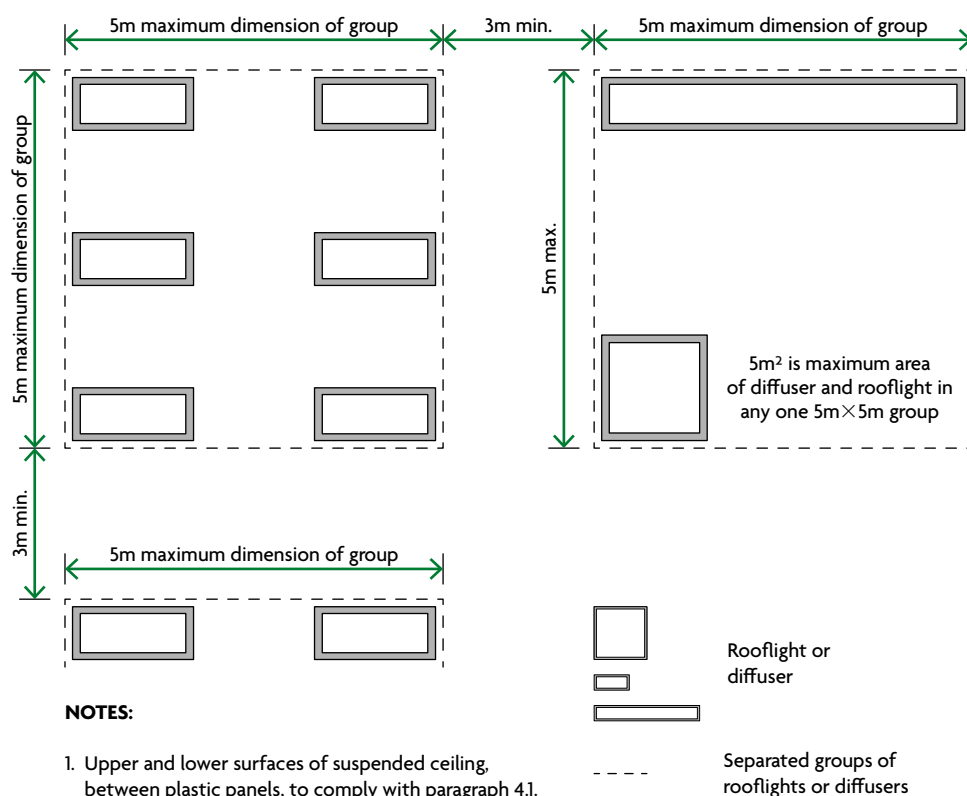
- a. Except for the upper surfaces of the thermoplastic panels, wall and ceiling surfaces exposed in the space above the suspended ceiling should comply with paragraph 4.1.
- b. Diffusers should be classified as one of the following.
  - i. TP(a) rigid – no restrictions on their extent.
  - ii. TP(b) – limited in their extent (see Table 4.2 and Diagram 4.2).

## Suspended or stretched-skin ceilings

**4.17** A ceiling constructed from TP(a) flexible panels should meet the following conditions.

- Have a maximum area of  $5\text{m}^2$ .
- Be supported on all sides.

See Table 4.2



### NOTES:

- Upper and lower surfaces of suspended ceiling, between plastic panels, to comply with paragraph 4.1.
- No restriction on class D-s3, d2 diffusers or rooflights in small rooms.
- See note 4 to Table 4.2.

Diagram 4.2 Layout restrictions on class D-s3, d2 plastic rooflights, TP(b) rooflights and TP(b) lighting diffusers

**Table 4.2 Limitations applied to thermoplastic rooflights and lighting diffusers in suspended ceilings and class D-s3, d2 plastic rooflights<sup>(1)</sup>**

Minimum classification of lower surface	Use of space below the diffusers or rooflights	Maximum area of each diffuser or rooflight <sup>(2)</sup> (m <sup>2</sup> )	Maximum total area of diffusers and rooflights as a percentage of floor area of the space in which the ceiling is located (%)	Minimum separation distance between diffusers or rooflights <sup>(2)</sup> (m)
TP(a)	Any except protected stairways	No limit <sup>(3)</sup>	No limit	No limit
Class D-s3, d2 <sup>(4)</sup> or TP(b)	Rooms	5	50 <sup>(5)</sup>	3
	Circulation spaces except protected stairways	5	15 <sup>(5)</sup>	3

**NOTES:**

1. This table does not apply to products that meet the provisions in Table 4.1.
2. Smaller rooflights and diffusers can be grouped together provided that both of the following satisfy the dimensions in Diagram 4.2 or 4.3.
  - a. The overall size of the group.
  - b. The space between one group and any others.
3. Lighting diffusers of TP(a) flexible rating should be used only in panels of a maximum of 5m<sup>2</sup> each. See paragraph 4.17.
4. There are no limits on the use of class D-s3, d2 materials in small rooms. See Table 4.1.
5. The minimum 3m separation given in Diagram 4.2 between each 5m<sup>2</sup> group must be maintained. Therefore, in some cases, it may not be possible to use the maximum percentage quoted.

See Table 4.2

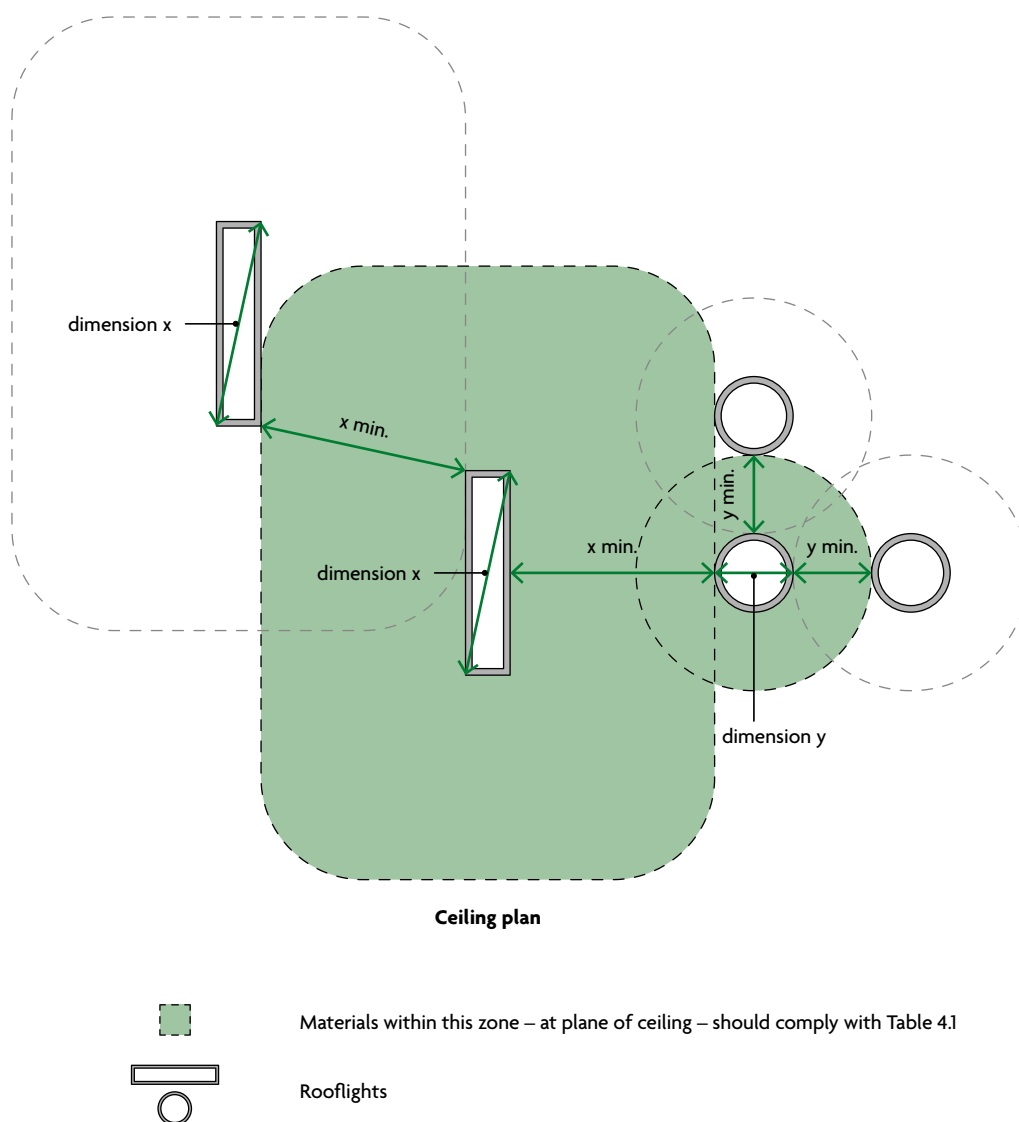


Diagram 4.3 Layout restrictions on small class D-s3, d2 plastic rooflights, TP(b) rooflights and lighting diffusers

## Requirement B3: Internal fire spread (structure)

These sections deal with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

### 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—
- (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.

#### *Limits on application*

Requirement B3(3) does not apply to material alterations to any prison provided under section 33 of the Prison Act 1952.

## Intention

In the Secretary of State's view, requirement B3 is met by achieving all of the following.

- a. For defined periods, loadbearing **elements of structure** withstand the effects of fire without loss of stability.
- b. Compartmentation of **buildings** by **fire resisting** construction elements.
- c. Automatic fire suppression is provided where it is necessary.
- d. Protection of openings in **fire-separating elements** to maintain continuity of the fire separation.
- e. Inhibition of the unseen spread of fire and smoke in **cavities**, in order to reduce the risk of structural failure and spread of fire and smoke, where they pose a threat to the safety of people in and around the **building**.

The extent to which any of these measures are necessary is dependent on the use of the **building** and, in some cases, its size, and on the location of the elements of construction.

## Section 5: Internal fire spread – dwellinghouses

### Loadbearing elements of structure

#### Fire resistance standard

- 5.1** Elements such as structural frames, beams, columns, loadbearing walls (internal and external), floor structures and gallery structures should have, as a minimum, the fire resistance given in Appendix B, Table B3.
- 5.2** If one element of structure supports or stabilises another, as a minimum the supporting element should have the same fire resistance as the other element.
- 5.3** The following are excluded from the definition of 'element of structure'.
- A structure that supports only a roof, unless either of the following applies.
    - The roof performs the function of a floor, such as a roof terrace, or as a means of escape.
    - The structure is essential for the stability of an external wall that needs to be fire resisting (e.g. to achieve compartmentation or for the purposes of preventing fire spread between buildings).
  - The lowest floor of the building.
  - External walls, such as curtain walls or other forms of cladding, which transmit only self weight and wind loads and do not transmit floor load.

**NOTE:** In some cases, structural members within a roof may be essential for the structural stability system of the building. In these cases, the structural members in the roof do not just support a roof and must demonstrate the relevant fire resistance for the building as required by paragraph 5.2 above.

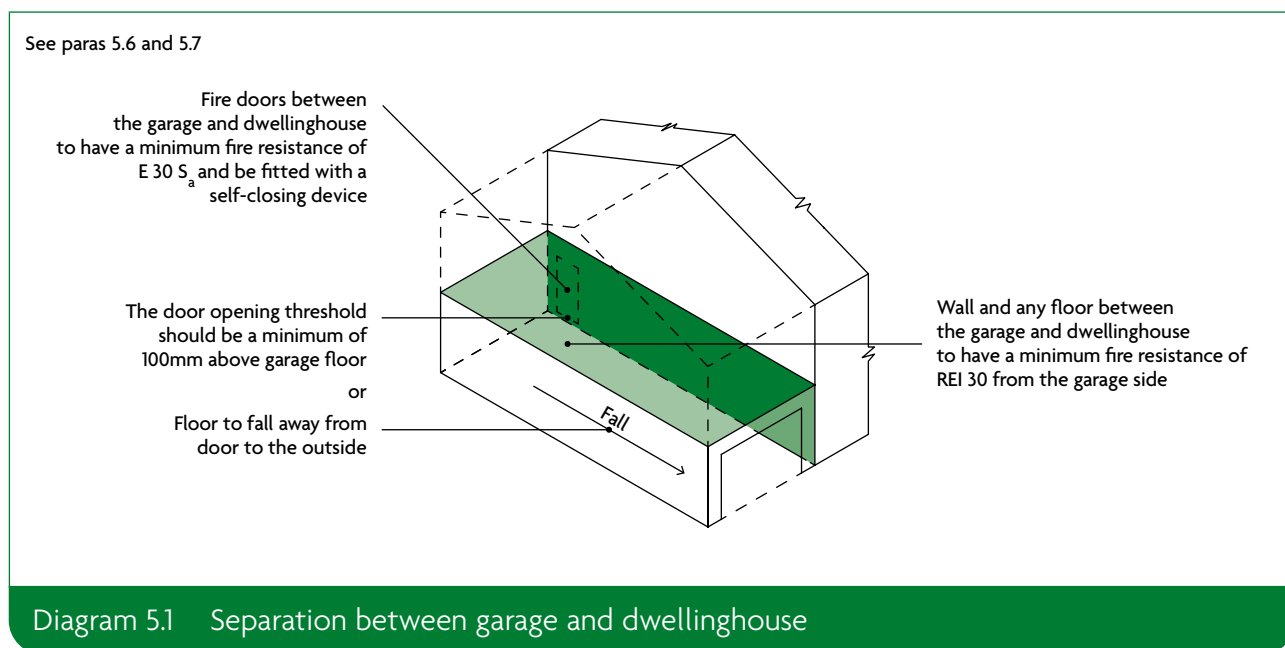
#### Floors in loft conversions

- 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>.

## Compartmentation

### Provision of compartmentation

- 5.5** Dwellinghouses that are semi-detached or in terraces should be considered as separate buildings. Every wall separating the dwellinghouses should be constructed as a compartment wall (see paragraphs 5.8 to 5.12).
- 5.6** If a garage is attached to or forms an integral part of a dwellinghouse, the garage should be separated from the rest of the dwellinghouse by fire resisting construction (minimum REI 30) (Diagram 5.1).
- 5.7** Where a door is provided between a dwellinghouse and the garage (see Diagram 5.1), it should meet one of the following conditions.
- The garage floor should be laid such that it falls away from the door to the outside, to allow fuel spills to flow away.
  - The door opening should be a minimum of 100mm above the level of the garage floor.



## Construction of compartment walls and compartment floors

### General provisions

- 5.8** All compartment walls and compartment floors should achieve both of the following.
- Form a complete barrier to fire between the compartments they separate.
  - Have the appropriate fire resistance, as given in Appendix B, Table B3 and Table B4.
- 5.9** Timber beams, joists, purlins and rafters may be built into or carried through a masonry or concrete compartment wall if the openings for them are both of the following.
- As small as practicable.
  - Fire-stopped.

If trussed rafters bridge the wall, failure of the truss due to a fire in one **compartment** should not cause failure of the truss in another **compartment**.

### Compartment walls between buildings

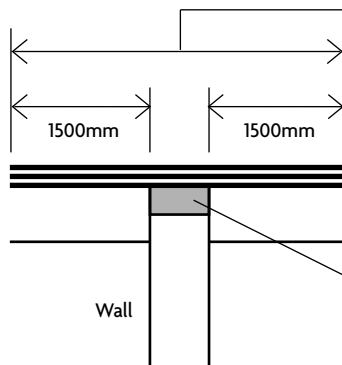
- 5.10** Adjoining **buildings** should only be separated by walls, not floors. **Compartment walls** common to two or more **buildings** should comply with both of the following.
- Run the full **height** of the **building** in a continuous vertical plane.
  - Be continued through any roof space to the underside of the roof (see Diagram 5.2).

### Junction of compartment wall with roof

- 5.11** A **compartment wall** should achieve both of the following.
- Meet the underside of the roof covering or deck, with **fire-stopping** to maintain the continuity of **fire resistance**.
  - Be continued across any eaves.
- 5.12** To reduce the risk of fire spreading over the roof from one **compartment** to another, a 1500mm wide zone of the roof, either side of the wall, should have a covering classified as  $B_{ROOF}(t4)$ , on a substrate or deck of a material rated class A2-s3, d2 or better, as set out in Diagram 5.2a.
- Thermoplastic **rooflights** that, because of paragraph 12.7, are regarded as having a  $B_{ROOF}(t4)$  classification are *not* suitable for use in that zone.
- 5.13** Materials achieving class B-s3, d2 or worse used as a substrate to the roof covering and any timber tiling battens, fully bedded in mortar or other suitable material for the width of the wall (Diagram 5.2b), may extend over the **compartment wall** in **buildings** that are a maximum of 15m high.
- 5.14** Double-skinned insulated roof sheeting should incorporate a band of material rated class A2-s3, d2 or better, a minimum of 300mm in width, centred over the wall.
- 5.15** As an alternative to the provisions of paragraphs 5.12 to 5.14, the **compartment wall** may extend through the roof for a minimum of either of the following (see Diagram 5.2c).
- Where the height difference between the two roofs is less than 375mm, 375mm above the top surface of the adjoining roof covering.
  - 200mm above the top surface of the adjoining roof covering where either of the following applies.
    - The height difference between the two roofs is 375mm or more.
    - The roof coverings either side of the wall are of a material classified as  $B_{ROOF}(t4)$ .

See paras 5.12 to 5.15

a. ANY BUILDING OR COMPARTMENT



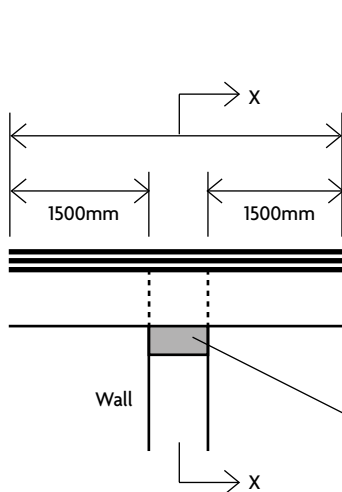
Roof covering over this distance to be designated  $B_{\text{ROOF}}(t4)$  rated on deck of material of class A2-s3, d2 or better. Roof covering and deck could be composite structure, e.g. profiled steel cladding.

Double-skinned insulated roof sheeting should incorporate a band of material rated class A2-s3, d2 or better, a minimum of 300mm in width, centred over the wall.

If roof support members pass through the wall, fire protection to these members for a distance of 1500mm on either side of the wall may be needed to delay distortion at the junction (see paragraph 5.9).

Fire-stopping to be carried up to underside of roof covering, e.g. roof tiles.

b. RESIDENTIAL (DWELLINGS) AND RESIDENTIAL (OTHER) A MAXIMUM OF 15M HIGH



Roof covering to be designated  $B_{\text{ROOF}}(t4)$  rated for at least this distance.

Boarding (used as a substrate) or timber tiling battens may be carried over the wall provided that they are fully bedded in mortar (or other no less suitable material) where over the wall.

Thermoplastic insulation materials should not be carried over the wall.

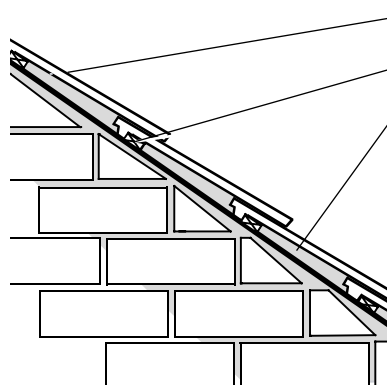
Double-skinned insulated roof sheeting with a thermoplastic core should incorporate a band of material of class A2-s3, d2 at least 300mm wide centred over the wall.

Sarking felt may also be carried over the wall.

If roof support members pass through the wall, fire protection to these members for a distance of 1500mm on either side of the wall may be needed to delay distortion at the junction (see paragraph 5.9).

Fire-stopping to be carried up to underside of roof covering, boarding or slab.

Section X-X



Roof covering to be designated  $B_{\text{ROOF}}(t4)$  rated for at least 1500mm either side of wall.

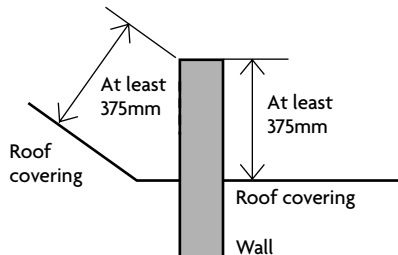
Roofing battens and sarking felt may be carried over the wall.

Fire-stopping to be carried up to underside of roof covering above and below sarking felt.

NOTES:

1. Fire-stopping should be carried over the full thickness of the wall.
2. Fire-stopping should be extended into any eaves.
3. The compartment wall does not necessarily need to be constructed of masonry.

c. ANY BUILDING OR COMPARTMENT



The wall should be extended up through the roof for a height of at least 375mm above the top surface of the adjoining roof covering.

Where there is a height difference of at least 375 mm between two roofs or where the roof coverings on either side of the wall are  $B_{\text{ROOF}}(t4)$  rated, the height of the upstand/parapet wall above the highest roof may be reduced to 200mm.

Diagram 5.2 Junction of compartment wall with roof

## Cavities

**5.16** Cavities in the construction of a building provide a ready route for the spread of smoke and flame, which can present a greater danger as any spread is concealed. For the purpose of this document, a cavity is considered to be any concealed space.

### Provision of cavity barriers

**5.17** To reduce the potential for fire spread, cavity barriers should be provided for both of the following.

- To divide cavities.
- To close the edges of cavities.

Cavity barriers should not be confused with fire-stopping details (Section 9).

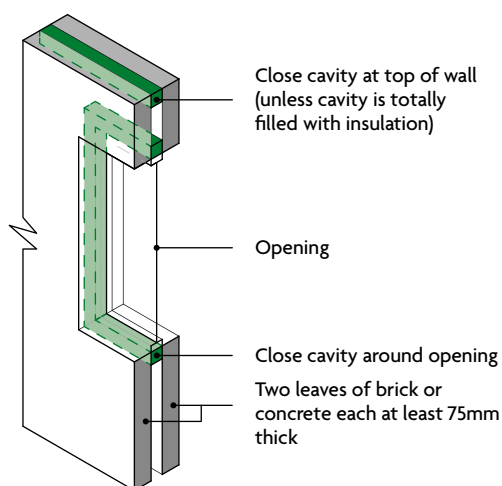
**5.18** Cavity barriers should be provided at all of the following locations.

- At the edges of cavities, including around openings (such as windows, doors and exit/entry points for services).
- At the junction between an external cavity wall and every compartment floor and compartment wall.
- At the junction between an internal cavity wall and every compartment floor, compartment wall or other wall or door assembly forming a fire resisting barrier.

This does not apply where a wall meets the conditions of Diagram 5.3.

**5.19** It is not appropriate to complete a line of compartment walls by fitting cavity barriers above them. The compartment wall should be extended to the underside of the floor or roof above.

See para 5.18



#### NOTES:

- Materials used to close the cavity in this arrangement do not need to achieve a specific performance in relation to fire resistance.
- Domestic meter cupboards may be installed provided that the following conditions are met:
  - There are no more than two cupboards per dwelling
  - The openings in the outer wall leaf are not bigger than 800×500mm for each cupboard
  - The inner leaf is not penetrated except by a sleeve not more than 80×80mm, which is fire-stopped.
- Materials achieving class B-s3, d2 or worse may be placed within the cavity.

Diagram 5.3 Cavity walls excluded from provisions for cavity barriers

## Construction and fixings for cavity barriers

**5.20** Cavity barriers, tested from each side separately, should provide a minimum of both of the following:

- a. 30 minutes' integrity (E 30)
- b. 15 minutes' insulation (I 15).

They may be formed by a construction provided for another purpose if it achieves the same performance.

**5.21** Cavity barriers in a stud wall or partition, or provided around openings, may be formed of any of the following.

- a. Steel, a minimum of 0.5mm thick.
- b. Timber, a minimum of 38mm thick.
- c. Polythene-sleeved mineral wool, or mineral wool slab, under compression when installed in the cavity.
- d. Calcium silicate, cement-based or gypsum-based boards, a minimum of 12mm thick.

These do not necessarily achieve the performance specified in paragraph 5.20.

**NOTE:** Cavity barriers provided around openings may be formed by the window or door frame, if the frame is constructed of steel or timber of the minimum thickness in (a) or (b), as appropriate.

**5.22** Cavity barriers should be tightly fitted to a rigid construction and mechanically fixed in position. If this is not possible (e.g. where a cavity barrier joins to slates, tiles, corrugated sheeting or similar materials) the junction should be fire-stopped.

**5.23** Cavity barriers should be fixed so their performance is unlikely to be made ineffective by any of the following.

- a. Movement of the building due to subsidence, shrinkage or temperature change, and movement of the external envelope due to wind.
- b. During a fire, collapse of services penetrating the cavity barriers, either by the failure of the supporting system or through degradation of the service itself (e.g. by melting or burning).
- c. During a fire, failure of the cavity barrier fixings. (In roof spaces, where cavity barriers are fixed to roof members, there is no expectation of fire resistance from roof members provided for the purpose of support.)
- d. During a fire, failure of any material or construction to which cavity barriers abut. (For example, a suspended ceiling that continues over a fire resisting wall or partition collapses, and the cavity barrier fails prematurely because the ceiling was not designed to provide a minimum fire resistance of EI 30.)

## Openings in cavity barriers

**5.24** Openings should be limited to the following.

- a. Fire doorsets with a minimum E 30 rating, fitted in accordance with Appendix C.
- b. The passage of pipes that follow the provisions in Section 9.
- c. The passage of cables or conduits containing one or more cables.
- d. Openings fitted with a suitably mounted and appropriate fire damper.

- e. Ducts that are either of the following.
  - i. Fire resisting (minimum E 30).
  - ii. Fitted with a suitably mounted and appropriate fire damper where they pass through the cavity barrier.

**NOTE:** For further guidance on openings in cavity barriers see Section 9.

## Section 6: Loadbearing elements of structures – flats

### Fire resistance standard

**6.1** Elements such as structural frames, beams, columns, loadbearing walls (internal and external), floor structures and gallery structures should have, as a minimum, the fire resistance given in Appendix B, Table B3.

**NOTE:** If one element of structure supports or stabilises another, as a minimum the supporting element should have the same fire resistance as the other element.

**6.2** The following are excluded from the definition of ‘element of structure’.

- a. A structure that supports only a roof, unless either of the following applies.
  - i. The roof performs the function of a floor, such as for parking vehicles, or as a means of escape.
  - ii. The structure is essential for the stability of an external wall that needs to be fire resisting (e.g. to achieve compartmentation or for the purposes of preventing fire spread between buildings).
- b. The lowest floor of the building.
- c. A platform floor.
- d. External walls, such as curtain walls or other forms of cladding, which transmit only self weight and wind loads and do not transmit floor load.

**NOTE:** In some cases, structural members within a roof may be essential for the structural stability system of the building. In these cases, the structural members in the roof do not just support a roof and must demonstrate the relevant fire resistance for the building as required by the note to paragraph 6.1 above.

### Additional guidance

**6.3** If a loadbearing wall is any of the following, guidance in other sections may also apply.

- a. A compartment wall (including a wall common to two buildings): Section 7.
- b. Enclosing a place of special fire hazard: Section 7.
- c. Protecting a means of escape: Sections 2 and 3.
- d. An external wall: Sections 10 and 11.
- e. Enclosing a firefighting shaft: Section 15.

**6.4** If a floor is also a compartment floor, see Section 7.

## Conversion to flats

- 6.5 Where an existing **dwellinghouse** or other **building** is converted into **flats**, a review of the existing construction should be carried out. Retained timber floors may make it difficult to meet the relevant provisions for **fire resistance**.
- 6.6 In a converted **building** with a maximum of three **storeys**, a minimum REI 30 **fire resistance** could be accepted for **elements of structure** if the **means of escape** conform to the provisions of Section 3.
- 6.7 In a converted **building** with four or more **storeys**, the full standard of **fire resistance** given in Appendix B is necessary.

## Section 7: Compartmentation/sprinklers – flats

### Provision of compartmentation

- 7.1** All of the following should be provided as **compartment walls** and **compartment floors** and should have, as a minimum, the fire resistance given in Appendix B, Table B3.
- Any floor and wall separating a **flat** from another part of the **building**.
  - Any wall enclosing a refuse storage chamber.
  - Any wall common to two or more **buildings**.

### Places of special fire hazard

- 7.2** **Fire resisting** construction enclosing these places should achieve minimum REI 30. These walls and floors are not **compartment walls** and **compartment floors**.
- 7.3** Parts of a **building** occupied mainly for different purposes should be separated from one another by **compartment walls** and/or **compartment floors**. Compartmentation is not needed if one of the different purposes is ancillary to the other. See paragraphs 0.18 and 0.19.

### Sprinklers

- 7.4** Blocks of **flats** with a top **storey** more than 11m above ground level (see Diagram D6) should be fitted with a sprinkler system throughout the **building** in accordance with Appendix E.

**NOTE:** Sprinklers should be provided within the individual flats, they do not need to be provided in the common areas such as stairs, corridors or landings when these areas are fire sterile.

## Construction of compartment walls and compartment floors

### General provisions

- 7.5** All **compartment walls** and **compartment floors** should achieve both of the following.
- Form a complete barrier to fire between the **compartments** they separate.
  - Have the appropriate **fire resistance**, as given in Appendix B, Tables B3 and B4.
- 7.6** Timber beams, joists, purlins and rafters may be built into or carried through a masonry or concrete **compartment wall** if the openings for them are both of the following.
- As small as practicable.
  - Fire-stopped**.

If trussed rafters bridge the wall, failure of the truss due to a fire in one **compartment** should not cause failure of the truss in another **compartment**.

- 7.7** Where services could provide a source of ignition, the risk of fire developing and spreading into adjacent **compartments** should be controlled.

## Compartment walls between buildings

- 7.8** Adjoining buildings should only be separated by walls, not floors. Compartment walls common to two or more buildings should comply with both of the following.
- Run the full height of the building in a continuous vertical plane.
  - Be continued through any roof space to the underside of the roof (see Diagram 5.2).

## Separated parts of buildings

- 7.9** Compartment walls forming a separated part of a building should run the full height of the building in a continuous vertical plane.

Separated parts can be assessed independently to determine the appropriate standard of fire resistance in each. The two separated parts can have different standards of fire resistance.

## Other compartment walls

- 7.10** Compartment walls not described in paragraphs 7.8 and 7.9 should run the full height of the storey in which they are situated.
- 7.11** Compartment walls in a top storey beneath a roof should be continued through the roof space.

## Junction of compartment wall or compartment floor with other walls

- 7.12** At the junction with another compartment wall or an external wall, the fire resistance of the compartmentation should be maintained. Fire-stopping that meets the provisions in paragraphs 9.24 to 9.29 should be provided.
- 7.13** At the junction of a compartment floor and an external wall with no fire resistance, the external wall should be restrained at floor level. The restraint should reduce movement of the wall away from the floor if exposed to fire.
- 7.14** Compartment walls should be able to accommodate deflection of the floor, when exposed to fire, by either of the following means.
- Between the wall and floor, provide a head detail that is capable of maintaining its integrity while deforming.
  - Design the wall so it maintains its integrity by resisting the additional vertical load from the floor above.

Where compartment walls are located within the middle half of a floor between vertical supports, the deflection may be assumed to be 40mm unless a smaller value can be justified by assessment. Outside this area, the limit can be reduced linearly to zero at the supports.

For steel beams that do not have the required fire resistance, reference should be made to SCI Publication P288.

## Junction of compartment wall with roof

- 7.15** The requirements are the same as for dwellinghouses, detailed in paragraphs 5.11 and 5.12.
- 7.16** Materials achieving class B-s3, d2 or worse used as a substrate to the roof covering and any timber tiling battens, fully bedded in mortar or other suitable material for the width of the wall (Diagram 5.2b), may extend over the compartment wall in buildings that are both of the following.
- A maximum of 15m high.

- b. In one of the following **purpose groups**.
  - i. All residential **purpose groups** (**purpose groups** 1 and 2) other than 'residential (institutional)' (**purpose group** 2(a)).
  - ii. 'Office' (**purpose group** 3).
  - iii. 'Assembly and recreation' (**purpose group** 5).

**7.17** Double-skinned insulated roof sheeting with a thermoplastic core should incorporate a band of material rated class A2-s3, d2 or better, a minimum of 300mm in width, centred over the wall.

**7.18** As an alternative to the provisions of paragraph 7.16 or 7.17, the **compartment wall** may extend through the roof for a minimum of either of the following (see Diagram 5.2c).

- a. Where the height difference between the two roofs is less than 375mm, 375mm above the top surface of the adjoining roof covering.
- b. 200mm above the top surface of the adjoining roof covering where either of the following applies.
  - i. The height difference between the two roofs is 375mm or more.
  - ii. The roof coverings either side of the wall are of a material classified as  $B_{ROOF}(t_4)$ .

## Openings in compartmentation

### Openings in compartment walls separating buildings or occupancies

**7.19** Openings in a **compartment wall** common to two or more **buildings** should be limited to those for either of the following.

- a. A **fire doorset** providing a **means of escape**, which has the same **fire resistance** as the wall and is fitted in accordance with the provisions in Appendix C.
- b. The passage of a **pipe** that complies with the provisions in Section 9.

### Openings in other compartment walls, or in compartment floors

**7.20** Openings should be limited to those for any of the following.

- a. **Fire doorsets** of the appropriate **fire resistance**, fitted in accordance with the provisions in Appendix C.
- b. **Pipes**, ventilation ducts, service cables, chimneys, **appliance ventilation ducts** or ducts encasing one or more flue **pipes**, complying with the provisions in Section 9.
- c. Refuse chutes of class A1 construction.
- d. **Atria** designed in accordance with Annexes B and C of **BS 9999**.
- e. **Protected shafts** that conform to the provisions in the following paragraphs.

## Protected shafts

**7.21** Stairs and service shafts connecting **compartments** should be protected to restrict the spread of fire between the **compartments**. These are called **protected shafts**. Walls or floors surrounding a **protected shaft** are considered to be **compartment walls** or **compartment floors**.

**7.22** Any stair or other shaft passing directly from one **compartment** to another should be enclosed in a **protected shaft**. **Protected shafts** should be used for the following only, but may also include sanitary accommodation and washrooms.

- a. Stairs.
- b. Lifts.
- c. Escalators.
- d. Chutes.
- e. Ducts.
- f. **Pipes**.
- g. Additional provisions apply for both of the following.
  - i. **Protected shafts** that are **protected stairways**: Sections 2 to 4.
  - ii. Stairs that are also **firefighting stairs**: Section 15.

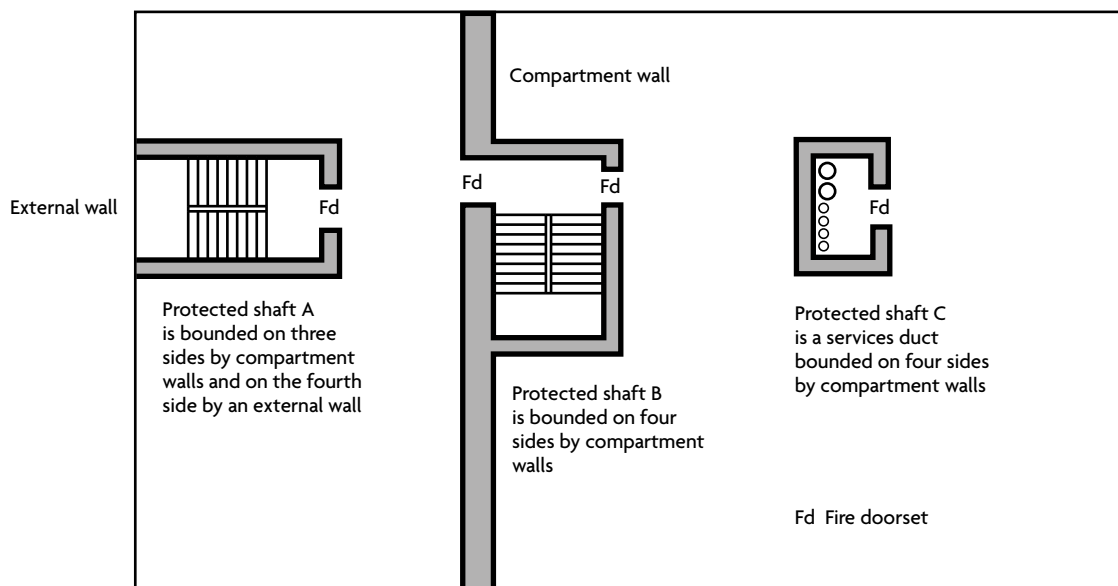
## Construction of protected shafts

**7.23** The construction enclosing a **protected shaft** (Diagram 7.1) should do all of the following.

- a. Form a complete barrier to fire between the **compartments** connected by the shaft.
- b. Have the appropriate **fire resistance** given in Appendix B, Table B3, *except for uninsulated glazed screens that meet the provisions of paragraph 7.24*.
- c. Satisfy the provisions for ventilation and the treatment of openings in paragraphs 7.28 and 7.29.

See para 7.23

The diagram shows three common examples which illustrate the principles. The elements enclosing the shaft (unless formed by adjacent external walls) are compartment walls and floors.



The shaft structure (including any openings) should meet the relevant provisions for: compartment walls (see paragraphs 7.5 to 7.19), external walls (see sections 10 and 11 and Diagram 3.10).

Diagram 7.1 Construction of protected shafts

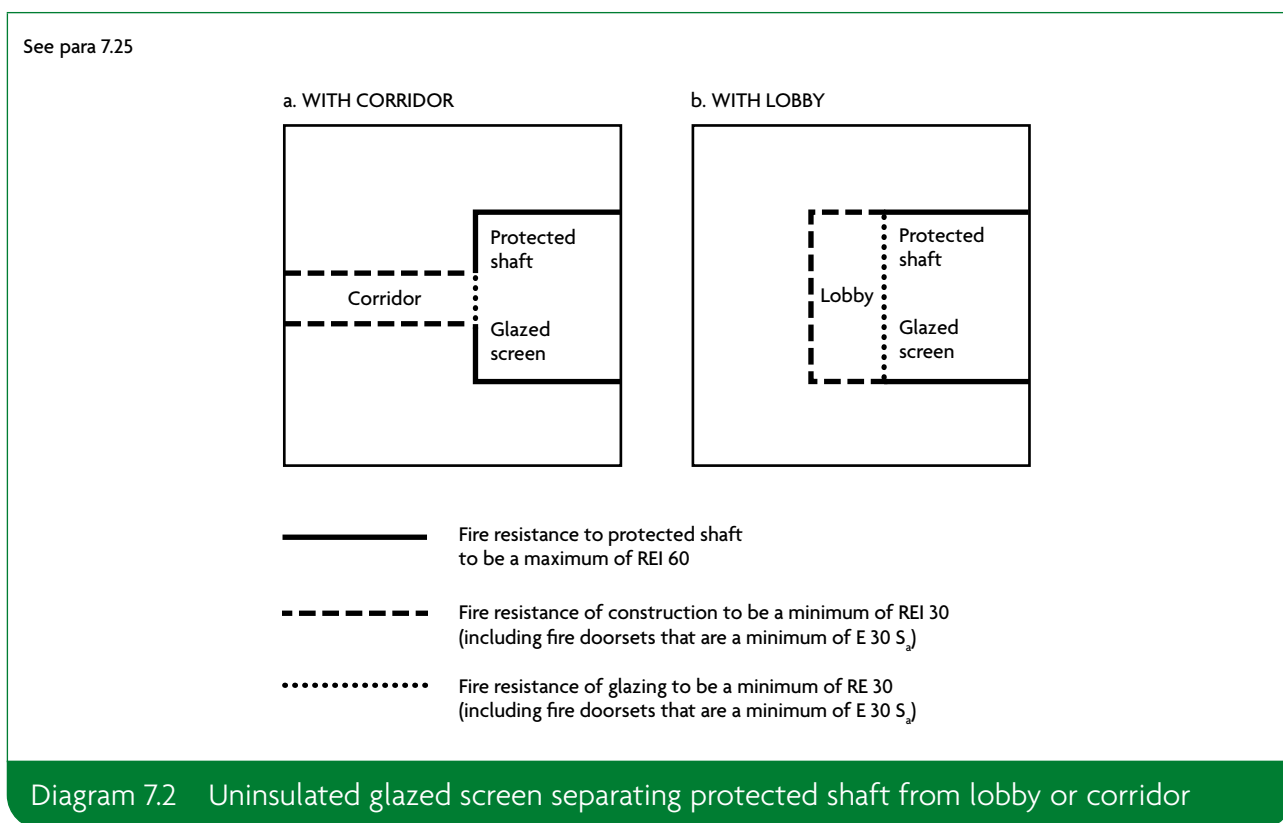
## Uninsulated glazed screens to protected shafts

**7.24** An uninsulated glazed screen may be incorporated in the enclosure to a **protected shaft** between a stair and a lobby or corridor entered from the stair. The enclosure must conform to Diagram 7.2 and meet all of the following conditions.

- a. The standard of **fire resistance** required for the **protected stairway** is not more than REI 60.
- b. The glazed screen complies with the following.
  - i. It achieves a minimum rating of E 30.
  - ii. It complies with the guidance on limits on areas of uninsulated glazing in Appendix B, Table B5.
- c. The lobby or corridor is enclosed with **fire resisting** construction achieving a minimum rating of REI 30.

**7.25** Where the measures in Diagram 7.2 are not provided, then both of the following apply.

- a. The enclosing walls should comply with Appendix B, Table B3.
- b. The doors should comply with Appendix B, Table B5.



## Pipes for oil or gas and ventilation ducts in protected shafts

**7.26** A **protected shaft** containing a **protected stairway** and/or a lift *should not* also contain either of the following.

- a. A **pipe** that conveys oil, other than in the mechanism of a hydraulic lift.
- b. A ventilating duct. Two exceptions are as follows.
  - i. A duct provided for pressurising the **protected stairway** to keep it smoke free.

- ii. A duct provided only to ventilate the **protected stairway**.

A **pipe** that is completely separated from a **protected shaft** by **fire resisting** construction is not considered to be contained within that shaft.

**7.27** In a **protected shaft**, any **pipe** carrying natural gas or LPG should be both of the following.

- a. Of screwed steel or all-welded steel construction.
- b. Installed in accordance with both of the following.
  - i. The Pipelines Safety Regulations 1996.
  - ii. The Gas Safety (Installation and Use) Regulations 1998.

## Ventilation of protected shafts conveying gas

**7.28** A **protected shaft** conveying piped flammable gas should be ventilated direct to the outside air, by ventilation openings at high and low level in the shaft.

Any extension of the **storey** floor into the **protected shaft** should not compromise the free movement of air throughout the entire length of the shaft.

Guidance on shafts conveying piped flammable gas, including the size of ventilation openings, is given in **BS 8313**.

## Openings into protected shafts

**7.29** The **external wall** of a **protected shaft** does not normally need to have **fire resistance**. Situations where there are provisions are given in paragraph 3.63 (**external walls** of **protected stairways**, which may also be **protected shafts**) and paragraphs 15.8 to 15.11 (**firefighting shafts**).

Openings in other parts of the enclosure to a **protected shaft** should be limited to the following.

- a. If a wall common to two or more **buildings** forms part of the enclosure, only the following openings should be made in that wall.
  - i. A **fire doorset** providing a **means of escape**, which has the same **fire resistance** as the wall and is fitted in accordance with the provisions in Appendix C.
  - ii. The passage of a **pipe** that meets the provisions in Section 9.
- b. Other parts of the enclosure (other than an **external wall**) should only have openings for any of the following.
  - i. **Fire doorsets** of the appropriate **fire resistance**, fitted in accordance with the provisions in Appendix C.
  - ii. The passage of **pipes** which meet the provisions in Section 9.
  - iii. Inlets to, outlets from and openings for a ventilation duct (if the shaft contains or serves as a ventilating duct), meeting the provisions in Section 9.
  - iv. The passage of lift cables into a lift machine **room** (if the shaft contains a lift). If the machine **room** is at the bottom of the shaft, the openings should be as small as practicable.

## Section 8: Cavities – flats

- 8.1** Cavities in the construction of a building provide a ready route for the spread of smoke and flame, which can present a greater danger as any spread is concealed. For the purpose of this document, a cavity is considered to be any concealed space.

### Provision of cavity barriers

- 8.2** To reduce the potential for fire spread, cavity barriers should be provided for both of the following.
- To divide cavities.
  - To close the edges of cavities.

See Diagram 8.1. Cavity barriers should not be confused with fire-stopping details (Section 9).

### Pathways around fire-separating elements

#### Junctions and cavity closures

- 8.3** Cavity barriers should be provided at all of the following locations.
- At the edges of cavities, including around openings (such as windows, doors and exit/entry points for services).
  - At the junction between an external cavity wall and every compartment floor and compartment wall.
  - At the junction between an internal cavity wall and every compartment floor, compartment wall or other wall or door assembly forming a fire resisting barrier.

This does not apply where a wall meets the conditions of Diagram 8.2.

- 8.4** It is not appropriate to complete a line of compartment walls by fitting cavity barriers above them. The compartment walls should extend to the underside of the floor or roof above.

#### Protected escape routes

- 8.5** If the fire resisting construction of a protected escape route is either of the following.
- Not carried to full storey height.
  - At the top storey, not carried to the underside of the roof covering.
- Then the cavity above or below the fire resisting construction should be either of the following.
- Fitted with cavity barriers on the line of the enclosure.
  - For cavities above the fire resisting construction, enclosed on the lower side by a fire resisting ceiling (minimum EI 30) that extends throughout the building, compartment or separated part (see Diagram 8.3).

See para 8.2

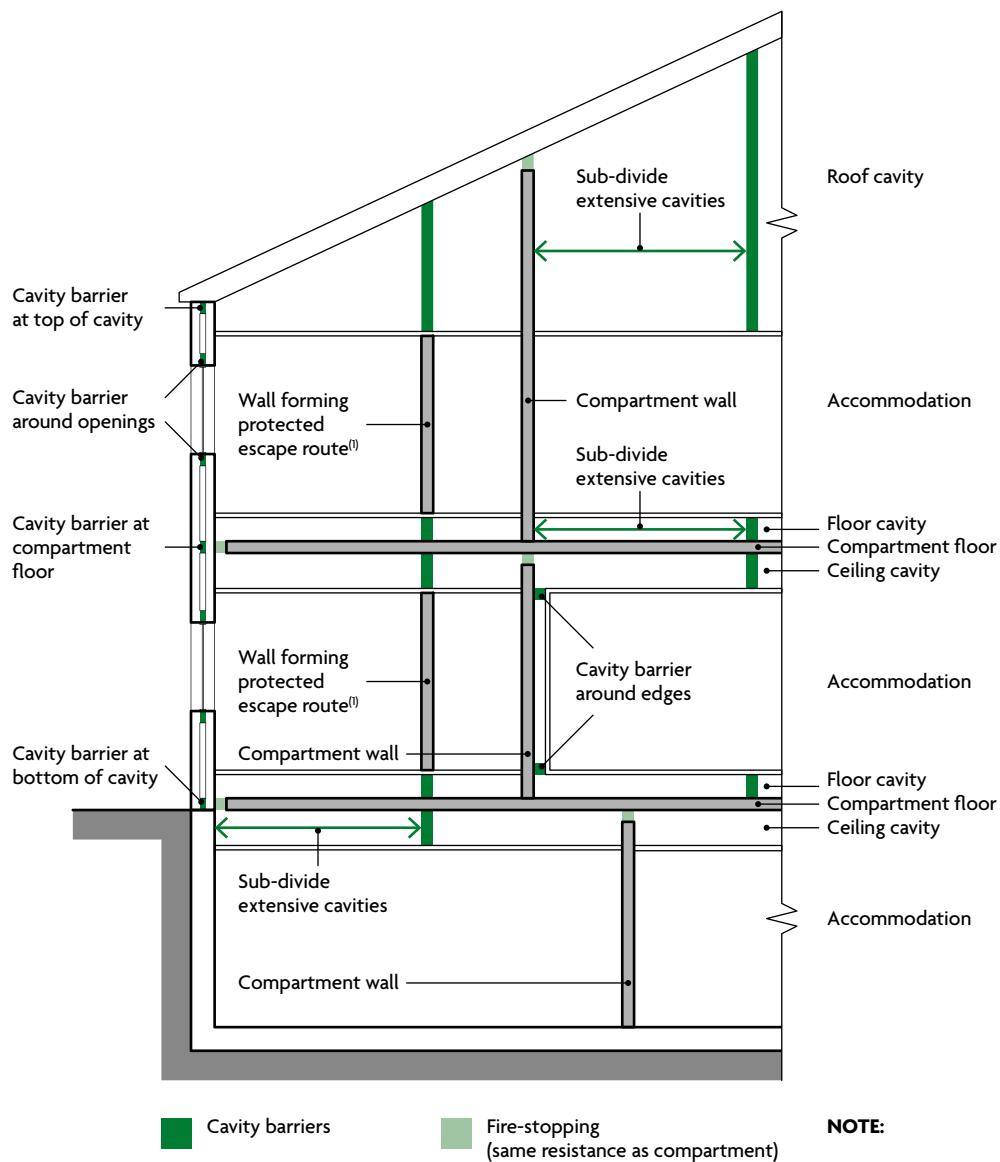


Diagram 8.1 Provisions for cavity barriers

## Cavities affecting alternative escape routes

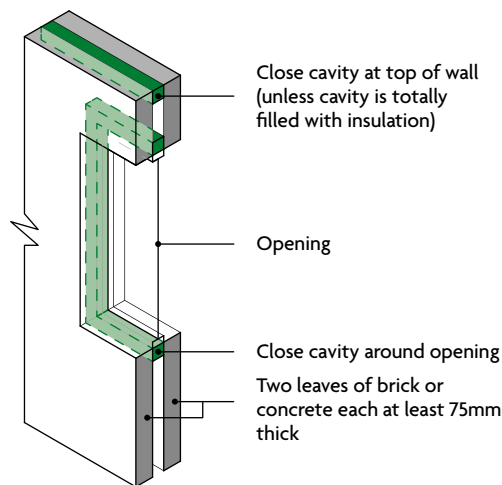
**8.6** In divided corridors (paragraph 3.25 and following) with cavities, fire-stopping should be provided to prevent alternative escape routes being affected by fire and/or smoke.

## Double-skinned corrugated or profiled roof sheeting

**8.7** Cavity barriers are not required between double-skinned corrugated or profiled insulated roof sheeting, if the sheeting complies with all of the following.

- The sheeting is rated class A2-s3, d2 or better.
- Both surfaces of the insulating layer are rated class C-s3, d2 or better.
- Both surfaces of the insulating layer make contact with the inner and outer skins of cladding (Diagram 8.4).

See para 8.3

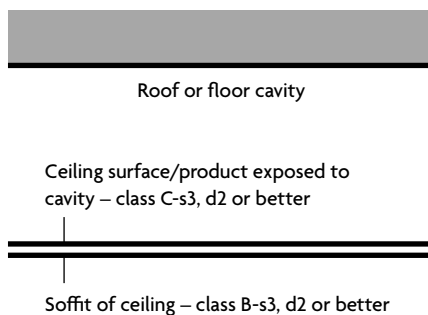


### NOTES:

- Materials used to close the cavity in this arrangement do not need to achieve a specific performance in relation to fire resistance.
- Domestic meter cupboards may be installed provided that the following conditions are met:
  - There are no more than two cupboards per dwelling
  - The openings in the outer wall leaf are not bigger than 800×500mm for each cupboard
  - The inner leaf is not penetrated except by a sleeve not more than 80×80mm, which is fire-stopped.
- Materials achieving class B-s3, d2 or worse may be placed within the cavity.

Diagram 8.2 Cavity walls excluded from provisions for cavity barriers

See para 8.5



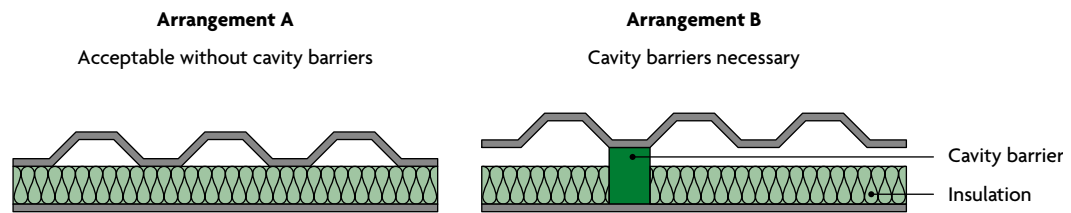
### NOTE:

The ceiling should meet the following conditions.

- Provide a minimum fire resistance of EI 30.
- Be imperforate, except for an opening described in paragraph 5.24.
- Extend throughout the building or compartment.
- Not be easily demountable.

Diagram 8.3 Fire resisting ceiling below concealed space

See para 8.7



The insulation should make contact with both skins of sheeting. See also Diagram 5.2a regarding the need for fire-stopping where such roofs pass over the top of a compartment wall.

Diagram 8.4 Provisions for cavity barriers in double-skinned insulated roof sheeting

## Construction and fixings for cavity barriers

**8.8** Cavity barriers, tested from each side separately, should provide a minimum of both of the following:

- a. 30 minutes' integrity (E 30)
- b. 15 minutes' insulation (I 15).

They may be formed by a construction provided for another purpose if it achieves the same performance.

**8.9** Cavity barriers should meet the requirements set out in paragraphs 5.21 to 5.23.

# Section 9: Protection of openings and fire-stopping

## Introduction

- 9.1 The performance of a **fire-separating element** should not be impaired. Every joint, imperfect fit and opening for services should be sealed. **Fire-stopping** delays the spread of fire and, generally, the spread of smoke as well.

## Openings for pipes

- 9.2 Pipes passing through a **fire-separating element**, unless in a **protected shaft**, should meet one of the alternatives A, B or C below.

### Alternative A: Proprietary seals (any pipe diameter)

- 9.3 Provide a proprietary, tested sealing system that will maintain the **fire resistance** of the wall, floor or **cavity barrier**.

### Alternative B: Pipes with a restricted diameter

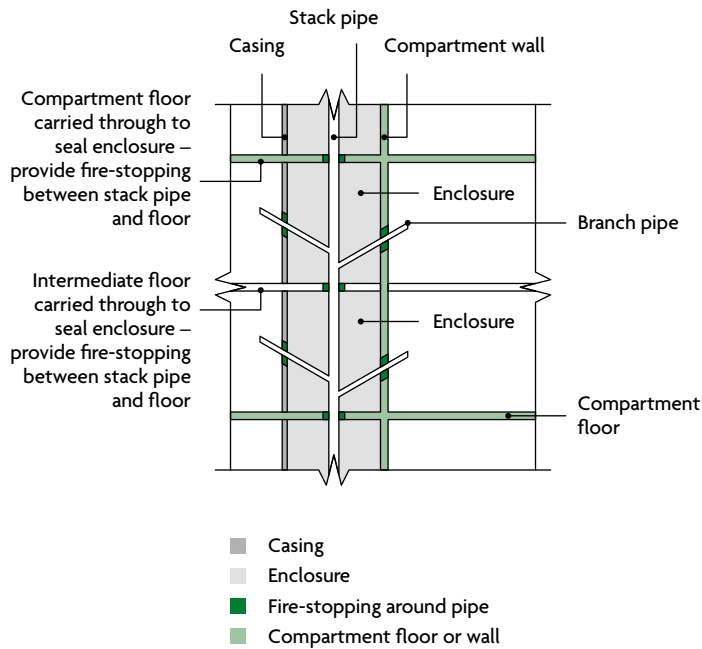
- 9.4 Where a proprietary sealing system is not used, **fire-stop** around the **pipe**, keeping the opening for the **pipe** as small as possible. The nominal internal diameter of the **pipe** should not exceed the relevant dimension given in Table 9.1. The diameter given in Table 9.1 for **pipes** of specification (b) used in situation 2 or 3 assumes that the **pipes** are part of an above-ground drainage system and are enclosed as shown in Diagram 9.1. If they are not, the smaller diameter given for situation 5 should be used.

### Alternative C: Sleeving

- 9.5 A **pipe** with a maximum nominal internal diameter of 160mm may be used with a sleeve made out of a high melting point metal, as shown in Diagram 9.2, if the **pipe** is made of one of the following.
- Lead.
  - Aluminium.
  - Aluminium alloy.
  - Fibre-cement.
  - uPVC (**pipes** should also comply with either **BS 4514** or **BS 5255**).

A high melting point metal means any metal (such as cast iron, copper or steel) which, if exposed to a temperature of 800°C, will not soften or fracture to the extent that flame or hot gas will pass through the wall of the **pipe**.

See para 9.4 and Table 9.1

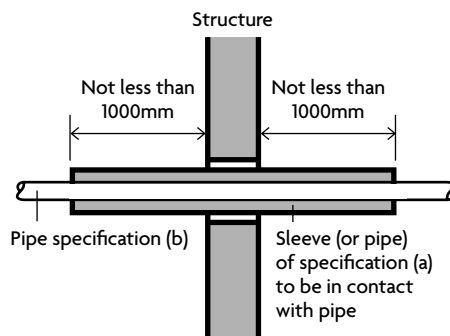


#### NOTES:

1. The enclosure should meet all of the following conditions.
  - a. Be bounded by a compartment wall or floor, an outside wall, an intermediate floor or a casing (see specification at 2 below).
  - b. Have internal surfaces (except framing members) of class B-s3, d2 or better.  
Note: when a classification includes 's3, d2', this means that there is no limit set for smoke production and/or flaming droplets/particles.
  - c. Not have an access panel which opens into a circulation space or bedroom.
  - d. Be used only for drainage or water supply or vent pipes for a drainage system.
2. The casing should meet all the following conditions.
  - a. Be imperforate except for an opening for a pipe or an access panel.
  - b. Not be of sheet metal.
  - c. Not have fire resistance less than E 30 (including any access panel).
3. The opening for a pipe, in either the element of structure or the casing, should be as small as possible and fire-stopped around the pipe.

Diagram 9.1 Enclosure for drainage or water supply pipes

See para 9.5



#### NOTES:

1. Make the opening in the structure as small as possible and provide fire-stopping between pipe and structure.
2. See Table 9.1 for materials specification.
3. The sleeve should be class A1 rated.

Diagram 9.2 Pipes penetrating structure

**Table 9.1 Maximum nominal internal diameter of pipes passing through a compartment wall/floor**

Situation	Pipe material and maximum nominal internal diameter (mm)		
	(a) High melting point metal <sup>(1)</sup>	(b) Lead, aluminium, aluminium alloy, uPVC, <sup>(2)</sup> fibre cement	(c) Any other material
1. Structure (but not a wall separating buildings) enclosing a protected shaft that is not a stair or a lift shaft	160	110	40
2. Compartment wall or compartment floor between flats	160	160 (stack pipe) <sup>(3)</sup> 110 (branch pipe) <sup>(3)</sup>	40
3. Wall separating dwellinghouses	160	160 (stack pipe) <sup>(3)</sup> 110 (branch pipe) <sup>(3)</sup>	40
4. Wall or floor separating a dwellinghouse from an attached garage	160	110	40
5. Any other situation	160	40	40

**NOTES:**

1. Any metal (such as cast iron, copper or steel) which, if exposed to a temperature of 800°C, will not soften or fracture to the extent that flame or hot gas will pass through the wall of the pipe.
2. uPVC pipes that comply with either **BS 4514** or **BS 5255**.
3. These diameters are only in relation to pipes that form part of an above-ground drainage system and are enclosed as shown in Diagram 9.1. In other cases, the maximum diameters given for situation 5 apply.

## Mechanical ventilation and air-conditioning systems

### General provisions

- 9.6** Ductwork should not help to transfer fire and smoke through the **building**. Terminals of exhaust points should be sited away from **final exits**, cladding or roofing materials achieving class B-s3, d2 or worse and openings into the **building**.
- 9.7** Ventilation ducts supplying or extracting air directly to or from a **protected stairway** should not also serve other areas. A separate ventilation system should be provided for each **protected stairway**.
- 9.8** A **fire and smoke damper** should be provided where ductwork enters or leaves each section of the protected **escape route** it serves. It should be operated by a smoke detector or suitable fire detection system. **Fire and smoke dampers** should close when smoke is detected. Alternatively, the methods set out in paragraphs 9.16 and 9.17 and Diagrams 9.3 and 9.4 may be followed.
- 9.9** In a system that recirculates air, smoke detectors should be fitted in the extract ductwork before both of the following.
- a. The point where recirculated air is separated from air to be discharged to the outside.
  - b. Any filters or other air cleaning equipment.
- When smoke is detected, detectors should do one of the following.
- i. Cause the system to immediately shut down.

- ii. Switch the ventilation system from recirculating mode to extraction to divert smoke to outside the building.

**9.10** In mixed use buildings, non-domestic kitchens, car parks and plant rooms should have separate and independent extraction systems. Extracted air should not be recirculated.

**9.11** Under fire conditions, ventilation and air-conditioning systems should be compatible with smoke control systems and need to be considered in their respective design.

## Ventilation ducts and flues passing through fire-separating elements

### General provisions

**9.12** If air handling ducts pass through fire-separating elements, the load-bearing capacity, integrity and insulation of the elements should be maintained using one or more of the following four methods. In most ductwork systems, a combination of the four methods is best to combat potential fire dangers.

- a. Method 1 – thermally activated fire dampers.
- b. Method 2 – fire resisting enclosures.
- c. Method 3 – protection using fire resisting ductwork.
- d. Method 4 – automatically activated fire and smoke dampers triggered by smoke detectors.

**9.13** Further information on fire resisting ductwork is given in the ASFP Blue Book.

### Flats and dwellings

**9.14** Where ducts pass between fire-separating elements to serve multiple flats or dwellings, fire dampers or fire and smoke dampers should be actuated by both of the following.

- a. Smoke detector-controlled automatic release mechanisms.
- b. Thermally actuated devices.

### Kitchen extract

**9.15** Methods 1 and 4 should not be used for extract ductwork serving kitchens. The likely build-up of grease within the duct can adversely affect dampers.

### Ducts passing through protected escape routes

**9.16** Method 1 should not be used for extract ductwork passing through the enclosures of protected escape routes (Diagrams 9.3 and 9.4), as large volumes of smoke can pass thermal devices without triggering them.

**9.17** An ES classified fire and smoke damper which is activated by a suitable fire detection system (method 4) may also be used for protected escape routes.

See para 9.16

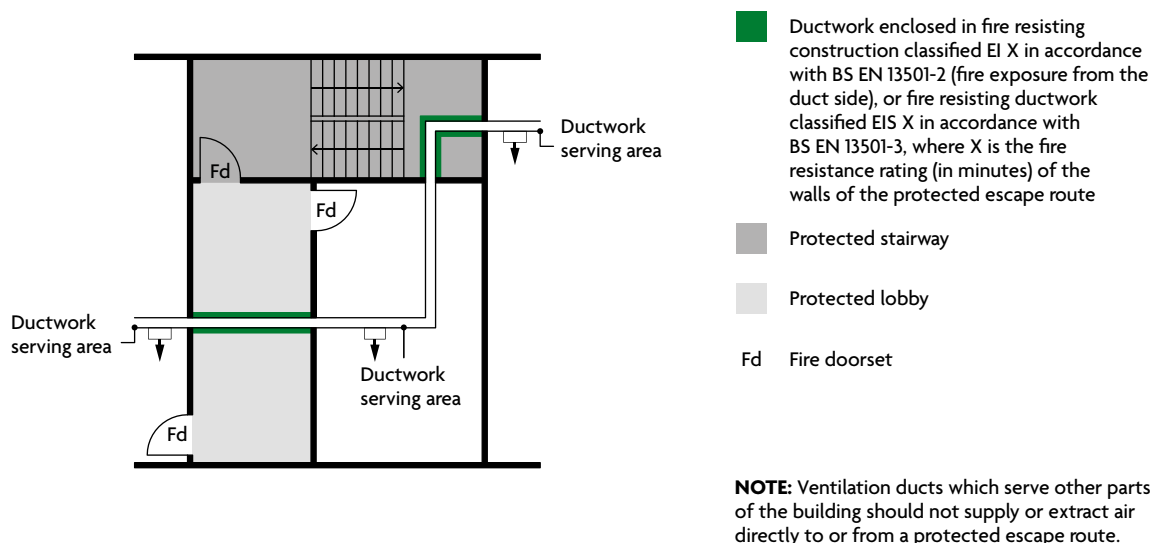


Diagram 9.3 Ductwork passing through protected escape routes – method 2 or method 3

See para 9.16

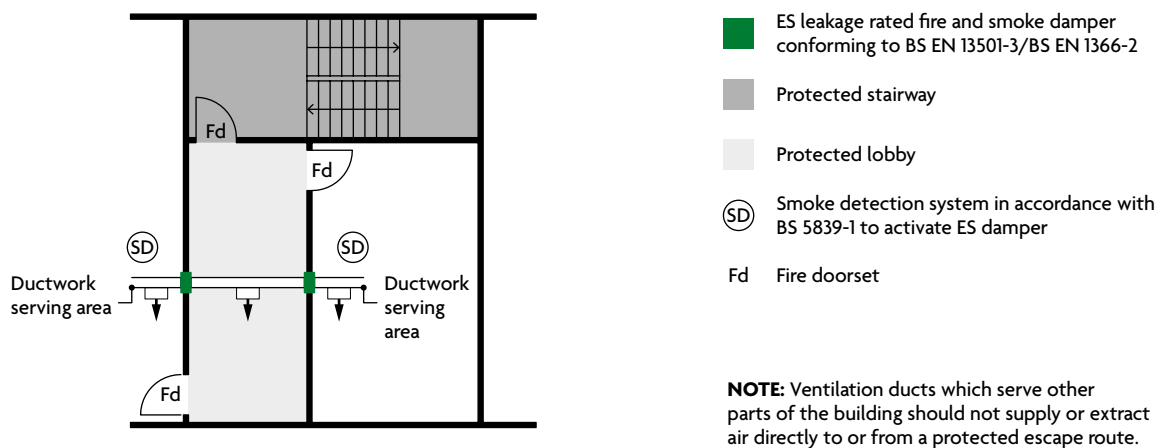


Diagram 9.4 Ductwork passing through protected escape routes – method 4

## Installation and specification of fire dampers

- 9.18** Both **fire dampers** and **fire and smoke dampers** should be all of the following.
- Sited within the thickness of the **fire-separating elements**.
  - Securely fixed.
  - Sited such that, in a fire, expansion of the ductwork would not push the **fire damper** through the structure.
- 9.19** Access to the **fire damper** and its actuating mechanism should be provided for inspection, testing and maintenance.
- 9.20** **Fire dampers** should meet both of the following conditions.
- Conform to **BS EN 15650**.
  - Have a minimum E classification of 60 minutes or to match the integrity rating of the **fire resisting** elements, whichever is higher.
- 9.21** **Fire and smoke dampers** should meet both of the following conditions.
- Conform to **BS EN 15650**.
  - Have a minimum ES classification of 60 minutes or to match the integrity rating of the **fire resisting** elements, whichever is higher.
- 9.22** Smoke detectors should be sited so as to prevent the spread of smoke as early as practicable by activating the **fire and smoke dampers**. Smoke detectors and **automatic release mechanisms** used to activate **fire dampers** and/or **fire and smoke dampers** should conform to **BS EN 54-7** and **BS 5839-3** respectively.

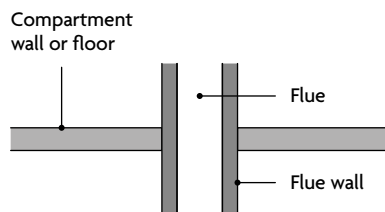
Further information on **fire dampers** and/or **fire and smoke dampers** is given in the ASFP Grey Book.

## Flues, etc.

- 9.23** The wall of a flue, duct containing flues or **appliance ventilation duct(s)** should have a **fire resistance (REI)** that is at least half of any **compartment wall** or **compartment floor** it passes through or is built into (Diagram 9.5).

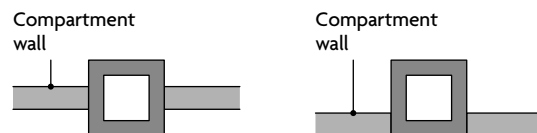
See para 9.23

**a. Flue passing through compartment wall or floor**



Flue walls should have a fire resistance of at least one half of that required for the compartment wall or floor and be of class A1 construction.

**b. Flue built into compartment wall**



In each case flue walls should have a fire resistance of at least one half of that required for the compartment wall and be of class A1 construction.

Diagram 9.5 Flues penetrating compartment walls or floors

## Fire-stopping

**9.24** In addition to any other provisions in this section, both of the following conditions should be met.

- a. Joints between fire-separating elements should be fire-stopped.
- b. Openings through a fire resisting element for pipes, ducts, conduits or cable should be all of the following.
  - i. As few as possible.
  - ii. As small as practicable.
  - iii. Fire-stopped (allowing thermal movement in the case of a pipe or duct).

**NOTE:** The fire-stopping around fire dampers, fire resisting ducts, fire and smoke dampers and smoke control ducts should be in accordance with the manufacturer or supplier's installation instructions.

**9.25** Materials used for fire-stopping should be reinforced with (or supported by) materials rated class A2-s3, d2 or better to prevent displacement in both of the following cases.

- a. Where the unsupported span is greater than 100mm.
- b. Where non-rigid materials are used (unless subjected to appropriate fire resistance testing to show their suitability).

**9.26** Proprietary, tested fire-stopping and sealing systems are available and may be used. Different materials suit different situations and not all are suitable in every situation.

**9.27** Other fire-stopping materials include the following.

- a. Cement mortar.
- b. Gypsum-based plaster.
- c. Cement-based or gypsum-based vermiculite/perlite mixes.
- d. Glass fibre, crushed rock, blast furnace slag or ceramic-based products (with or without resin binders).
- e. Intumescent mastics.

These may be used in situations appropriate to the particular material. Not all materials will be suitable in every situation.

**9.28** Guidance on the design, installation and maintenance of measures to contain fires or slow their spread is given in *Ensuring Best Practice for Passive Fire Protection in Buildings* produced by the Association for Specialist Fire Protection (ASFP).

**9.29** Further information on generic systems, their suitability for different applications and guidance on test methods, is given in the ASFP Red Book.

## Requirement B4: External fire spread

These sections deal with the following requirement from Part B of Schedule 1 to the Building Regulations 2010. Section 10 also refers to regulation 7(2) of the Building Regulations 2010. Guidance on regulation 7(1) can be found in Approved Document 7.

### 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.

### Regulation

#### **Regulation 7 – Materials and workmanship**

- (1) Building work shall be carried out—
- with adequate and proper materials which—
    - are appropriate for the circumstances in which they are used,
    - are adequately mixed or prepared, and
    - are applied, used or fixed so as adequately to perform the functions for which they are designed; and
  - in a workmanlike manner.
- (2) Subject to paragraph (3), building work shall be carried out so that materials which become part of an external wall, or specified attachment, of a relevant building are of European Classification A2-s1, d0 or A1, classified in accordance with BS EN 13501-1:2007+A1:2009 entitled “Fire classification of construction products and building elements. Classification using test data from reaction to fire tests” (ISBN 978 0 580 59861 6) published by the British Standards Institution on 30th March 2007 and amended in November 2009.

**Regulation continued**

- (3) Paragraph (2) does not apply to—
- (a) cavity trays when used between two leaves of masonry;
  - (b) any part of a roof (other than any part of a roof which falls within paragraph (iv) of regulation 2(6)) if that part is connected to an external wall;
  - (c) door frames and doors;
  - (d) electrical installations;
  - (e) insulation and water proofing materials used below ground level;
  - (f) intumescent and fire stopping materials where the inclusion of the materials is necessary to meet the requirements of Part B of Schedule 1;
  - (g) membranes;
  - (h) seals, gaskets, fixings, sealants and backer rods;
  - (i) thermal break materials where the inclusion of the materials is necessary to meet the thermal bridging requirements of Part L of Schedule 1; or
  - (j) window frames and glass.
- (4) In this regulation—
- (a) a “relevant building” means a building with a storey (not including roof-top plant areas or any storey consisting exclusively of plant rooms) at least 18 metres above ground level and which—
    - (i) contains one or more dwellings;
    - (ii) contains an institution; or
    - (iii) contains a room for residential purposes (excluding any room in a hostel, hotel or boarding house); and
  - (b) “above ground level” in relation to a storey means above ground level when measured from the lowest ground level adjoining the outside of a building to the top of the floor surface of the storey.

## Intention

### Resisting fire spread over external walls

The external envelope of a **building** should not contribute to undue fire spread from one part of a **building** to another part. This intention can be met by constructing **external walls** so that both of the following are satisfied.

- a. The risk of ignition by an external source to the outside surface of the **building** and spread of fire over the outside surface is restricted.
- b. The materials used to construct **external walls**, and attachments to them, and how they are assembled do not contribute to the rate of fire spread up the outside of the **building**.

The extent to which this is necessary depends on the **height** and use of the **building**.

## Resisting fire spread from one building to another

The external envelope of a **building** should not provide a medium for undue fire spread to adjacent **buildings** or be readily ignited by fires in adjacent **buildings**. This intention can be met by constructing **external walls** so that all of the following are satisfied.

- a. The risk of ignition by an external source to the outside surface of the **building** is restricted.
- b. The amount of thermal radiation that falls on a neighbouring **building** from window openings and other **unprotected areas** in the **building** on fire is not enough to start a fire in the other **building**.
- c. Flame spread over the roof and/or fire penetration from external sources through the roof is restricted.

The extent to which this is necessary depends on the use of the **building** and its position in relation to adjacent **buildings** and therefore the **site boundary**.

## Section 10: Resisting fire spread over external walls

### Introduction

**10.1** The **external wall** of a **building** should not provide a medium for fire spread if that is likely to be a risk to health and safety. Combustible materials and **cavities** in **external walls** and attachments to them can present such a risk, particularly in tall **buildings**. The guidance in this section is designed to reduce the risk of vertical fire spread as well as the risk of ignition from flames coming from adjacent **buildings**.

### Fire resistance

**10.2** This section does not deal with **fire resistance** for **external walls**. An **external wall** may need **fire resistance** to meet the requirements of Section 3 (Means of escape – flats), Section 6 (Loadbearing elements of structures – flats) or Section 11 (Resisting fire spread from one building to another).

### Combustibility of external walls

- 10.3** The **external walls** of **buildings** other than those described in regulation 7(4) of the Building Regulations should achieve either of the following.
- Follow the provisions given in paragraphs 10.5 to 10.8, which provide guidance on all of the following.
    - External surfaces.
    - Materials and products.
    - Cavities** and **cavity barriers**.
  - Meet the performance criteria given in BRE report BR 135 for **external walls** using full-scale test data from **BS 8414-1** or **BS 8414-2**.
- 10.4** In relation to **buildings** of any **height** or use, consideration should be given to the choice of materials (including their extent and arrangement) used for the **external wall**, or attachments to the wall, to reduce the risk of fire spread over the wall.

### External surfaces

**10.5** The external surfaces (i.e. outermost external material) of **external walls** should comply with the provisions in Table 10.1. The provisions in Table 10.1 apply to each wall individually in relation to its proximity to the relevant boundary.

**Table 10.1 Reaction to fire performance of external surface of walls**

Building type	Building height	Less than 1000mm from the relevant boundary	1000mm or more from the relevant boundary
'Relevant buildings' as defined in regulation 7(4) (see paragraph 10.10)		Class A2-s1, d0 <sup>(1)</sup> or better	Class A2-s1, d0 <sup>(1)</sup> or better
Assembly and recreation	More than 18m	Class B-s3, d2 <sup>(2)</sup> or better	From ground level to 18m: class C-s3, d2 <sup>(3)</sup> or better  From 18m in height and above: class B-s3, d2 <sup>(2)</sup> or better
	18m or less	Class B-s3, d2 <sup>(2)</sup> or better	Up to 10m above ground level: class C-s3, d2 <sup>(3)</sup> or better  Up to 10m above a roof or any part of the building to which the public have access: class C-s3, d2 <sup>(3)</sup> or better <sup>(4)</sup>  From 10m in height and above: no minimum performance
Any other building	More than 18m	Class B-s3, d2 <sup>(2)</sup> or better	From ground level to 18m: class C-s3, d2 <sup>(3)</sup> or better  From 18m in height and above: class B-s3, d2 <sup>(2)</sup> or better
	18m or less	Class B-s3, d2 <sup>(2)</sup> or better	No provisions

**NOTES:**

In addition to the requirements within this table, buildings with a top occupied storey above 18m should also meet the provisions of paragraph 10.6.

In all cases, the advice in paragraph 10.4 should be followed.

1. The restrictions for these buildings apply to all the materials used in the external wall and specified attachments (see paragraphs 10.9 to 10.12 for further guidance).
2. Profiled or flat steel sheet at least 0.5 mm thick with an organic coating of no more than 0.2mm thickness is also acceptable.
3. Timber cladding at least 9mm thick is also acceptable.
4. 10m is measured from the top surface of the roof.

## Materials and products

**10.6** In a building with a storey 18m or more in height (see Diagram D6 in Appendix D) any insulation product, filler material (such as the core materials of metal composite panels, sandwich panels and window spandrel panels but not including gaskets, sealants and similar) etc. used in the construction of an external wall should be class A2-s3, d2 or better (see Appendix B). This restriction does not apply to masonry cavity wall construction which complies with Diagram 8.2 in Section 8. Where regulation 7(2) applies, that regulation prevails over all the provisions in this paragraph.

- 10.7** Best practice guidance for green walls (also called living walls) can be found in *Fire Performance of Green Roofs and Walls*, published by the Department for Communities and Local Government.

### Cavities and cavity barriers

- 10.8** Cavity barriers should be provided in accordance with Section 5 in *dwellinghouses* and Section 8 in *flats*.

## Regulation 7(2) and requirement B4

### Materials

- 10.9** Regulation 7(1)(a) requires that materials used in building work are appropriate for the circumstances in which they are used. Regulation 7(2) sets requirements in respect of *external walls* and *specified attachments* in relevant *buildings*.

**NOTE:** Guidance on regulation 7(1) can be found in Approved Document 7.

- 10.10** Regulation 7(2) applies to any *building* with a *storey* at least 18m above ground level (as measured in accordance with Diagram D6 in Appendix D) and which contains one or more *dwelling*s; an institution; or a *room* for residential purposes (excluding any *room* in a hostel, hotel or a boarding house). It requires that all materials which become part of an *external wall* or *specified attachment* achieve class A2-s1, d0 or class A1, other than those exempted by regulation 7(3).

**NOTE:** The above includes student accommodation, care homes, *sheltered housing*, hospitals and dormitories in boarding *schools*. See regulation 7(4) for the definition of relevant *buildings*.

**NOTE:** The requirement in regulation 7(2) is limited to materials achieving class A2-s1, d0 or class A1.

- 10.11** *External walls* and *specified attachments* are defined in regulation 2 and these definitions include any parts of the *external wall* as well as balconies, solar panels and sun shading.
- 10.12** Regulation 7(3) provides an exemption for certain components found in *external walls* and *specified attachments*.

### Material change of use

- 10.13** Regulations 5(k) and 6(3) provide that, where the use of a *building* is changed such that the *building* becomes a *building* described in regulation 7(4), the construction of the *external walls*, and *specified attachments*, must be investigated and, where necessary, work must be carried out to ensure they only contain materials achieving class A2-s1, d0 or class A1, other than those exempted by regulation 7(3).

### Additional considerations

- 10.14** The provisions of regulation 7 apply in addition to requirement B4. Therefore, for *buildings* described in regulation 7(4), the potential impact of any products incorporated into or onto the *external walls* and *specified attachments* should be carefully considered with regard to their number, size, orientation and position.

**10.15** Particular attention is drawn to the following points.

- a. Membranes used as part of the **external wall** construction above ground level should achieve a minimum of class B-s3, d0.
- b. Internal linings should comply with the guidance provided in Section 4.
- c. Any part of a roof should achieve the minimum performance as detailed in Section 12.
- d. As per regulation 7(3), window frames and glass (including laminated glass) are exempted from regulation 7(2). Window spandrel panels and infill panels must comply with regulation 7(2).
- e. Thermal breaks are small elements used as part of the **external wall** construction to restrict thermal bridging. There is no minimum performance for these materials. However, they should not span two **compartments** and should be limited in size to the minimum required to restrict the thermal bridging (the principal insulation layer is not to be regarded as a thermal break).
- f. Regulation 7(2) only applies to **specified attachments**. Shop front signs and similar attachments are not covered by the requirements of regulation 7(2), although attention is drawn to paragraph 10.15g.
- g. While regulation 7(2) applies to materials which become part of an **external wall** or **specified attachment**, consideration should be given to other attachments to the wall which could impact on the risk of fire spread over the wall.

# Section 11: Resisting fire spread from one building to another

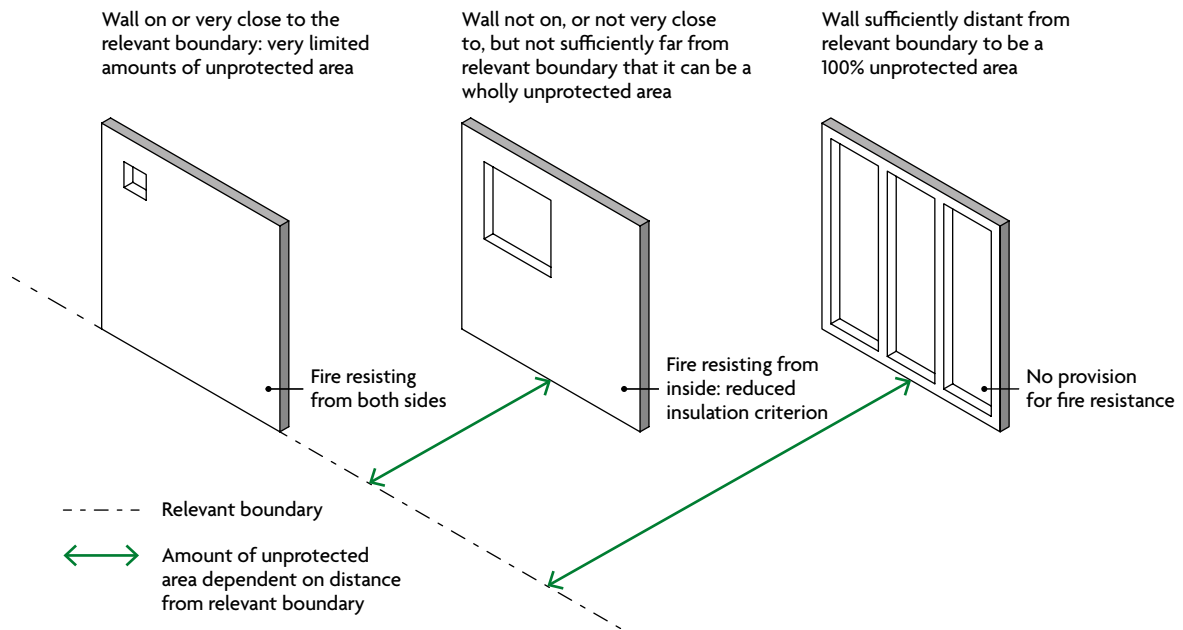
## Introduction

- 11.1** The following assumptions enable a reasonable standard of resistance to the spread of fire to be specified.
- The size of a fire depends on the compartmentation within the **building**. A fire may involve a complete **compartment**, but will not spread to other **compartments**.
  - The intensity of a fire is related to the building use, but can be moderated by a sprinkler system.
  - Fires in ‘residential’ and ‘assembly and recreation’ **buildings** (**purpose groups** 1, 2 and 5) represent a greater risk to life.
  - A **building** on the far side of the **relevant boundary** meets both of the following conditions.
    - Has a similar elevation to the one in question.
    - Is the same distance as the one in question from the common **boundary**.
  - The radiated heat passing through any part of the **fire resisting external wall** may be discounted.
- 11.2** Where regulation 7(2) applies, that regulation prevails over the provisions within this section.
- 11.3** If a reduced separation distance between **buildings**, or increased amount of **unprotected area**, is required, smaller **compartments** should be considered.

## Boundaries

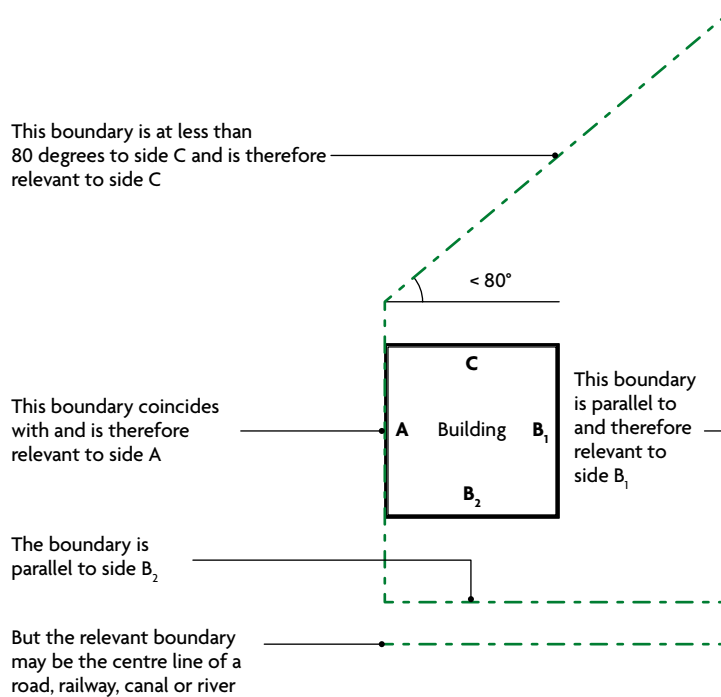
- 11.4** The **fire resistance** of a wall depends on its distance from the **relevant boundary** (see Diagram 11.1). Separation distances are measured to boundaries to ensure that the location and design of **buildings** on adjoining **sites** have no influence on the **building** under consideration.
- 11.5** The **boundary** that a wall faces is the **relevant boundary** (Diagram 11.2). It may be one of the following.
- The site **boundary**.
  - The centre line of a space where further development is unlikely, such as a road, railway, canal or river.
  - An assumed **notional boundary** between two **buildings** on the same site (Diagram 11.3) where either of the following conditions is met.
    - One or both of the **buildings** are in the ‘residential’ or ‘assembly and recreation’ **purpose groups** (**purpose group** 1, 2 or 5).
    - The buildings will be operated/managed by different organisations.

See para 11.4



### Diagram 11.1 Principles of space separation

See para 11.5



**NOTES:**

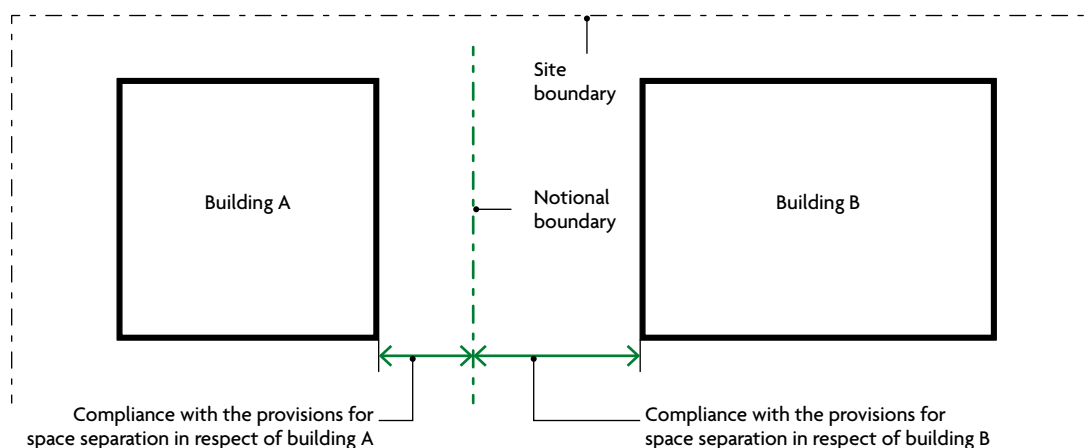
This diagram sets out the rules that apply in respect of a boundary for it to be considered as a relevant boundary.

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

See para 11.5



**NOTES:**

The notional boundary should be set in the area between the two buildings using the following rules:

1. The notional boundary is assumed to exist in the space between the buildings and is positioned so that one of the buildings would comply with the provisions for space separation having regard to the amount of its unprotected area. In practice, if one of the buildings is existing, the position of the boundary will be set by the space separation factors for that building.
2. The siting of the new building, or the second building if both are new, can then be checked to see that it also complies, using the notional boundary as the relevant boundary for the second building.

Diagram 11.3 Notional boundary

## Unprotected areas and fire resistance

- 11.6** Parts of an **external wall** with less **fire resistance** than the appropriate amount given in Appendix B, Table B4, are called **unprotected areas**.
- 11.7** Where a **fire resisting external wall** has a surface material that is worse than class B-s3, d2 and is more than 1mm thick, that part of the wall should be classified as an **unprotected area** equating to half its area (Diagram 11.4).

### External walls on, and within 1000mm of, the relevant boundary

- 11.8** **Unprotected areas** should meet the conditions in Diagram 11.5, and the rest of the wall should be **fire resisting** from both sides.

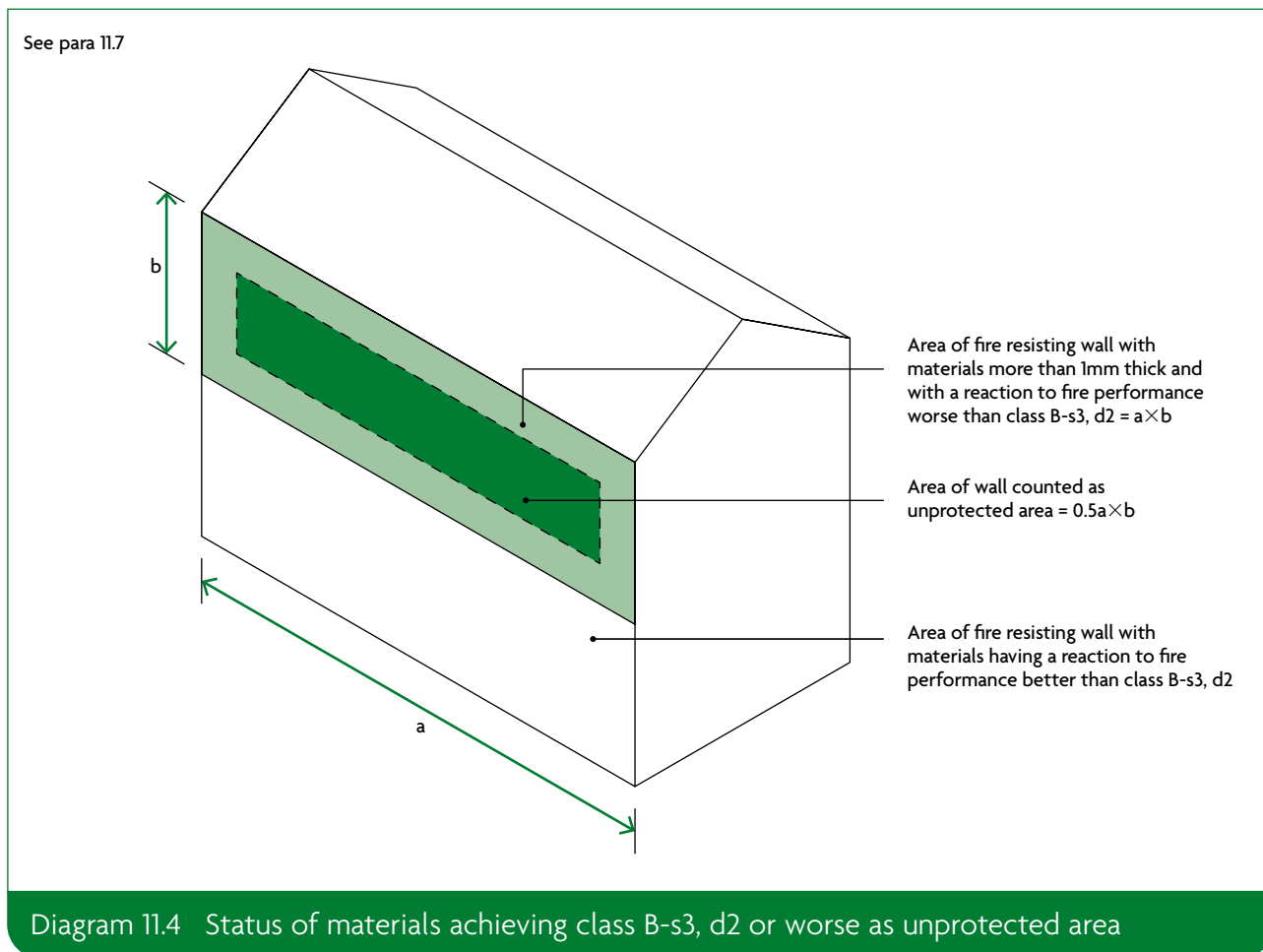
External surface materials facing the **boundary** should be class B-s3, d2 or better.

### External walls 1000mm or more from the relevant boundary

- 11.9** **Unprotected areas** should not exceed the result given by one of the methods in paragraph 11.16, and the rest of the wall (if any) should be **fire resisting** but only from the inside of the **building**.

### External walls of protected stairways

- 11.10** Exclude **external walls** of **protected stairways** when assessing **unprotected areas** (see Diagram 3.10).



## Small unprotected areas

**11.11** In an otherwise protected wall, small **unprotected areas** may be ignored where they meet the conditions in Diagram 11.5.

See para 11.11

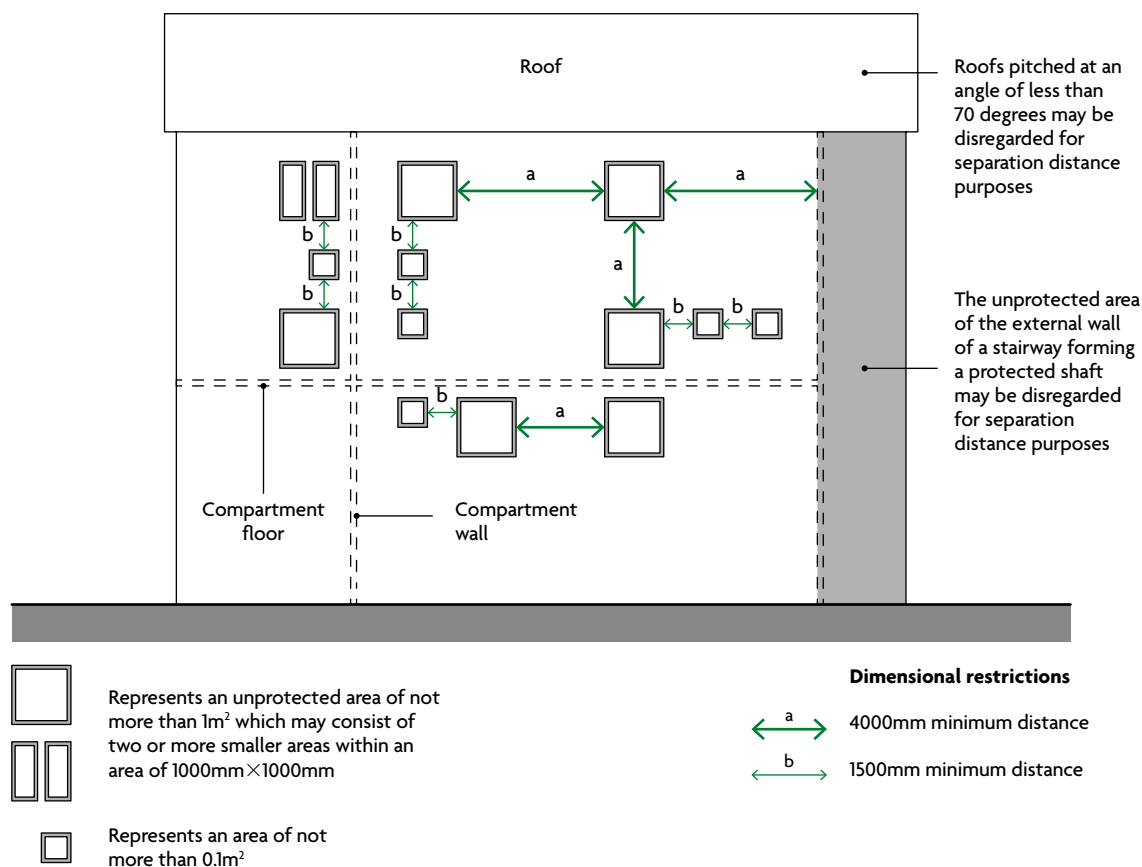


Diagram 11.5 Small unprotected areas that may be disregarded in assessing the separation distance from the boundary

## Canopies

**11.12** Where both of the following apply, separation distances may be determined from the wall rather than from the edge of the canopy (Diagram 11.6).

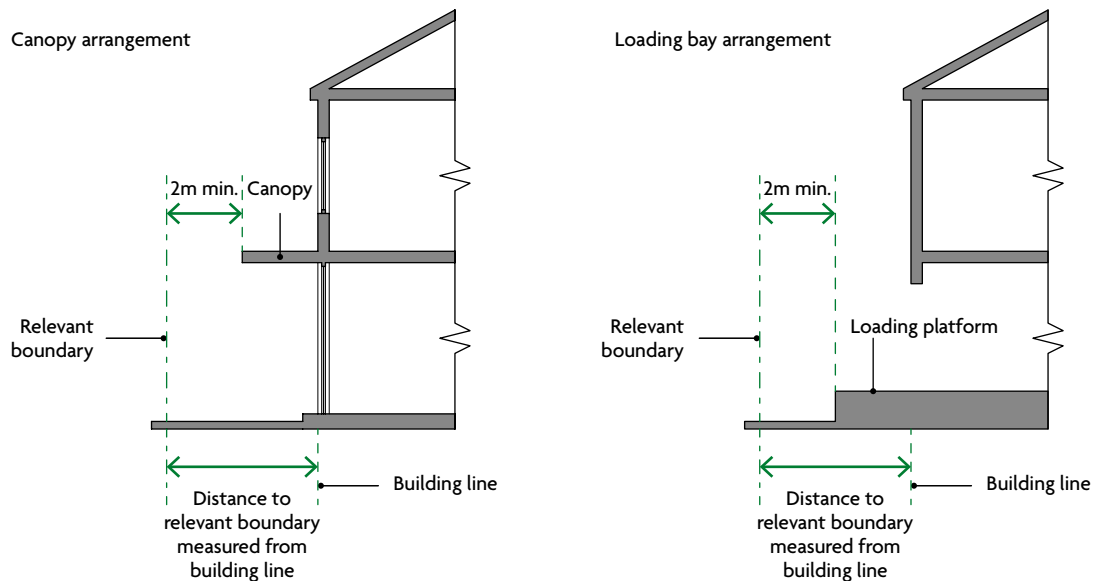
- The canopy is attached to the side of a **building**.
- The edges of the canopy are a minimum of 2m from the **relevant boundary**.

Canopies that fall within class 6 or class 7 of Schedule 2 to the regulations (Exempt Buildings and Work) are exempt from the Building Regulations.

**11.13** Space separation may be disregarded if a canopy is all of the following.

- Free-standing.
- Above a limited risk or controlled hazard.
- A minimum of 1000mm from the **relevant boundary**.

See para 11.12



**NOTE:** Projections from the building line, such as a canopy or a loading platform, can be ignored when assessing separation distance. This does not apply where the canopy is enclosed by side walls.

Diagram 11.6 The effect of a canopy on separation distance

## 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.

## Portal frames

**11.15** Portal frames are often used in single storey industrial and commercial buildings where there may be no need for fire resistance of the structure (requirement B3). However, where a portal framed building is near a relevant boundary, the external wall near the boundary may need fire resistance to restrict the spread of fire between buildings. It is generally accepted that a portal frame acts as a single structural element because of the moment-resisting connections used, especially at the column/rafter joints. Thus, in cases where the external wall of the building cannot be wholly unprotected, the rafter members of the frame, as well as the column members, may need to be fire protected. The design method for this is set out in SCI Publication P313.

**NOTE:** The recommendations in the SCI publication for designing the foundation to resist overturning do not need to be followed if the building is fitted with a sprinkler system in accordance with Appendix E.

**NOTE:** Normally, portal frames of reinforced concrete can support external walls requiring a similar degree of fire resistance without specific provision at the base to resist overturning.

**NOTE:** Existing buildings may have been designed to comply with all of the following guidance, which is also acceptable.

- The column members are fixed rigidly to a base of sufficient size and depth to resist overturning.
- There is brick, block or concrete protection to the columns up to a protected ring beam providing lateral support.
- There is some form of roof venting to give early heat release. (The roof venting could be, for example, PVC rooflights covering some 10% of the floor area and evenly spaced over the floor area.)

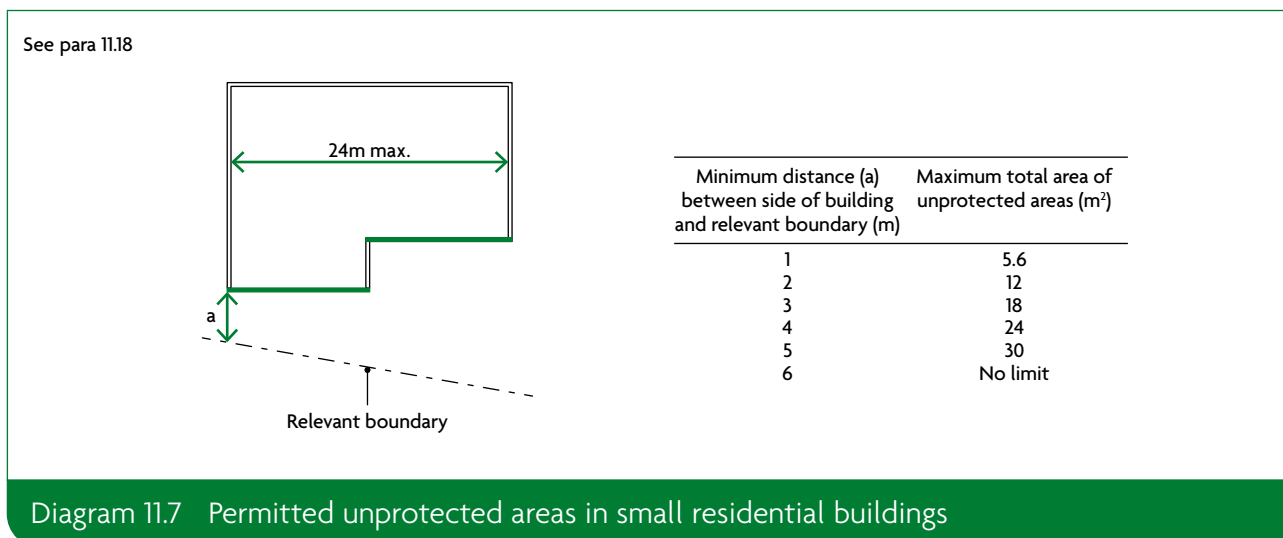
## Methods for calculating acceptable unprotected area

**11.16** Two simple methods are given for calculating the acceptable amount of **unprotected area** in an **external wall** that is a minimum of 1000mm from any point on the **relevant boundary**. More precise methods are described in BRE report BR 187 and may be used instead.

### 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.



### Method 2

**11.19** This method may be used for **buildings** or **compartments** for which method 1 is not appropriate.

**11.20** The **building** should not exceed 10m in **height**. Each side of the **building** should meet the limits stated in Table 11.1. Any areas falling within the limits shown in Diagram 11.5 can be ignored.

**Table 11.1 Permitted unprotected areas in small buildings or compartments**

Minimum distance between side of building and relevant boundary (m)	Maximum total percentage of unprotected area (%) <sup>(1)</sup>
Not applicable	4
1	8
2.5	20
5	40
7.5	60
10	80
12.5	100

**NOTES:**

Intermediate values may be obtained by interpolation.

1. The total percentage of unprotected area is found by dividing the total unprotected area by the area of a rectangle that encloses all the unprotected areas, and multiplying the result by 100.

## Sprinkler systems

**11.21** If a **building** is fitted throughout with a sprinkler system in accordance with Appendix E, either of the following is permitted.

- a. The **boundary** distance can be halved, to a minimum distance of 1m.
- b. The amount of **unprotected area** can be doubled.

# Section 12: Resisting fire spread over roof coverings

## Introduction

- 12.1** 'Roof covering' describes one or more layers of material, but not the roof structure as a whole.
- 12.2** Provisions for the fire properties of roofs are given in other parts of this document.
- a. Requirement B1 – for roofs that are part of a **means of escape**.
  - b. Requirement B2 – for the internal surfaces of **rooflights** as part of internal linings.
  - c. Requirement B3 – for roofs that are used as a floor and for roofs passing over a **compartment wall**.
  - d. Section 11 – the circumstances in which a roof is subject to the provisions for space separation.

## Separation distances

- 12.3** Separation distance is the minimum distance from the roof, or part of the roof, to the **relevant boundary** (paragraph 11.4). Table 12.1 sets out separation distances by the type of roof covering and the size and use of the **building**.

In addition, roof covering products (and/or materials) defined in Commission Decision 2000/553/EC of 6 September 2000, implementing Council Directive 89/106/EEC, can be considered to fulfil all of the requirements for the performance characteristic 'external fire performance' without the need for testing, *provided that any national provisions on the design and execution of works are fulfilled*, and can be used without restriction.

- 12.4** The performance of **rooflights** is specified in a similar way to the performance of roof coverings. Plastic **rooflights** may also be used.

## Plastic rooflights

- 12.5** Table 12.2 and Diagram 12.1 set the limitations for using plastic **rooflights** whose lower surface has a minimum class D-s3, d2 rating.
- 12.6** Table 12.3 sets the limitations for using **thermoplastic materials** with a TP(a) rigid or TP(b) (see also Diagram 12.1) classification. The method of classifying **thermoplastic materials** is given in Appendix B.
- 12.7** Other than for the purposes of Diagram 5.2, polycarbonate or uPVC **rooflights** achieving a minimum rating of class C-s3, d2 can be regarded as having a  $B_{ROOF}(t4)$  classification.

## Unwired glass in rooflights

**12.8** When used in rooflights, unwired glass a minimum of 4mm thick can be regarded as having a  $B_{ROOF}(t4)$  classification.

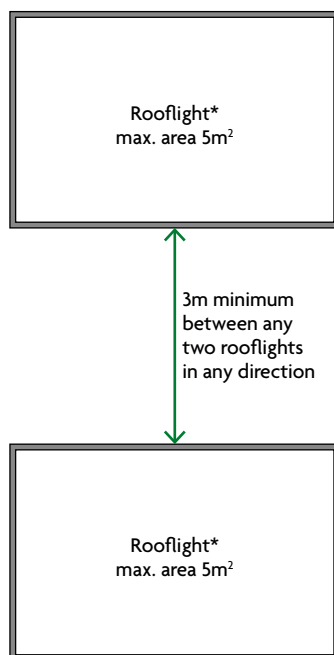
## Thatch and wood shingles

**12.9** If the performance of thatch or wood shingles cannot be established, they should be regarded as having an  $E_{ROOF}(t4)$  classification in Table 12.1.

**NOTE:** Consideration can be given to thatched roofs being closer to the relevant boundary than shown in Table 12.1 if, for example, all of the following precautions (based on the LABC publication *Thatched Buildings (the Dorset Model): New Properties and Extensions*) are incorporated in the design.

- The rafters are overdrawn with construction having not less than 30 minutes' fire resistance.
- The guidance given in Approved Document J is followed.
- The smoke alarm installation (see Section 1) extends to the roof spaces.

See paras 12.5 and 12.6



\* Or group of rooflights amounting to no more than 5m<sup>2</sup>

**NOTES:**

- There are restrictions on the use of plastic rooflights in the guidance to requirement B2 in Section 4.
- Surrounding roof covering to be a material of class A2-s3, d3 or better for at least 3m distance.
- Where Diagram 5.2a or 5.2b applies, rooflights should be at least 1500mm from the compartment wall.

Diagram 12.1 Limitations on spacing and size of plastic rooflights that have a class D-s3, d2 or TP(b) lower surface

**Table 12.1 Limitations on roof coverings**

Designation <sup>(1)</sup> of covering of roof or part of roof	Distance from any point on relevant boundary			
	Less than 6m	At least 6m	At least 12m	At least 20m
B <sub>ROOF</sub> (t4)	●	●	●	●
C <sub>ROOF</sub> (t4)	○	●	●	●
D <sub>ROOF</sub> (t4)	○	● <sup>(2)(3)</sup>	● <sup>(2)</sup>	●
E <sub>ROOF</sub> (t4)	○	● <sup>(2)(3)</sup>	● <sup>(2)</sup>	● <sup>(2)</sup>
F <sub>ROOF</sub> (t4)	○	○	○	● <sup>(2)(3)</sup>

● Acceptable.

○ Not acceptable.

**NOTES:**

Separation distances do not apply to the boundary between roofs of a pair of semi-detached dwellinghouses and to enclosed/covered walkways. However, see Diagram 5.2 if the roof passes over the top of a compartment wall.

Polycarbonate and uPVC rooflights that achieve a class C-s3, d2 rating by test may be regarded as having a B<sub>ROOF</sub>(t4) designation.

1. The designation of external roof surfaces is explained in Appendix B.
2. Not acceptable on any of the following buildings.
  - a. Dwellinghouses in terraces of three or more dwellinghouses.
  - b. Any other buildings with a cubic capacity of more than 1500m<sup>3</sup>.
3. Acceptable on buildings not listed in (1) if both of the following apply.
  - a. Part of the roof has a maximum area of 3m<sup>2</sup> and is a minimum of 1500mm from any similar part.
  - b. The roof between the parts is covered with a material rated class A2-s3, d2 or better.

**Table 12.2 Class D-s3, d2 plastic rooflights: limitations on use and boundary distance**

Minimum classification on lower surface <sup>(1)</sup>	Space that rooflight can serve	Minimum distance from any point on relevant boundary to rooflight with an external designation <sup>(2)</sup> of:	
		$E_{\text{ROOF}}(t4)$ or $D_{\text{ROOF}}(t4)$	$F_{\text{ROOF}}(t4)$
Class D-s3, d2	a. Balcony, verandah, carport, covered way or loading bay with at least one longer side wholly or permanently open	6m	20m
	b. Detached swimming pool		
	c. Conservatory, garage or outbuilding, with a maximum floor area of 40m <sup>2</sup>		
	d. Circulation space <sup>(3)</sup> (except a protected stairway)	6m <sup>(4)</sup>	20m <sup>(4)</sup>
	e. Room <sup>(3)</sup>		

**NOTES:**

None of the above designations are suitable for protected stairways.

Polycarbonate and uPVC rooflights that achieve a class C-s3, d2 rating by test (see paragraph 12.7) may be regarded as having a  $B_{\text{ROOF}}(t4)$  classification.

Where Diagram 5.2a or 5.2b applies, rooflights should be a minimum of 1500mm from the compartment wall.

If double-skinned or laminate products have upper and lower surfaces of different materials, the greater distance applies.

1. See also the guidance to requirement B2 in Section 4.
2. The designation of external roof surfaces is explained in Appendix B.
3. Single-skinned rooflight only, in the case of non-thermoplastic material.
4. The rooflight should also meet the provisions of Diagram 12.1.

**Table 12.3 TP(a) and TP(b) thermoplastic rooflights: limitations on use and boundary distance**

Minimum classification on lower surface <sup>(1)</sup>	Space that rooflight can serve	Minimum distance from any point on relevant boundary to rooflight with an external designation <sup>(1)</sup> of:	
		TP(a)	TP(b)
1. TP(a) rigid	Any space except a protected stairway	6m <sup>(2)</sup>	Not applicable
2. TP(b)	a. Balcony, verandah, carport, covered way or loading bay with at least one longer side wholly or permanently open	Not applicable	6m
	b. Detached swimming pool		
	c. Conservatory, garage or outbuilding, with a maximum floor area of 40m <sup>2</sup>		
	d. Circulation space <sup>(3)</sup> (except a protected stairway)	Not applicable	6m <sup>(4)</sup>
	e. Room <sup>(3)</sup>		

**NOTES:**

None of the above designations are suitable for protected stairways.

Polycarbonate and uPVC rooflights that achieve a class C-s3, d2 rating by test (paragraph 12.7) may be regarded as having a B<sub>ROOF</sub>(t4) classification.

Where Diagram 5.2a or 5.2b applies, rooflights should be a minimum of 1500mm from the compartment wall.

If double-skinned or laminate products have upper and lower surfaces of different materials, the greater distance applies.

1. See also the guidance to requirement B2 in section 4.
2. No limit in the case of any space described in 2a, b and c.
3. Single-skinned rooflight only, in the case of non-thermoplastic material.
4. The rooflight should also meet the provisions of diagram 12.1.

## Requirement B5: Access and facilities for the fire service

These sections deal with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
<b>Access and facilities for the fire service</b>	
<b>B5.</b> (1) The building shall be designed and constructed so as to provide reasonable facilities to assist fire fighters in the protection of life.  (2) Reasonable provision shall be made within the site of the building to enable fire appliances to gain access to the building.	

### Intention

Provisions covering access and facilities for the fire service are to safeguard the health and safety of people in and around the **building**. Their extent depends on the size and use of the **building**. Most firefighting is carried out within the **building**. In the Secretary of State's view, requirement B5 is met by achieving all of the following.

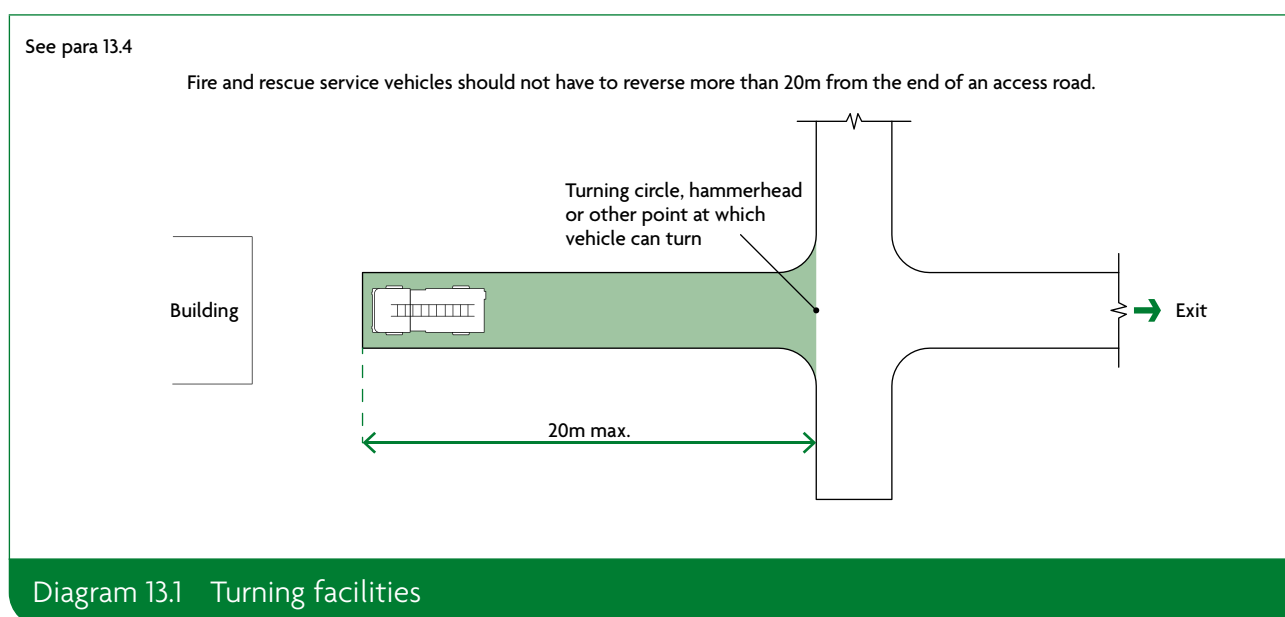
- a. External access enabling fire appliances to be used near the **building**.
- b. Access into and within the **building** for firefighting personnel to both:
  - i. search for and rescue people
  - ii. fight fire.
- c. Provision for internal fire facilities for firefighters to complete their tasks.
- d. Ventilation of heat and smoke from a fire in a basement.

If an alternative approach is taken to providing the **means of escape**, outside the scope of this approved document, additional provisions for firefighting access may be required. Where deviating from the general guidance, it is advisable to seek advice from the fire and rescue service as early as possible (even if there is no statutory duty to consult).

## Section 13: Vehicle access

### Provision and design of access routes and hardstandings

- 13.1** For **dwellinghouses**, access for a pumping appliance should be provided to within 45m of all points inside the **dwellinghouse**.
- 13.2** For **flats**, either of the following provisions should be made.
- Provide access for a pumping appliance to within 45m of all points inside each **flat** of a block, measured along the route of the hose.
  - Provide fire mains in accordance with paragraphs 13.5 and 13.6.
- 13.3** Access routes and hardstandings should comply with the guidance in Table 13.1.
- 13.4** Dead-end access routes longer than 20m require turning facilities, as in Diagram 13.1. Turning facilities should comply with the guidance in Table 13.1.



**Table 13.1 Typical fire and rescue service vehicle access route specification**

Appliance type	Minimum width of road between kerbs (m)	Minimum width of gateways (m)	Minimum turning circle between kerbs (m)	Minimum turning circle between walls (m)	Minimum clearance height (m)	Minimum carrying capacity (tonnes)
Pump	3.7	3.1	16.8	19.2	3.7	12.5
High reach	3.7	3.1	26.0	29.0	4.0	17.0

**NOTES:**

1. Fire appliances are not standardised. The building control body may, in consultation with the local fire and rescue service, use other dimensions.
2. The roadbase can be designed to 12.5 tonne capacity. Structures such as bridges should have the full 17-tonne capacity. The weight of high reach appliances is distributed over a number of axles, so infrequent use of a route designed to accommodate 12.5 tonnes should not cause damage.

## Blocks of flats fitted with fire mains

**13.5** For **buildings** fitted with dry fire mains, both of the following apply.

- a. Access should be provided for a pumping appliance to within 18m of each fire main inlet connection point. Inlets should be on the face of the **building**.
- b. The fire main inlet connection point should be visible from the parking position of the appliance, and satisfy paragraph 14.10.

**13.6** For **buildings** fitted with wet fire mains, access for a pumping appliance should comply with both of the following.

- a. Within 18m, and within sight, of an entrance giving access to the fire main.
- b. Within sight of the inlet to replenish the suction tank for the fire main in an emergency.

## Section 14: Fire mains and hydrants – flats

### Introduction

**14.1** Fire mains are installed for the fire and rescue service to connect hoses for water. They may be either of the following.

- a. The 'dry' type, which are both of the following.
  - i. Normally kept empty.
  - ii. Supplied through a hose from a fire and rescue service pumping appliance.
- b. The 'wet' type, which are both of the following.
  - i. Kept full of water.
  - ii. Supplied by pumps from tanks in the building.

There should be a facility to replenish a wet system from a pumping appliance in an emergency.

### Provision of fire mains

**14.2** Buildings with firefighting shafts should have fire mains provided in both of the following.

- a. The firefighting stairs.
- b. Where necessary, in protected stairways.

The criteria for providing firefighting shafts and fire mains are given in Section 15.

**14.3** Buildings without firefighting shafts should be provided with fire mains where fire service vehicle access is not provided in accordance with paragraph 13.2(a). In these cases, the fire mains should be located within the protected stairway enclosure, with a maximum hose distance of 45m from the fire main outlet to the furthest point inside each flat, measured on a route suitable for laying a hose.

### Design and construction of fire mains

**14.4** The outlets from fire mains should be located within the protected stairway enclosure (see Diagram 15.1).

**14.5** Guidance on the design and construction of fire mains is given in BS 9990.

**14.6** Buildings with a storey more than 50m above fire service vehicle access level should be provided with wet fire mains. In all other buildings where fire mains are provided, either wet or dry fire mains are suitable.

**14.7** Fire service vehicle access to fire mains should be provided as described in paragraphs 13.5 and 13.6.

## Provision of private hydrants

**14.8** A **building** requires additional fire hydrants if both of the following apply.

- a. It has a **compartment** with an area of more than 280m<sup>2</sup>.
- b. It is being erected more than 100m from an existing fire hydrant.

**14.9** If additional hydrants are required, these should be provided in accordance with the following.

- a. For **buildings** provided with fire mains – within 90m of dry fire main inlets.
- b. For **buildings** not provided with fire mains – hydrants should be both of the following.
  - i. Within 90m of an entrance to the **building**.
  - ii. A maximum of 90m apart.

**14.10** Each fire hydrant should be clearly indicated by a plate, fixed nearby in a conspicuous position, in accordance with **BS 3251**.

**14.11** Guidance on aspects of the provision and siting of private fire hydrants is given in **BS 9990**.

## Alternative supply of water

**14.12** An alternative source of water should be supplied where any of the following apply.

- a. No piped water supply is available.
- b. Pressure and flow in the water main are insufficient.
- c. An alternative source of supply is proposed.

**14.13** The alternative source of water supply should be one of the following, subject to consultation with the local fire and rescue service.

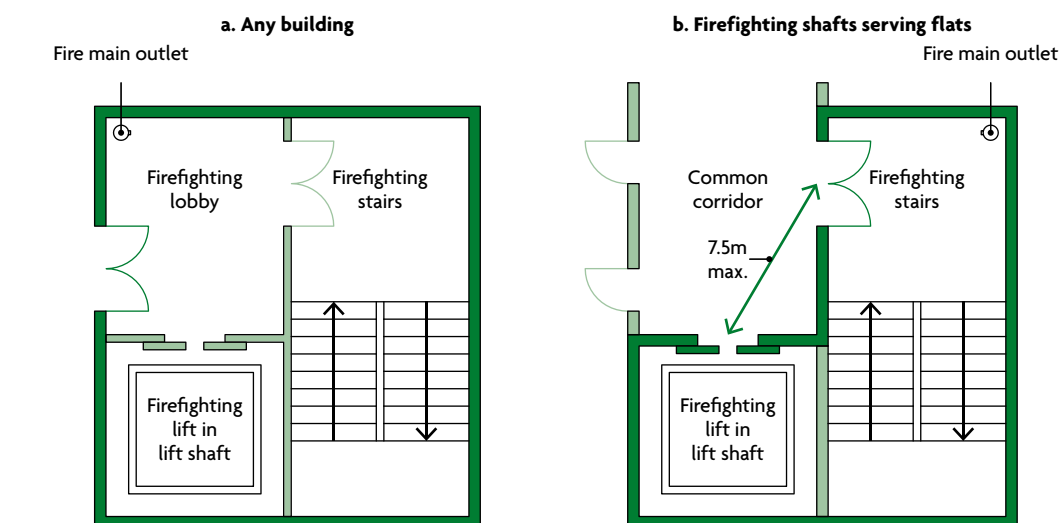
- a. A charged static water tank with a minimum capacity of 45,000 litres.
- b. A spring, river, canal or pond that is capable of fulfilling both of the following conditions.
  - i. Providing or storing a minimum of 45,000 litres of water at all times.
  - ii. Providing access, space and a hardstanding for a pumping appliance.
- c. Any other water supply that the local fire and rescue service considers appropriate.

## Section 15: Access to buildings for firefighting personnel – flats

### Provision of firefighting shafts

- 15.1** In low rise buildings without deep basements, access for firefighting personnel is typically achieved by providing measures for fire service vehicle access in Section 13 and means of escape.
- 15.2** A building with a storey more than 18m above the fire and rescue service vehicle access level should have one or more firefighting shafts, each containing a firefighting lift (Diagram 15.1). The number and location of firefighting shafts should comply with paragraphs 15.4 to 15.7. Firefighting shafts are not required to serve a basement that is not large or deep enough to need one (see paragraph 15.3 and Diagram 15.2).

See paras 15.2, 15.8 and 15.9



#### NOTES:

1. Outlets from a fire main should be located in the firefighting lobby or, in the case of a shaft serving flats, in the firefighting stairway (see Diagram b).
2. Smoke control should be provided in accordance with BS 9999 or, where the firefighting shaft only serves flats, the provisions for smoke control given in paragraph 3.49 may be followed instead.
3. A firefighting lift is required if the building has a floor more than 18m above, or more than 10m below, fire service vehicle access level.
4. This diagram is only to illustrate the basic components and is not meant to represent the only acceptable layout. The firefighting shaft should be constructed generally in accordance with section 6 of BS 9999.
5. For the minimum fire resistance of lift doors see Table C1.

Diagram 15.1 Components of a firefighting shaft

See para 15.2

## Buildings in which firefighting shafts should be provided, showing which storeys need to be served

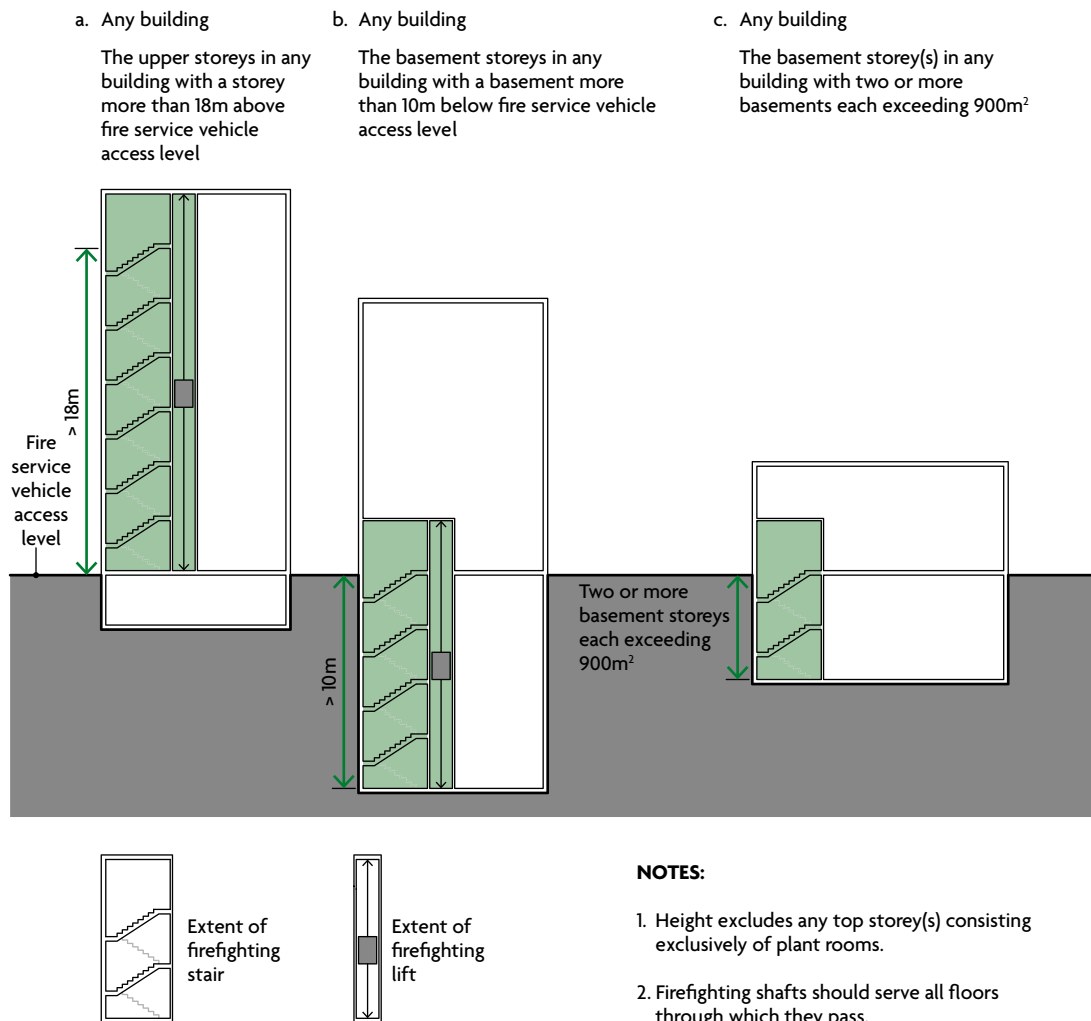
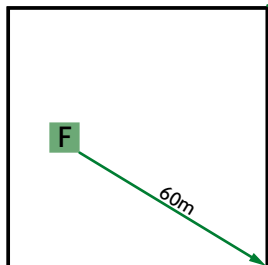


Diagram 15.2 Provision of firefighting shafts

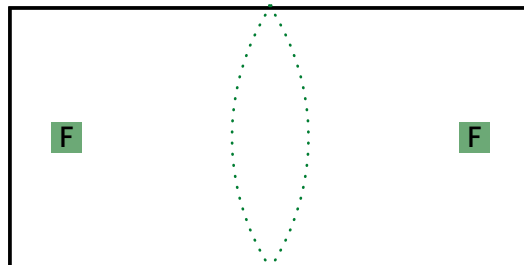
See para 15.7

## With sprinklers

a.

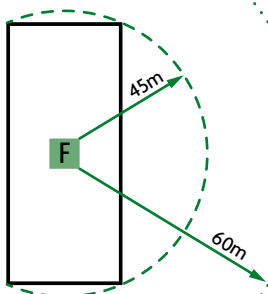


b.



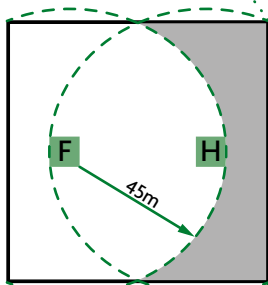
## Without sprinklers

c.

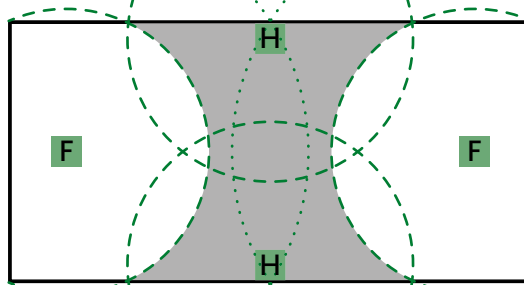


- ..... Floor plan within 60m hose laying distance of fire main outlet
- Floor plan within 45m hose laying distance of fire main outlet
- Hose reach
- F** Fire main outlet in firefighting shaft
- H** Dry or wet fire main
- Additional hose coverage required

d.



e.



### NOTES:

1. Hose laying distance should be measured from the fire main outlet along the route suitable for laying hose. If this route is not known, the distance should be taken at two-thirds of the direct distance
2. The fire main outlet should be located according to Section 14.

Diagram 15.3 Location of firefighting shafts: hose laying distances

**15.3** A building with basement storeys should have firefighting shafts in accordance with the following.

- a. There is a basement more than 10m below the fire and rescue service vehicle access level. The firefighting shafts should contain firefighting lifts.
- b. There are two or more basement storeys, each with a minimum area of 900m<sup>2</sup>. The firefighting shafts do not need to include firefighting lifts.

The building's height and size determine whether firefighting shafts also serve upper storeys.

**15.4** Firefighting shafts should serve all storeys through which they pass.

**15.5** A minimum of two firefighting shafts should be provided to buildings with a storey that has both of the following.

- a. A floor area of 900m<sup>2</sup> or more.
- b. A floor level 18m or more above the fire and rescue service vehicle access level.

**15.6** Firefighting shafts and protected stairways should be positioned such that every part of each storey more than 18m above the fire and rescue service vehicle access level complies with the maximum distances given in paragraph 15.7. Distances should be measured from the fire main outlet on a route suitable for laying a hose.

**NOTE:** If the internal layout is not known, the distance should be measured at two-thirds of the direct distance.

**15.7** In any building, the hose laying distance should meet all of the following conditions.

- a. A maximum of 60m from the fire main outlet in a firefighting shaft (see Diagram 15.3).
- b. Additionally, where sprinklers have not been provided in accordance with Appendix E, the hose laying distance should be a maximum of 45m from a fire main outlet in a protected stairway (although this does not imply that the protected stairway needs to be designed as a firefighting shaft (see Diagram 15.3)).

## Design and construction of firefighting shafts

**15.8** Firefighting stairs and firefighting lifts should be approached from either of the following.

- a. A firefighting lobby.
- b. A protected corridor or protected lobby that complies with the following guidance.
  - i. Means of escape (Section 3).
  - ii. Compartmentation (Section 7).

Both the stair and lobby of the firefighting shaft should be provided with a means of venting smoke and heat (see clause 27.1 of **BS 9999**).

Only services associated with the firefighting shaft, such as ventilation systems and lighting for the firefighting shafts, should pass through or be contained within the firefighting shaft.

Doors of a firefighting lift landing should be a maximum of 7.5m from the door to the firefighting stair (Diagram 15.1).

**15.9** Firefighting shafts should achieve a minimum fire resistance of REI 120. A minimum of REI 60 is acceptable for either of the following (see Diagram 15.1).

- a. Constructions separating the firefighting shaft from the rest of the building.
- b. Constructions separating the firefighting stair, firefighting lift shaft and firefighting lobby.

**15.10** All firefighting shafts should have fire mains with outlet connections and valves at every storey.

**15.11** A firefighting lift installation includes all of the following.

- a. Lift car.
- b. Lift well.
- c. Lift machinery space.
- d. Lift control system.
- e. Lift communications system.

The lift shaft should be constructed in accordance with Section 6 of **BS 9999**.

Firefighting lift installations should conform to **BS EN 81-72** and **BS EN 81-20**.

## Rolling shutters in compartment walls

**15.12** The fire and rescue service should be able to manually open and close rolling shutters without the use of a ladder.

## Wayfinding signage for the fire service

**15.13** To assist the fire service to identify each floor in a block of flats with a top storey more than 11m above ground level (see Diagram D6), floor identification signs and flat indicator signs should be provided.

**15.14** The floor identification signs should meet all of the following conditions.

- a. The signs should be located on every landing of a protected stairway and every protected corridor/lobby (or open access balcony) into which a firefighting lift opens.
- b. The text should be in sans serif typeface with a letter height of at least 50mm. The height of the numeral that designates the floor number should be at least 75mm.
- c. The signs should be visible from the top step of a firefighting stair and, where possible, from inside a firefighting lift when the lift car doors open.
- d. The signs should be mounted between 1.7m and 2m above floor level and, as far as practicable, all the signs should be mounted at the same height.
- e. The text should be on a contrasting background, easily legible and readable in low level lighting conditions or when illuminated with a torch.

**15.15** The wording used on each floor identification sign should take the form Floor X, with X designating the number of the **storey**, as intended for reference by residents. The floor number designations should meet all of the following conditions.

- a. The floor closest to the mean ground level (see Diagram D4) should be designated as either Floor 0 or Ground Floor.
- b. Each floor above the ground floor should be numbered sequentially beginning with Floor 1.
- c. A lower ground floor should be designated as either Floor –1 or Lower Ground Floor.
- d. Each floor below the ground floor should be numbered sequentially beginning with Floor –1 or Basement 1.

**15.16** All floor identification signs should be supplemented by **flat** indicator signs, which provide information relating to the **flats** accessed on each **storey**. The **flat** indicator signs should meet all of the following conditions.

- a. The signs should be sited immediately below the floor identification signs, such that the top edge of the sign is no more than 50mm below the bottom edge of the floor identification sign.
- b. The wording should take the form Flats X–Y, with the lowest **flat** number first.
- c. The text should be in sans serif typeface with a letter height of at least half that of the floor indicator sign.
- d. The wording should be supplemented by arrows when **flats** are in more than one direction.
- e. The text and arrows should be on a contrasting background, easily legible and readable in low level lighting conditions or when illuminated with a torch.

**NOTE:** In the case of multi-storey **flats** with two or more entrances, the **flat** number should only be indicated on the normal access **storey**.

## Section 16: Venting of heat and smoke from basements – flats

### Provision of smoke outlets

- 16.1** Heat and smoke from basement fires vented via stairs can inhibit access for firefighting personnel. This may be reduced by providing smoke outlets, or smoke vents, which allow heat and smoke to escape from the basement levels to the open air. They can also be used by the fire and rescue service to let cooler air into the basements (Diagram 16.1).
- 16.2** Each basement space should have one or more smoke outlets.
- Where this is not practicable (for example, the plan area is deep and the amount of external wall is restricted by adjoining buildings), the perimeter basement spaces may be vented, with other spaces vented indirectly by opening connecting doors. This does not apply for places of special fire hazard (see paragraph 16.7).
- If a basement is compartmented, each compartment should have one or more smoke outlets, rather than indirect venting.
- A basement storey or compartment containing rooms with doors or windows does not need smoke outlets.
- 16.3** Smoke outlets connecting directly to the open air should be provided from every basement storey, except for any basement storey that has both of the following.
- A maximum floor area of 200m<sup>2</sup>.
  - A floor a maximum of 3m below the adjacent ground level.
- 16.4** Strong rooms do not need to be provided with smoke outlets.

### Natural smoke outlets

- 16.5** Smoke outlets should be both of the following.
- Sited at high level in either the ceiling or wall of the space they serve.
  - Evenly distributed around the perimeter, to discharge to the open air.
- 16.6** The combined clear cross-sectional area of all smoke outlets should be a minimum of 1/40 of the area of the floor of the storey they serve.
- 16.7** Separate outlets should be provided from places of special fire hazard.
- 16.8** If the smoke outlet terminates at a point that is not readily accessible, it should be kept unobstructed and covered only with a class A1 grille or louvre.
- 16.9** If the smoke outlet terminates in a readily accessible position, it may be covered by a panel, stallboard or pavement light that can be broken out or opened. The position of covered smoke outlets should be suitably indicated.
- 16.10** Outlets should not be placed where they prevent the use of escape routes from the building.

## Mechanical smoke extract

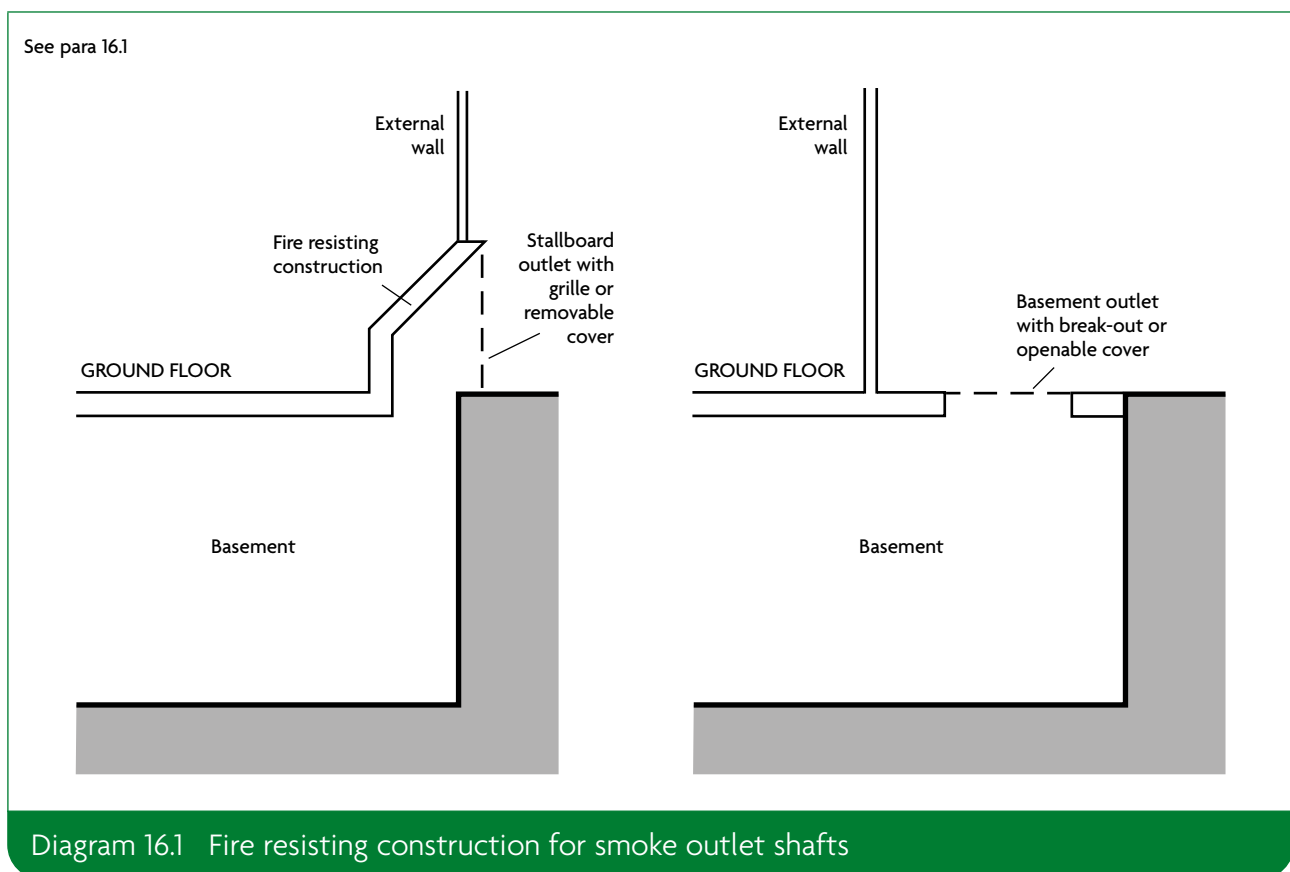
**16.11** If **basement storeys** are fitted with a sprinkler system in accordance with Appendix E, a mechanical smoke extraction system may be provided as an alternative to natural venting. Sprinklers do not need to be installed on the other **storeys** unless needed for other reasons.

Car parks are not normally expected to be fitted with sprinklers (see Section 11 of Approved Document B Volume 2).

**16.12** The air extraction system should comply with all of the following.

- a. It should give at least 10 air changes per hour.
- b. It should be capable of handling gas temperatures of 300°C for not less than one hour.
- c. It should do either of the following.
  - i. Be activated automatically if the sprinkler system activates.
  - ii. Be activated by an automatic fire detection system that conforms to **BS 5839-1** (minimum L3 standard).

Further information on equipment for removing hot smoke is given in **BS EN 12101-3**.



## Construction of outlet ducts or shafts

- 16.13** Outlet ducts or shafts, including any bulkheads over them (see Diagram 16.1), should be enclosed in construction of class A1 rating and **fire resistance** at least equal to that of the element through which they pass.
- 16.14** Natural smoke outlet shafts should be separated from each other using construction of class A1 rating and **fire resistance** at least equal to that of the **storeys** they serve, where the shafts are either of the following.
- From different **compartments** of the same **basement storey**.
  - From different **basement storeys**.

## Regulation 38: Fire safety information

This section deals with the following regulation of the Building Regulations 2010.

### Fire safety information

- 38.** (1) This regulation applies where building work—
- (a) consists of or includes the erection or extension of a relevant building; or
  - (b) is carried out in connection with a relevant change of use of a building,
- and Part B of Schedule 1 imposes a requirement in relation to the work.
- (2) The person carrying out the work shall give fire safety information to the responsible person not later than the date of completion of the work, or the date of occupation of the building or extension, whichever is the earlier.
- (3) In this regulation—
- (a) “fire safety information” means information relating to the design and construction of the building or extension, and the services, fittings and equipment provided in or in connection with the building or extension which will assist the responsible person to operate and maintain the building or extension with reasonable safety;
  - (b) a “relevant building” is a building to which the Regulatory Reform (Fire Safety) Order 2005 applies, or will apply after the completion of building work;
  - (c) a “relevant change of use” is a material change of use where, after the change of use takes place, the Regulatory Reform (Fire Safety) Order 2005 will apply, or continue to apply, to the building; and
  - (d) “responsible person” has the meaning given by article 3 of the Regulatory Reform (Fire Safety) Order 2005.

### Intention

The aim of this regulation is to ensure that the person responsible for the building has sufficient information relating to fire safety to enable them to manage the building effectively. The aim of regulation 38 will be achieved when the person responsible for the building has all the information to enable them to do all of the following.

- a. Understand and implement the fire safety strategy of the building.
- b. Maintain any fire safety system provided in the building.
- c. Carry out an effective fire risk assessment of the building.

## Section 17: Fire safety information

- 17.1** For building work involving the erection or extension of a relevant **building** (i.e. a **building** to which the Regulatory Reform (Fire Safety) Order 2005 applies, or will apply), or the relevant change of use of a **building**, fire safety information should be given to the responsible person at one of the following times.
- When the project is complete.
  - When the **building** or extension is first occupied.
- 17.2** This section is a guide to the information that should be provided. Guidance is in terms of essential information and additional information for complex **buildings**; however, the level of detail required should be considered on a case-by-case basis.

### Essential information

- 17.3** Basic information on the location of fire protection measures may be sufficient. An as-built plan of the **building** should be provided showing all of the following.
- Escape routes** – this should include exit capacity (i.e. the maximum allowable number of people for each **storey** and for the **building**).
  - Location of **fire-separating elements** (including **cavity barriers** in walk-in spaces).
  - Fire doorsets**, **fire doorsets** fitted with a **self-closing device** and other doors equipped with relevant hardware.
  - Locations of fire and/or smoke detector heads, alarm call points, detection/alarm control boxes, alarm sounders, fire safety signage, **emergency lighting**, fire extinguishers, dry or wet fire mains and other firefighting equipment, and hydrants outside the **building**.
  - Any sprinkler systems, including isolating valves and control equipment.
  - Any smoke control systems, or ventilation systems with a smoke control function, including mode of operation and control systems.
  - Any high risk areas (e.g. heating machinery).
- 17.4** Details should be provided of all of the following.
- Specifications of fire safety equipment provided, including routine maintenance schedules.
  - Any assumptions regarding the management of the **building** in the design of the fire safety arrangements.
  - Any provision enabling the evacuation of disabled people, which can be used when designing personal emergency evacuation plans.

## Additional information for complex buildings

**17.5** A detailed record should be provided of both of the following.

- a. The fire safety strategy.
- b. Procedures for operating and maintaining any fire protection measures. This should include an outline cause and effect matrix/strategy for the building.

Further guidance is available in clause 9 and Annex H of **BS 9999**.

**17.6** The records should include details of all of the following.

- a. The fire safety strategy, including all assumptions in the design of the fire safety systems (such as fire load). Any risk assessments or risk analysis.
- b. All assumptions in the design of the fire safety arrangements for the management of the building.
- c. All of the following.
  - i. **Escape routes** (including occupant load and capacity of escape routes).
  - ii. Any provision to enable the evacuation of disabled people.
  - iii. Escape strategy (e.g. simultaneous or phased).
  - iv. Muster points.
- d. All passive fire safety measures, including all of the following.
  - i. Compartmentation (i.e. location of **fire-separating elements**).
  - ii. **Cavity barriers**.
  - iii. **Fire doorsets**, including **fire doorsets** fitted with a **self-closing device** and other doors equipped with relevant hardware (e.g. electronic security locks).
  - iv. Duct dampers.
  - v. Fire shutters.
- e. All of the following.
  - i. Fire detector heads.
  - ii. Smoke detector heads.
  - iii. Alarm call points.
  - iv. Detection/alarm control boxes.
  - v. Alarm sounders.
  - vi. Emergency communications systems.
  - vii. CCTV.
  - viii. Fire safety signage.
  - ix. **Emergency lighting**.
  - x. Fire extinguishers.
  - xi. Dry or wet fire mains and other firefighting equipment.

- xii. Other interior facilities for the fire and rescue service.
- xiii. Emergency control rooms.
- xiv. Location of hydrants outside the **building**.
- xv. Other exterior facilities for the fire and rescue service.
- f. All active fire safety measures, including both of the following.
  - i. Sprinkler system(s) design, including isolating valves and control equipment.
  - ii. Smoke control system(s) (or heating, ventilation and air conditioning system with a smoke control function) design, including mode of operation and control systems.
- g. Any high risk areas (e.g. heating machinery) and particular hazards.
- h. Plans of the **building** as built, showing the locations of the above.
- i. Both of the following.
  - i. Specifications of any fire safety equipment provided, including all of the following.
    - Operational details.
    - Operators' manuals.
    - Software.
    - System zoning.
    - Routine inspection, testing and maintenance schedules.
  - ii. Records of any acceptance or commissioning tests.
- j. Any other details appropriate for the specific **building**.

## Appendix A: Key terms

**NOTE:** Except for the items marked \* (which are from the Building Regulations 2010), these definitions apply only to Approved Document B.

**NOTE:** The terms defined below are key terms used in this document only. Refer to **BS 4422** for further guidance on the definitions of common terms used in the fire safety industry which are not listed below.

**Access room** A room that the only escape route from an inner room passes through.

**Alternative escape routes** Escape routes that are sufficiently separated by direction and space or by fire resisting construction to ensure that one is still available if the other is affected by fire.

**NOTE:** A second stair, balcony or flat roof which enables a person to reach a place free from danger from fire is considered an alternative escape route for the purposes of a dwellinghouse.

**Alternative exit** One of two or more exits, each of which is separate from the other.

**Appliance ventilation duct** A duct to deliver combustion air to a gas appliance.

**Atrium** (plural **atria**) A continuous space that passes through one or more structural floors within a building, not necessarily vertically.

**NOTE:** Enclosed lift wells, enclosed escalator wells, building services ducts and stairs are not classified as atria.

**Automatic release mechanism** A device that normally holds a door open, but closes it automatically if any one of the following occurs.

- Smoke is detected by an automatic device of a suitable nature and quality in a suitable location.
- A hand-operated switch, fitted in a suitable position, is operated.
- The electricity supply to the device, apparatus or switch fails.
- The fire alarm system, if any, is operated.

**Basement storey** A storey with a floor that, at some point, is more than 1200mm below the highest level of ground beside the outside walls. (However, see Appendix B, paragraph B26c, for situations where the storey is considered to be a basement only because of a sloping site.)

**Boundary** The boundary of the land that belongs to a building, or, where the land abuts a road, railway, canal or river, the centre line of that road, railway, canal or river.

**\*Building** Any permanent or temporary building but not any other kind of structure or erection. A reference to a building includes a reference to part of a building.

**Building control body** A term that includes both local authority building control and approved inspectors.

**Cavity** A space enclosed by elements of a building (including a suspended ceiling) or contained within an element, but that *is not* a room, cupboard, circulation space, protected shaft, or space within a flue, chute, duct, pipe or conduit.

**Cavity barrier** A construction within a cavity, other than a smoke curtain, to perform either of the following functions.

- Close a cavity to stop smoke or flame entering.
- Restrict the movement of smoke or flame within a cavity.

**Ceiling** Part of a building that encloses a room, protected shaft or circulation space and is exposed overhead.

**NOTE:** The soffit of a rooflight, but not the frame, is included as part of the surface of the ceiling. An upstand below a rooflight is considered as a wall.

**Circulation space** A space (including a protected stairway) mainly used as a means of access between a room and an exit from the building or compartment.

**Common balcony** A walkway, open to the air on one or more sides, that forms part of the escape route from more than one flat.

**Common stair** An escape stair that serves more than one flat.

**Compartment (fire)** A building or part of a building, comprising one or more rooms, spaces or storeys, that is constructed to prevent the spread of fire to or from another part of the same building or an adjoining building.

**NOTE:** A roof space above the top storey of a compartment is included in that compartment. (See also 'Separated part'.)

**Compartment wall or floor** A fire resisting wall or floor to separate one fire compartment from another.

**NOTE:** Provisions relating to construction are given in Section 7.

**Corridor access** A design of a building containing flats, in which each flat is approached via a common horizontal internal access or circulation space, which may include a common entrance hall.

**Dead end** An area from which escape is possible in one direction only.

**Direct distance** The shortest distance from any point within the floor area to the nearest storey exit, measured within the external enclosures of the building, and ignoring walls, partitions and fittings other than the enclosing walls and partitions to protected stairways.

**\*Dwelling** Includes a dwellinghouse and a flat.

**NOTE:** A dwelling is a unit where one or more people live (whether or not as a sole or main residence) in either of the following situations.

- A single person or people living together as a family.
- A maximum of six people living together as a single household, including where care is provided for residents.

**\*Dwellinghouse** Does not include a flat or a building containing a flat.

**Element of structure** Any of the following.

- A member that forms part of the structural frame of a building, or any other beam or column.
- A loadbearing wall or loadbearing part of a wall.
- A floor.
- A gallery (but *not* a loading gallery, fly gallery, stage grid, lighting bridge, or any gallery provided for similar purposes or for maintenance and repair).
- An external wall.
- A compartment wall (including a wall that is common to two or more buildings).

**NOTE:** However, see the guidance to requirement B3, paragraph 6.2, for a list of structures that are *not* considered to be elements of structure.

**Emergency lighting** Lighting for use when the power supply to the normal lighting fails.

**Escape lighting** The part of the emergency lighting that is provided to ensure that the escape route is illuminated at all material times.

**Escape route** The route along which people can escape from any point in a building to a final exit.

**Evacuation lift** A lift that may be used to evacuate people in a fire.

**Exit passageway** A protected passageway that connects a protected stairway to a final exit.

**NOTE:** Exit passageways should be protected to the same standard as the stairway they serve.

**\*External wall** The external wall of a building includes all of the following.

- Anything located within any space forming part of the wall.
- Any decoration or other finish applied to any external (but not internal) surface forming part of the wall.
- Any windows and doors in the wall.
- Any part of a roof pitched at an angle of more than 70 degrees to the horizontal if that part of the roof adjoins a space within the building to which persons have access, but not access only for the purpose of carrying out repairs or maintenance.

**Final exit** The end of an escape route from a building that gives direct access to a street, passageway, walkway or open space, and is sited to ensure that people rapidly disperse away from the building so that they are no longer in danger from fire and/or smoke.

**NOTE:** Windows are not acceptable as final exits.

**Fire alarm system** Combination of components for giving an audible and/or other perceptible warning of fire.

**Fire damper** A mechanical or intumescent device within a duct or ventilation opening that operates automatically and is designed to resist the spread of fire.

**Fire and smoke damper** A fire damper which, in addition to the performance of the fire damper, resists the spread of smoke.

**Fire doorset** A door or shutter which, together with its frame and furniture as installed in a building, is intended (when closed) to resist the spread of fire and/or gaseous products of combustion and meets specified performance criteria to those ends.

**NOTE:** A fire doorset may have one or more leaves. The term includes a cover or other form of protection to an opening in a fire resisting wall or floor, or in a structure that surrounds a protected shaft. A fire doorset is a complete door assembly, assembled on site or delivered as a completed assembly, consisting of the door frame, leaf or leaves, essential hardware, edge seals and glazing, and any integral side panels or fanlight panels in an associated door screen.

**Firefighting lift** A lift with additional protection and with controls that enable it to be used by the fire and rescue service when fighting a fire. (See Section 15.)

**Firefighting lobby** A protected lobby that provides access from a firefighting stair to the accommodation area and to any associated firefighting lift.

**Firefighting shaft** A protected enclosure that contains a firefighting stair, firefighting lobbies and, if provided, a firefighting lift together with its machine room.

**Firefighting stair** A protected stairway that connects to the accommodation area through only a firefighting lobby.

**Fire resisting (Fire resistance)** The ability of a component or a building to satisfy, for a stated period of time, some or all of the appropriate criteria given in the relevant standard.

**Fire-separating element** A compartment wall, compartment floor, cavity barrier and construction that encloses a protected escape route and/or a place of special fire hazard.

**Fire-stop (Fire-stopping)** A seal provided to close an imperfection of fit or design tolerance between elements or components, to restrict the spread of fire and smoke.

**\*Flat** A flat is a separate and self-contained premises constructed or adapted for use for residential purposes and forming part of a building from some other part of which it is divided horizontally.

**Gallery** A floor or balcony that does not extend across the full extent of a building's footprint and is open to the floor below.

**Habitable room** A room used, or intended to be used, for people to live in (including, for the purposes of Approved Document B Volumes 1 and 2, a kitchen, but not a bathroom).

**Height** (of a building or storey for the purposes of Approved Document B Volumes 1 and 2)

- Height of a building is measured as shown in Appendix D, Diagram D4.
- Height of the floor of the top storey above ground level is measured as shown in Appendix D, Diagram D6.

**Inner room** Room from which escape is possible only by passing through another room (the access room).

**Live/work unit** A flat that is a workplace for people who live there, its occupants, and for people who do not live on the premises.

**Means of escape** Structural means that provide one or more safe routes for people to go, during a fire, from any point in the building to a place of safety.

## Measurement

- Width of a doorway, cubic capacity, area, height of a building and number of storeys are measured as shown in Appendix D, Diagrams D1 to D6.
- Occupant number, travel distance, escape route and stairs are measured as described in Appendix D, paragraphs D1 to D4.

**Notional boundary** A boundary presumed to exist between two buildings on the same site.

**Open spatial planning** The internal arrangement of a building in which more than one storey or level is contained in one undivided volume, e.g. split-level floors. For the purposes of this document there is a distinction between open spatial planning and an atrium space.

**Perimeter** (of a building) The maximum aggregate plan perimeter, found by vertical projection onto a horizontal plane. (See Section 15 of Approved Document B Volume 2.)

**Pipe** Includes pipe fittings and accessories. The definition of 'pipe' *excludes* a flue pipe and a pipe used for ventilating purposes, other than a ventilating pipe for an above-ground drainage system.

**Place of special fire hazard** A room such as any of the following.

- Oil-filled transformer room.
- Switch gear room.
- Boiler room.
- Storage space for fuel or other highly flammable substance(s).
- Room that houses a fixed internal combustion engine.

**Platform floor** (also called an access or raised floor) A floor that is supported by a structural floor, but with an intervening cavity to house services.

**Protected circuit** An electrical circuit that is protected against fire.

**Protected corridor/lobby** A corridor or lobby that is adequately protected from fire in adjoining areas by fire resisting construction.

**Protected entrance hall/landing** A circulation area, consisting of a hall or space in a flat, that is enclosed with fire resisting construction other than an external wall of a building.

**Protected shaft** A shaft that enables people, air or objects to pass from one compartment to another, and which is enclosed with fire resisting construction.

**Protected stairway** A stair that leads to a final exit to a place of safety and that is adequately enclosed with fire resisting construction. Included in the definition is any exit passageway between the foot of the stair and the final exit.

**Purpose group** A classification of a building according to the purpose to which it is intended to be put. (See Table 0.1.)

**Relevant boundary** The boundary or notional boundary that one side of the building faces and/or coincides with, and that is parallel or at an angle of a maximum of 80 degrees to that side of the building.

**Rooflight** A dome light, lantern light, skylight, ridge light, glazed barrel vault or other element to admit daylight through a roof.

**Room** An enclosed space within a building that is not used solely as a circulation space. The term includes not only conventional rooms, but also cupboards that are not fittings and large spaces such as warehouses and auditoria. The term *does not* include cavities such as ducts, ceiling cavities and roof spaces.

**School** A place of education for children between 2 and 19 years old. The term includes nursery schools, primary schools and secondary schools as defined in the Education Act 1996.

**Self-closing device** A device that closes a door, when open at any angle, against a door frame.

**NOTE:** If the door is in a cavity barrier, rising butt hinges (which are different from the self-closing device mentioned above) are acceptable.

**Separated part** (of a building) Part of a building that is separated from another part of the same building by a compartment wall. The wall runs the full height of the part and is in one vertical plane. (See Appendix D, Diagram D5.)

**Sheltered housing** Includes two or more dwellings in the same building or on adjacent sites, designed and constructed as residential accommodation for vulnerable or elderly people who receive, or will receive, a support service.

**Single storey building** A building that consists of a ground storey only. Basements are not counted as storeys in a building (see Appendix D). A separated part that consists of a ground storey only, with a roof to which access is only provided for repair or maintenance, may be treated as a single storey building.

**Site** (of a building) The land occupied by the building, up to the boundaries with land in other ownership.

**\*Specified attachment** Includes any of the following.

- A balcony attached to an external wall.
- A device for reducing heat gain within a building by deflecting sunlight which is attached to an external wall.
- A solar panel attached to an external wall.

**Storey** Includes any of the following.

- Any gallery in an assembly building (purpose group 5).
- Any gallery in any other type of building if its area is more than half that of the space into which it projects.
- A roof, unless it is accessible only for maintenance and repair.

**NOTE:** The building is regarded as a multi-storey building if both of the following apply.

- There is more than one gallery.
- The total aggregate area of all the galleries in one space is more than half the floor area of that space.

**Storey exit** A final exit, or a doorway that gives direct access into a protected stairway, firefighting lobby or external escape route.

**NOTE:** If an institutional building is planned to enable progressive horizontal evacuation, a door in a compartment wall is considered a storey exit for the purposes of requirement B1.

**Suspended ceiling** (fire-protecting) A ceiling suspended below a floor that adds to the fire resistance of the floor.

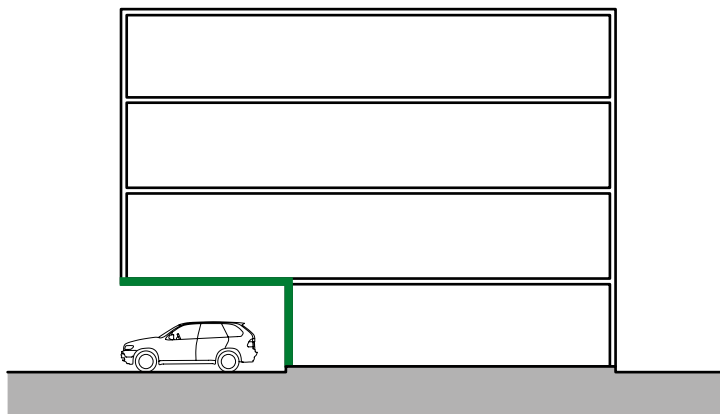
**Thermoplastic material** Any synthetic polymeric material that has a softening point below 200°C if tested to **BS EN ISO 306** Method A120. Specimens for this test may be fabricated from the original polymer where the thickness of material of the end product is less than 2.5mm.

**Travel distance** (unless otherwise specified, e.g. as in the case of flats) The distance that a person would travel from any point within the floor area to the nearest storey exit, determined by the layout of walls, partitions and fittings.

**Unprotected area** (in relation to a side or external wall of a building) All of the following are classed as unprotected areas.

- Any part of the external wall that has less than the relevant fire resistance set out in Section 11.
- Any part of the external wall constructed of material more than 1mm thick if that material does not have a class B-s3, d2 rating or better, which is attached or applied, whether for cladding or any other purpose.
- Windows, doors or other openings. This does not include windows that are designed and glazed to give the necessary level of fire resistance and that are not openable.

**NOTE:** Recessed car parking areas as shown in Diagram A1 should not be regarded as unprotected areas.

**NOTE:**

The parking area should be both of the following:

- a. Open fronted.
- b. Separated from the remainder of the building by a compartment wall(s) and floor(s) having not less than the period of fire resistance specified in Table B4 in Appendix B.

Diagram A1 Recessed car parking areas

# Appendix B: Performance of materials, products and structures

## Introduction

**B1** Much of the guidance in this document is given in terms of performance classifications in relation to British or European Standards. In such cases, it will be necessary to demonstrate that a system or product can meet the relevant performance classification. This will be achieved if the system or product complies with one of the following.

- a. They should be in accordance with a specification or design that has been shown by a specific test to be capable of meeting that performance classification.
- b. They should have been designed by using relevant design standards in order to meet that performance classification.
- c. They should have been assessed by applying relevant test evidence, in lieu of carrying out a specific test, as being capable of meeting that performance classification.

**NOTE:** Some products are subject to Classification Without Further Testing (CWFT). For the purposes of this approved document, such products can be considered to have been shown to be capable of meeting a performance specification as per paragraph B1a.

**B2** Any test evidence used to demonstrate the fire performance classification of a product or system should be carefully checked to ensure that it is applicable to the intended use. Small differences in detail, such as fixing method, joints, dimensions, the introduction of insulation materials and air gaps (ventilated or not), can significantly affect the performance.

**B3** Assessments should not be regarded as a way to avoid a test where one is necessary. Assessments should only be carried out where sufficient relevant test evidence is available. Relevant test evidence is unlikely to be provided by test standards which have different classification criteria.

**B4** Where it is proposed to assess the classification of a product or system in lieu of carrying out a specific test (as in paragraph B1b), this should be done in accordance with the relevant standard for extended application for the test in question and should include details of the test evidence that has been used to support the assessment.

For performance classifications where there is no specific standard for extended application, assessment reports should be produced in accordance with the principles of **BS EN 15725** and should include details of the test evidence that has been used to support the assessment. Further information on best practice is provided in the Passive Fire Protection Federation's *Guide to Undertaking Assessments in Lieu of Fire Tests*.

**NOTE:** Regulation 7(2) limits components used in or on the **external walls** of certain **buildings** to materials achieving class A2-s1, d0 or class A1 (see Section 10). Assessments cannot be used to demonstrate compliance with this requirement.

**B5** Tests and assessments should be carried out by organisations with the necessary expertise. For example, organisations listed as 'notified bodies' in accordance with the European Construction

Products Regulation or laboratories accredited by the United Kingdom Accreditation Service (UKAS) for the relevant test standard can be assumed to have the necessary expertise.

**NOTE:** Standard fire tests do not directly measure fire hazard. They measure or assess the response of a material or system to exposure to one or more aspects of fire conditions. Performance in fire tests is only one of a number of factors that should be taken into account.

## Reaction to fire

- B6** Reaction to fire relates to the degree to which a product will contribute, by its own decomposition, to a fire under specified conditions. Products, other than floorings, are classified as A1, A2, B, C, D, E or F (with class A1 being the highest performance and F being the lowest) in accordance with **BS EN 13501-1**. Class F is assigned when a product fails to attain class E. Untested products cannot be classified in accordance with **BS EN 13501-1**.

Materials covered by the Classification Without Further Testing (CWFT) process can be found by accessing the European Commission's website <https://eur-lex.europa.eu/>.

- B7** The classes of reaction to fire performance of A2, B, C, D and E are accompanied by additional classifications related to the production of smoke (s1, s2, s3), with s1 indicating the lowest production, and/or flaming droplets/particles (d0, d1, d2), with d0 indicating the lowest production.

**NOTE:** When a classification includes s3, d2 this means that there is no limit set for smoke production and/or flaming droplets/particles.

- B8** To reduce the testing burden on manufacturers, **BS EN 13238** defines a number of standard substrates that produce test results representative of different end use applications. The classification for reaction to fire achieved during testing is only valid when the product is used within this field of application, i.e. when the product is fixed to a substrate of that class in its end use. The standard substrate selected for testing should take account of the intended end use applications (field of application) of the product and represent end use substrates that have a density of a minimum of 75% of the standard substrate's nominal density.

- B9** Standard substrates include gypsum plasterboard (**BS EN 520**) with a density of  $700 \pm 100 \text{ kg/m}^3$ , calcium silicate board (**BS EN 14306**)  $870 \pm 50 \text{ kg/m}^3$  and fibre-cement board  $1800 \pm 200 \text{ kg/m}^3$ .

**NOTE:** Standard calcium silicate board is not representative of gypsum plasterboard end use (due to the paper layer), but would be representative of most gypsum plasters (with densities of more than  $650 \text{ kg/m}^3$ ).

**NOTE:** Classifications based on tests using a plasterboard substrate would also be acceptable for products bonded to a gypsum plaster end use substrate.

## National classifications for reaction to fire

- B10** This document uses the European classification system for reaction to fire set out in **BS EN 13501-1**; however, there may be some products lawfully on the market using the classification system set out in previous editions. Where this is the case, Table B1 can be used for the purposes of this document.

**Table B1 Reaction to fire classifications: transposition to national class**

<b>BS EN 13501-1 classification</b>	<b>Transposition</b>
A1	Material that, when tested to <b>BS 476-11</b> , does not either: <ul style="list-style-type: none"> <li>a. flame</li> <li>b. cause a rise in temperature on either the thermocouple at the centre of the specimen or in the furnaces</li> </ul>
A2-s1, d0	None
A2-s3, d2	Material that meets either of the following. <ul style="list-style-type: none"> <li>a. Any material of density 300kg/m<sup>3</sup> or more, which, when tested to <b>BS 476-11</b>, complies with both of the following:               <ul style="list-style-type: none"> <li>i. does not flame</li> <li>ii. causes a rise in temperature on the furnace thermocouple not exceeding 20°C</li> </ul> </li> <li>b. Any material of density less than 300kg/m<sup>3</sup>, which, when tested to <b>BS 476-11</b>, complies with both of the following:               <ul style="list-style-type: none"> <li>i. does not flame for more than 10 seconds</li> <li>ii. causes a rise in temperature on the thermocouple at the centre of the specimen or in the furnace that is a maximum of 35°C and on the furnace thermocouple that is a maximum of 25°C</li> </ul> </li> </ul>
B-s3, d2	Any material that meets both of the following criteria. <ul style="list-style-type: none"> <li>a. Class 1 in accordance with <b>BS 476-7</b>.</li> <li>b. Has a fire propagation index (I) of a maximum of 12 and sub-index (i1) of a maximum of 6, determined by using the method given in <b>BS 476-6</b>. Index of performance (I) relates to the overall test performance, whereas sub-index (i1) is derived from the first three minutes of the test</li> </ul>
C-s3, d2	Class 1 in accordance with <b>BS 476-7</b>
D-s3, d2	Class 3 in accordance with <b>BS 476-7</b>

**NOTE:** The national classifications do not automatically equate with the transposed classifications in the 'BS EN 13501-1 classification' column, therefore products cannot typically assume a European class unless they have been tested accordingly.

**NOTE:** A classification of s3, d2 indicates that no limit is set for production of smoke and/or flaming droplets/particles. If a performance for production of smoke and/or flaming droplets/particles is specified, then only the European classes can be used. For example, a national class may not be used as an alternative to a classification which includes s1, d0.

## Thermoplastic materials

- B11** Thermoplastic material is any synthetic polymeric material that has a softening point below 200°C if tested to **BS EN ISO 306** Method A120. Products formed from these materials cannot always be classified in the normal way. In those circumstances the following approach can be followed.
- B12** Thermoplastic materials used for window glazing, rooflights and lighting diffusers within suspended ceilings do not need to meet the criteria within paragraph B19 onwards, if the guidance to requirements B2 and B4 is followed.

**B13** For the purposes of requirements B2 and B4, **thermoplastic materials** should be classified as TP(a) rigid, TP(a) flexible or TP(b), as follows:

a. **TP(a) rigid**

- i. rigid solid uPVC sheet
- ii. solid (as distinct from double- or multi-skinned) polycarbonate sheet a minimum of 3mm thick
- iii. multi-skinned rigid sheet made from uPVC or polycarbonate that has a class 1 rating when tested to **BS 476-7**
- iv. any other rigid thermoplastic product, a specimen of which (at the thickness of the product as put on the market), when tested to **BS 2782-0** Method 508A, performs so that both:
  - the test flame extinguishes before the first mark
  - the duration of flaming or afterglow does not exceed 5 seconds following removal of the burner.

b. **TP(a) flexible**

Flexible products a maximum of 1mm thick that comply with the Type C requirements of **BS 5867-2** when tested to **BS 5438** Test 2 with the flame applied to the surface of the specimens for 5, 15, 20 and 30 seconds respectively, but excluding the cleansing procedure; and

c. **TP(b)**

- i. rigid solid polycarbonate sheet products a maximum of 3mm thick, or multi-skinned polycarbonate sheet products that do not qualify as TP(a) by test
- ii. other products which, when a specimen of the material between 1.5 and 3mm thick is tested in accordance with **BS 2782-0** Method 508A, have a maximum rate of burning of 50mm/minute.

**NOTE:** If it is not possible to cut or machine a 3mm thick specimen from the product, then a 3mm test specimen can be moulded from the same material as that used to manufacture the product.

**B14** A **thermoplastic material** alone when used as a lining to a wall or **ceiling** cannot be assumed to protect a substrate. The surface rating of both **thermoplastic material** and substrate must therefore meet the required classification.

If, however, the **thermoplastic material** is fully bonded to a non-thermoplastic substrate, then only the surface rating of the composite needs to meet the required classification.

## Roofs

**B15** Performance of the resistance of roofs to external fire exposure is measured in terms of penetration through the roof construction and the spread of flame over its surface.

**B16** Roof constructions are classified within the European system as  $B_{\text{ROOF}}(t4)$ ,  $C_{\text{ROOF}}(t4)$ ,  $D_{\text{ROOF}}(t4)$ ,  $E_{\text{ROOF}}(t4)$  or  $F_{\text{ROOF}}(t4)$  in accordance with **BS EN 13501-5**.  $B_{\text{ROOF}}(t4)$  indicates the highest performance and  $F_{\text{ROOF}}(t4)$  the lowest.

**B17** **BS EN 13501-5** refers to four separate roof tests. The suffix (t4) used in paragraph B16 indicates that Test 4 is to be used for the purposes of this approved document.

- B18** This document uses the European classification system for roof covering set out in **BS EN 13501-5**; however, there may be some products lawfully on the market using the classification system set out in previous editions. Where this is the case, Table B2 can be used for the purposes of this document.

**Table B2 Roof covering classifications: transposition to national class**

BS EN 13501-5 classification	Transposition to BS 476-3 classification
B <sub>ROOF</sub> (t4)	AA, AB or AC
C <sub>ROOF</sub> (t4)	BA, BB or BC
D <sub>ROOF</sub> (t4)	CA, CB or CC
E <sub>ROOF</sub> (t4)	AD, BD or CD
F <sub>ROOF</sub> (t4)	DA, DB, DC or DD

**NOTE:** The national classifications do not automatically equate with the transposed classifications in the European column, therefore products cannot typically assume a European class unless they have been tested accordingly.

## Fire resistance

- B19** Common to all of the provisions of Part B of the Building Regulations is the property of **fire resistance**. **Fire resistance** is a measure of one or more of the following.
- Resistance to collapse** (loadbearing capacity), which applies to loadbearing elements only, denoted R in the European classification of the resistance to fire performance.
  - Resistance to fire penetration** (integrity), denoted E in the European classification of the resistance to fire performance.
  - Resistance to the transfer of excessive heat** (insulation), denoted I in the European classification of the resistance to fire performance.
- B20** The standards of **fire resistance** necessary for a particular **building** are based on assumptions about the severity of fires and the consequences should an element fail. Fire severity is estimated in very broad terms from the use of the **building** (its **purpose group**), on the assumption that the building contents (which constitute the fire load) are similar for **buildings** with the same use.
- B21** Because the use of **buildings** may change, a precise estimate of fire severity based on the fire load due to a particular use may be misleading. Therefore if a fire engineering approach of this kind is adopted, the likelihood that the fire load may change in the future needs to be considered.
- B22** Performance in terms of the **fire resistance** to be achieved by **elements of structure**, doors and other forms of construction is classified in accordance with one of the following.
- BS EN 13501-2.**
  - BS EN 13501-3.**
  - BS EN 13501-4.**
- B23** **Fire resistance** is measured in minutes. This relates to time elapsed in a standard test and should not be confused with real time.
- B24** The **fire resistance** necessary for different circumstances is set out in the following tables.

- a. Table B3 gives the specific requirements for each **element of structure**.
- b. Table B4 sets out the minimum periods of **fire resistance** for **elements of structure**.
- c. Table B5 sets out limitations on the use of uninsulated **fire resisting** glazed elements.

**B25** This document uses the European classification system for **fire resistance** set out in **BS EN 13501-2** to **4**; however, there may be some products lawfully on the market using the classification system set out in previous editions. In those situations the equivalent classifications given in Table B1 can be used.

**Table B3 Specific provisions of the test for fire resistance of elements of structure, etc.**

Part of building	Minimum provisions when tested to the relevant European standard (minutes) <sup>(1)</sup>	Alternative minimum provisions when tested to the relevant part of <b>BS 476</b> <sup>(2)</sup> (minutes)			Type of exposure
		Loadbearing capacity <sup>(3)</sup>	Integrity	Insulation	
1. <b>Structural</b> frame, beam or column.	R see Table B4	See Table B4	Not applicable	Not applicable	Exposed faces
2. <b>Loadbearing wall</b> (which is not also a wall described in any of the following items).	R see Table B4	See Table B4	Not applicable	Not applicable	Each side separately
3. <b>Floors</b> <sup>(4)</sup>					
a. between a shop and flat above	REI 60 or see Table B4 (whichever is greater)	60 min or see Table B4 (whichever is greater)	60 min or see Table B4 (whichever is greater)	60 min or see Table B4 (whichever is greater)	From underside <sup>(5)</sup>
b. in upper storey of two storey dwellinghouse (but not over garage or basement)	R 30 and REI 15	30 min	15 min	15 min	From underside <sup>(5)</sup>
c. any other floor – including compartment floors.	REI see Table B4	See Table B4	See Table B4	See Table B4	From underside <sup>(5)</sup>
4. <b>Roofs</b>					
a. any part forming an escape route	REI 30	30 min	30 min	30 min	From underside <sup>(5)</sup>
b. any roof that performs the function of a floor.	REI see Table B4	See Table B4	See Table B4	See Table B4	From underside <sup>(5)</sup>

Table B3 Continued

Part of building	Minimum provisions when tested to the relevant European standard (minutes) <sup>(1)</sup>	Alternative minimum provisions when tested to the relevant part of <b>BS 476</b> <sup>(2)</sup> (minutes)			Type of exposure
		Loadbearing capacity <sup>(3)</sup>	Integrity	Insulation	
<b>5. External walls</b>					
a. any part a maximum of 1000mm from any point on the relevant boundary <sup>(6)</sup>	REI see Table B4	See Table B4	See Table B4	See Table B4	Each side separately
b. any part a minimum of 1000mm from the relevant boundary <sup>(6)</sup>	RE see Table B4 and REI 15	See Table B4	See Table B4	15 min	From inside the building
c. any part beside an external escape route (Section 2, Diagram 2.7 and Section 3, Diagram 3.11).	RE 30	30 min	30 min	No provision <sup>(7) (8)</sup>	From inside the building
<b>6. Compartment walls</b> Separating either:					
a. a flat from any other part of the building (see paragraph 7.1)	REI 60 or see Table B4 (whichever is less)	60 min or see Table B4 (whichever is less)	60 min or see Table B4 (whichever is less)	60 min or see Table B4 (whichever is less)	Each side separately
b. occupancies.	REI 60 or see Table B4 (whichever is less)	60 min or see Table B4 (whichever is less)	60 min or see Table B4 (whichever is less)	60 min or see Table B4 (whichever is less)	Each side separately
<b>7. Compartment walls</b> (other than in item 6 or item 10).	REI see Table B4	See Table B4	See Table B4	See Table B4	Each side separately
<b>8. Protected shafts</b> Excluding any firefighting shaft:					
a. any glazing	E 30	Not applicable	30 min	No provision <sup>(8)</sup>	Each side separately
b. any other part between the shaft and a protected lobby/corridor	REI 30	30 min	30 min	30 min	Each side separately
c. any part not described in (a) or (b) above.	REI see Table B4	See Table B4	See Table B4	See Table B4	Each side separately

Table B3 Continued

Part of building	Minimum provisions when tested to the relevant European standard (minutes) <sup>(1)</sup>	Alternative minimum provisions when tested to the relevant part of <b>BS 476</b> <sup>(2)</sup> (minutes)			Type of exposure
		Loadbearing capacity <sup>(3)</sup>	Integrity	Insulation	
9. <b>Enclosure</b> (that does not form part of a compartment wall or a protected shaft) to a:					
a. protected stairway	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	Each side separately
b. lift shaft.	REI 30	30 min	30 min	30 min	Each side separately
10. <b>Wall or floor</b> separating an attached or integral garage from a dwellinghouse	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	From garage side
11. <b>Fire resisting construction in dwellinghouses</b> not described elsewhere	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	Each side separately
12. <b>Firefighting shafts</b>	REI 120	120 min	120 min	120 min	From side remote from shaft
a. construction that separates firefighting shaft from rest of building	REI 60	60 min	60 min	60 min	From shaft side
b. construction that separates firefighting stair, firefighting lift shaft and firefighting lobby.	REI 60	60 min	60 min	60 min	Each side separately
13. <b>Enclosure</b> (that is not a compartment wall or described in item 8) to a:					
a. protected lobby	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	Each side separately
b. protected corridor.	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	Each side separately
14. <b>Sub-division of a corridor</b>	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	Each side separately

Table B3 Continued

Part of building	Minimum provisions when tested to the relevant European standard (minutes) <sup>(1)</sup>	Alternative minimum provisions when tested to the relevant part of BS 476 <sup>(2)</sup> (minutes)			Type of exposure
		Loadbearing capacity <sup>(3)</sup>	Integrity	Insulation	
<b>15. Fire resisting construction</b>					
a. construction that encloses places of special fire hazard	REI 30	30 min	30 min	30 min	Each side separately
b. construction between store rooms and sales area in shops	REI 30	30 min	30 min	30 min	Each side separately
c. fire resisting sub-division	REI 30	30 min	30 min	30 min	Each side separately
d. construction that encloses bedrooms and ancillary accommodation in care homes.	REI 30	30 min	30 min	30 min	Each side separately
<b>16. Enclosure</b> in a flat to a protected entrance hall, or to a protected landing.	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	Each side separately
<b>17. Cavity barrier</b>	E 30 and EI 15	Not applicable	30 min	15 min	Each side separately
<b>18. Ceiling</b> see paragraph 2.5 and Diagram 2.3; paragraph 8.5 and Diagram 8.3.	EI 30	Not applicable	30 min	30 min	From underside
<b>19. Duct</b> described in paragraph 5.24e.	E 30	Not applicable	30 min	No provision	From outside
<b>20. Casing</b> around a drainage system described in Diagram 9.1.	E 30	Not applicable	30 min	No provision	From outside
<b>21. Flue walls</b> described in Diagram 9.5.	EI half the period given in Table B4 for the compartment wall/floor	Not applicable	Half the period given in Table B4 for the compartment wall/floor	Half the period given in Table B4 for the compartment wall/floor	From outside

Table B3 Continued

Part of building	Minimum provisions when tested to the relevant European standard (minutes) <sup>(1)</sup>	Alternative minimum provisions when tested to the relevant part of <b>BS 476</b> <sup>(2)</sup> (minutes)			Type of exposure
		Loadbearing capacity <sup>(3)</sup>	Integrity	Insulation	
22. <b>Construction</b> described in note (a) to paragraph 12.9.	EI 30	Not applicable	30 min	30 min	From underside
23. <b>Fire doorsets</b>	See Table C1	See Table C1			See Appendix C

**NOTES:**

- BS EN 13501-2** Classification using data from fire resistance tests, excluding ventilation services. **BS EN 13501-3** Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers. **BS EN 13501-4** Classification using data from fire resistance tests on components of smoke control systems.  
In the European classification:  
'R' is the resistance to fire in terms of loadbearing capacity.  
'E' is the resistance to fire in terms of integrity.  
'I' is the resistance to fire in terms of insulation.  
The national classifications do not automatically equate with the alternative classifications in the European column, therefore products cannot typically assume a European class unless they have been tested accordingly.
- BS 476-20** for general principles, **BS 476-21** for loadbearing elements, **BS 476-22** for non-loadbearing elements, **BS 476-23** for fire-protecting suspended ceilings and **BS 476-24** for ventilation ducts.
- Applies to loadbearing elements only (see paragraph B19).
- Guidance on increasing the fire resistance of existing timber floors is given in BRE Digest 208.
- Only if a suspended ceiling meets the appropriate provisions should it be relied on to add to the fire resistance of the floor.
- Such walls may contain areas that do not need to be fire resisting (unprotected areas). See Section 11.
- Unless needed as part of a wall in item 5a or 5b.
- Except for any limitations on uninsulated glazed elements given in Table B5.

**Table B4 Minimum periods of fire resistance**

Purpose group of building	Minimum periods of fire resistance <sup>(1)</sup> (minutes) in a:						
	Basement storey* including floor over		Ground or upper storey				
	Depth (m) of the lowest basement		Height (m) of top floor above ground, in a building or separated part of a building				
	More than 10	Up to 10	Up to 5	Up to 11	Up to 18	Up to 30	More than 30
1. Residential:							
a. Block of flats							
– without sprinkler system	90 min	60 min	30 min <sup>†</sup>	60 min <sup>‡</sup>	Not permitted <sup>(2)</sup>	Not permitted <sup>(2)</sup>	Not permitted <sup>(2)</sup>
– with sprinkler system <sup>(3)</sup>	90 min	60 min	30 min <sup>†</sup>	60 min <sup>‡</sup>	60 min <sup>‡</sup>	90 min <sup>‡</sup>	120 min <sup>‡</sup>
b. and c. Dwellinghouse	Not applicable <sup>(4)</sup>	30 min <sup>†</sup>	30 min <sup>†</sup>	60 min <sup>(5)</sup>	60 min <sup>(5)</sup>	Not applicable <sup>(4)</sup>	Not applicable <sup>(4)</sup>
2. Residential							
a. Institutional	90 min	60 min	30 min <sup>†</sup>	60 min	60 min	90 min	120 min <sup>†</sup>
b. Other residential	90 min	60 min	30 min <sup>†</sup>	60 min	60 min	90 min	120 min <sup>†</sup>
3. Office:							
– without sprinkler system	90 min	60 min	30 min <sup>†</sup>	60 min	60 min	90 min	Not permitted <sup>(6)</sup>
– with sprinkler system <sup>(3)</sup>	60 min	60 min	30 min <sup>†</sup>	30 min <sup>†</sup>	30 min <sup>†</sup>	60 min	120 min <sup>†</sup>
4. Shop and commercial:							
– without sprinkler system	90 min	60 min	60 min	60 min	60 min	90 min	Not permitted <sup>(6)</sup>
– with sprinkler system <sup>(3)</sup>	60 min	60 min	30 min <sup>†</sup>	60 min	60 min	60 min	120 min <sup>†</sup>
5. Assembly and recreation:							
– without sprinkler system	90 min	60 min	60 min	60 min	60 min	90 min	Not permitted <sup>(6)</sup>
– with sprinkler system <sup>(3)</sup>	60 min	60 min	30 min <sup>†</sup>	60 min	60 min	60 min	120 min <sup>†</sup>
6. Industrial:							
– without sprinkler system	120 min	90 min	60 min	90 min	90 min	120 min	Not permitted <sup>(6)</sup>
– with sprinkler system <sup>(3)</sup>	90 min	60 min	30 min <sup>†</sup>	60 min	60 min	90 min	120 min <sup>†</sup>
7. Storage and other non-residential:							
a. any building or part not described elsewhere:							
– without sprinkler system	120 min	90 min	60 min	90 min	90 min	120 min	Not permitted <sup>(6)</sup>
– with sprinkler system <sup>(3)</sup>	90 min	60 min	30 min <sup>†</sup>	60 min	60 min	90 min	120 min <sup>†</sup>

Table B4 Continued

Purpose group of building	Minimum periods of fire resistance <sup>(1)</sup> (minutes) in a:						
	Basement storey* including floor over		Ground or upper storey				
	Depth (m) of the lowest basement		Height (m) of top floor above ground, in a building or separated part of a building				
	More than 10	Up to 10	Up to 5	Up to 11	Up to 18	Up to 30	More than 30
b. car park for light vehicles:							
i. open sided car park <sup>(7)</sup>	Not applicable	Not applicable	15 min <sup>†#</sup>	15 min <sup>†#(8)</sup>	15 min <sup>†#(8)</sup>	15 min <sup>†#(8)</sup>	60 min
ii. any other car park	90 min	60 min	30 min <sup>†</sup>	60 min	60 min	90 min	120 min <sup>†</sup>

**NOTES:**

For single storey buildings, the periods under the heading 'Up to 5' apply. If single storey buildings have basements, for the basement storeys the period appropriate to their depth applies.

\* For the floor over a basement or, if there is more than one basement, the floor over the topmost basement, the higher of the period for the basement storey and the period for the ground or upper storey applies.

† For compartment walls that separate buildings, the period is increased to a minimum of 60 minutes.

+ For any floor that does not contribute to the support of the building within a flat of more than one storey, the period is reduced to 30 minutes.

§ For flat conversions, refer to paragraphs 6.5 to 6.7 regarding the acceptability of 30 minutes.

‡ For elements that do not form part of the structural frame, the period is reduced to 90 minutes.

# For elements that protect the means of escape, the period is increased to 30 minutes.

1. Refer to note 1, Table B3 for the specific provisions of test.

2. Blocks of flats with a top storey more than 11m above ground level (see Diagram D6) should be fitted with a sprinkler system in accordance with Appendix E.

**NOTE:** Sprinklers should be provided within the individual flats, they do not need to be provided in the common areas such as stairs, corridors or landings when these areas are fire sterile.

3. 'With sprinkler system' means that the building is fitted throughout with an automatic sprinkler system in accordance with Appendix E.

4. Very large (with a top storey more than 18m above ground level or with a 10m deep basement) or unusual dwellinghouses are outside the scope of the guidance provided with regard to dwellinghouses.

5. A minimum of 30 minutes in the case of three storey dwellinghouses, increased to 60 minutes minimum for compartment walls separating buildings.

6. Buildings within the 'office', 'shop and commercial', 'assembly and recreation', 'industrial' and 'storage and other non-residential' (except car parks for light vehicles) purpose groups (purpose groups 3 to 7(a)) require sprinklers where there is a top storey more than 30m above ground level.

7. The car park should comply with the relevant provisions in the guidance on requirement B3, Section 11 of Approved Document B Volume 2.

8. For the purposes of meeting the Building Regulations, the following types of steel elements are deemed to have satisfied the minimum period of fire resistance of 15 minutes when tested to the European test method.

i. Beams supporting concrete floors, maximum  $H_p/A=230\text{m}^{-1}$  operating under full design load.

ii. Free-standing columns, maximum  $H_p/A=180\text{m}^{-1}$  operating under full design load.

iii. Wind bracing and struts, maximum  $H_p/A=210\text{m}^{-1}$  operating under full design load.

Guidance is also available in **BS EN 1993-1-2**.

## Application of the fire resistance standards in Table B4

**B26** The following guidance should be used when applying the fire resistance standards in Table B4.

- a. If one element of structure supports or carries or gives stability to another, the fire resistance of the supporting element should be no less than the minimum period of fire resistance for the other element (whether that other element is loadbearing or not). In some circumstances, it may be reasonable to vary this principle, for example:
  - i. if the supporting structure is in the open air and is not likely to be affected by the fire in the building
  - ii. if the supporting structure is in a different compartment, with a fire-separating element (that has the higher standard of fire resistance) between the supporting and the separated structure
  - iii. if a plant room on the roof needs greater fire resistance than the elements of structure that support it.
- b. If an element of structure forms part of more than one building or compartment, that element should be constructed to the standard of the higher of the relevant provisions.
- c. If, due to the slope of the ground, one side of a basement is open at ground level (allowing smoke to vent and providing access for firefighting) for elements of structure in that storey it may be appropriate to adopt the standard of fire resistance that applies to above-ground structures.
- d. Although most elements of structure in a single storey building may not need fire resistance, fire resistance is needed if one of the following applies to the element.
  - i. It is part of, or supports, an external wall, and there is provision in the guidance on requirement B4 to limit the extent of openings and other unprotected areas in the wall.
  - ii. It is part of, or supports, a compartment wall, including a wall that is common to two or more buildings.
  - iii. It supports a gallery.

**B27** For the purposes of this paragraph, the ground storey of a building that has one or more basement storeys and no upper storeys may be considered as a single storey building. The fire resistance of the basement storeys should be that specified for basements.

**Table B5 Limitations on the use of uninsulated glazed elements on escape routes. These limitations *do not* apply to glazed elements that satisfy the relevant insulation criterion, see Table B3**

Position of glazed element	Maximum total glazed area in parts of a building with access to:			
	A single stair		More than one stair	
	Walls	Door leaf	Walls	Door leaf
<b>Flats</b>				
1. Within the enclosures of a protected entrance hall or protected landing, or within fire resisting separation shown in Section 3, Diagram 3.4.	Fixed fanlights only	Unlimited above 1100mm from floor	Fixed fanlights only	Unlimited above 1100mm from floor
<b>Dwellinghouses</b>				
2. Within either: a. the enclosures of a protected stairway b. fire resisting separation shown in Diagram 2.2.	Unlimited above 1100mm from floor or pitch of the stair	Unlimited	Unlimited above 1100mm from floor or pitch of the stair	Unlimited
3. Within fire resisting separation either: a. shown in Diagram 2.4 b. described in paragraph 2.16b.	Unlimited above 100mm from floor	Unlimited above 100mm from floor	Unlimited above 100mm from floor	Unlimited above 100mm from floor
4. Existing window between an attached/ integral garage and the dwellinghouse.	Unlimited	Not applicable	Unlimited	Not applicable
5. Adjacent to an external escape stair (see paragraph 2.17 and Diagram 2.7) or roof escape route (see paragraph 2.13).	Unlimited	Unlimited	Unlimited	Unlimited
<b>General (except dwellinghouses)</b>				
6. Between residential/sleeping accommodation and a common escape route (corridor, lobby or stair).	Nil	Nil	Nil	Nil
7. Between a protected stairway <sup>(1)</sup> and either: a. the accommodation b. a corridor that <i>is not</i> a protected corridor <i>other than in item 6 above</i> .	Nil	25% of door area	Unlimited above 1100mm <sup>(2)</sup>	50% of door area
8. Between either: a. a protected stairway <sup>(1)</sup> and a protected lobby or protected corridor b. accommodation and a protected lobby <i>other than in item 6 above</i> .	Unlimited above 1100mm from floor	Unlimited above 100mm from floor	Unlimited above 100mm from floor	Unlimited above 100mm from floor
9. Between the accommodation and a protected corridor that forms a dead end, <i>other than in item 6 above</i> .	Unlimited above 1100mm from floor	Unlimited above 100mm from floor	Unlimited above 1100mm from floor	Unlimited above 100mm from floor
10. Between accommodation and any other corridor, or sub-dividing corridors, <i>other than in item 6 above</i> .	Not applicable	Not applicable	Unlimited above 100mm from floor	Unlimited above 100mm from floor
11. Beside an external escape route.	Unlimited above 1100mm from floor	Unlimited above 1100mm from floor	Unlimited above 1100mm from floor	Unlimited above 1100mm from floor

**Table B5 Continued**

Position of glazed element	Maximum total glazed area in parts of a building with access to:			
	A single stair		More than one stair	
	Walls	Door leaf	Walls	Door leaf
12. Beside an external escape stair (see paragraph 3.68 and Diagram 3.11) or roof escape route (see paragraph 3.30).	Unlimited	Unlimited	Unlimited	Unlimited

**NOTES:**

Items 1 and 8 apply also to single storey buildings.

Fire resisting glass should be marked with the name of the manufacturer and the name of the product.

Further guidance can be found in *A Guide to Best Practice in the Specification and Use of Fire-resistant Glazed Systems* published by the Glass and Glazing Federation.

1. If the protected stairway is also a protected shaft or a firefighting stair (see Section 15), there may be further restrictions on the use of glazed elements.
2. Measured vertically from the landing floor level or the stair pitch line.
3. The 100mm limit is intended to reduce the risk of fire spreading from a floor covering.

## Appendix C: Fire doorsets

- C1** All **fire doorsets** should have the performance shown in Table C1, based on one of the following.
- Fire resistance** in terms of integrity, for a period of minutes, when tested to **BS 476-22**, e.g. FD 30. A suffix (S) is added for doorsets where restricted smoke leakage at ambient temperatures is needed.
  - As determined with reference to Commission Decision 2000/367/EC regarding the classification of the resistance to fire performance of construction products, construction works and parts thereof. All **fire doorsets** should be classified in accordance with **BS EN 13501-2**, tested to the relevant European method from the following.
    - BS EN 1634-1.**
    - BS EN 1634-2.**
    - BS EN 1634-3.**
  - As determined with reference to European Parliament and Council Directive 95/16/EC (which applies to lifts that permanently serve **buildings** and constructions and specified safety components) on the approximation of laws of Member States relating to lifts ('Lifts Directive') implementing the Lifts Regulations 1997 (SI 1997/831) and calling upon the harmonised standard **BS EN 81-58**.
- C2** The performance requirement is in terms of integrity (E) for a period of minutes. An additional classification of  $S_a$  is used for all doors where restricted smoke leakage at ambient temperatures is needed.
- C3** The requirement is for test exposure from each side of the doorset separately. The exception is lift doors, which are tested from the landing side only.
- C4** Any test evidence used to verify the **fire resistance** rating of a doorset or shutter should be checked to ensure both of the following.
- It adequately demonstrates compliance.
  - It is applicable to the **complete installed assembly**. Small differences in detail may significantly affect the rating.
- Until relevant harmonised product standards are published, for the purposes of meeting the Building Regulations, products tested in accordance with **BS EN 1634-1** (with or without pre-fire test mechanical conditioning) that achieve the minimum performance in Table C1 will be deemed to satisfy the provisions.
- C5** All **fire doorsets**, including to **flat** entrances and between a **dwellinghouse** and an integral garage, should be fitted with a **self-closing device**, except for all of the following.
- Fire doorsets** to cupboards.
  - Fire doorsets** to service ducts normally locked shut.
  - Fire doorsets** within **flats** and **dwellinghouses**.

- C6** If a **self-closing device** would be considered to interfere with the normal approved use of the **building**, self-closing fire doors may be held open by one of the following.
- A fusible link, but not if the doorset is in an opening provided as a **means of escape** unless it complies with paragraph C7.
  - An **automatic release mechanism** activated by an automatic fire detection and alarm system.
  - A door closer delay device.
- C7** Two **fire doorsets** may be fitted in the same opening if each door is capable of closing the opening, so the total **fire resistance** is the sum of their individual resistances. If the opening is provided as a **means of escape**, both **fire doorsets** should be self-closing.
- If one **fire doorset** is capable of being easily opened by hand and has a minimum of 30 minutes' **fire resistance**, the other **fire doorset** should comply with both of the following.
- Be fitted with an automatic **self-closing device**.
  - Be held open by a fusible link.
- C8** **Fire doorsets** often do not provide any significant insulation. Unless providing both integrity and insulation in accordance with Appendix B, Table B3, a maximum of 25% of the length of a **compartment wall** should consist of door openings.
- Where it is practicable to maintain a clear space on both sides of the doorway, the above percentage may be greater.
- C9** Rolling shutters should be capable of manual opening and closing for firefighting purposes (see Section 15). Rolling shutters across a **means of escape** should only be released by a heat sensor, such as a fusible link or electric heat detector, in the immediate vicinity of the door.
- Unless a shutter is also intended to partially descend as part of a **boundary** to a smoke reservoir, shutters across a **means of escape** should not be closed by smoke detectors or a **fire alarm system**.
- C10** Unless shown to be satisfactory when tested as part of a **fire doorset** assembly, the essential components of any hinge on which a fire door is hung should be made entirely from materials that have a minimum melting point of 800°C.
- C11** Except for doorsets listed in paragraph C12, all **fire doorsets** should be marked with one of the following fire safety signs, complying with **BS 5499-5**, as appropriate.
- To be kept closed when not in use – mark 'Fire door keep shut'.
  - To be kept locked when not in use – mark 'Fire door keep locked shut'.
  - Held open by an **automatic release mechanism** or free swing device – mark 'Automatic fire door keep clear'.
- All **fire doorsets** should be marked on both sides, except **fire doorsets** to cupboards and service ducts, which should be marked on the outside.
- C12** The following **fire doorsets** are not required to comply with paragraph C11.
- Doors to and within **flats** and **dwellinghouses**.
  - Bedroom doors in 'residential (other)' (**purpose group 2(b)**) premises.
  - Lift entrance/landing doors.

**C13** The performance of some doorsets set out in Table C1 is linked to the minimum periods of **fire resistance** for **elements of structure** given in Tables B3 and B4. Limitations on the use of uninsulated glazing in **fire doorsets** are given in Table B5.

**C14** Recommendations for the specification, design, construction, installation and maintenance of **fire doorsets** constructed with non-metallic door leaves are given in **BS 8214**.

Guidance on timber **fire resisting doorsets**, in relation to the new European test standard, may be found in *Timber Fire Resisting Doorsets: Maintaining Performance Under the New European Test Standard* published by the Timber Research and Development Association (TRADA).

Guidance for metal doors is given in *Code of Practice for Fire Resisting Metal Doorsets* published by the Door and Shutter Manufacturers' Association (DSMA).

**C15** Hardware used on fire doors can significantly affect their performance in a fire. Notwithstanding the guidance in this approved document, guidance is available in *Hardware for Fire and Escape Doors* published by the Door and Hardware Federation (DHF) and Guild of Architectural Ironmongers (GAI).

**Table C1 Provisions for fire doorsets**

Position of door	Minimum fire resistance of door in terms of integrity (minutes) when tested to the relevant European standard <sup>(1)</sup>	Minimum fire resistance of door in terms of integrity (minutes) when tested to <b>BS 476-22</b>
1. <b>In a compartment wall separating buildings</b>	Same as for the wall in which the door is fitted, but a minimum of 60 minutes	Same as for the wall in which the door is fitted, but a minimum of 60 minutes
2. <b>In a compartment wall:</b>		
a. if it separates a flat from a space in common use	E 30 S <sub>a</sub> <sup>(2)</sup>	FD 30 S <sup>(2)</sup>
b. enclosing a protected shaft forming a stairway wholly or partly above the adjoining ground in a building used for flats, other residential, assembly and recreation, or office purposes	E 30 S <sub>a</sub> <sup>(2)</sup>	FD 30 S <sup>(2)</sup>
c. enclosing a protected shaft forming a stairway not described in (b) above	Half the period of fire resistance of the wall in which it is fitted, but 30 minutes minimum and with suffix S <sub>a</sub> <sup>(2)</sup>	Half the period of fire resistance of the wall in which it is fitted, but 30 minutes minimum and with suffix S <sup>(2)</sup>
d. enclosing a protected shaft forming a lift or service shaft	Half the period of fire resistance of the wall in which it is fitted, but 30 minutes minimum	Half the period of fire resistance of the wall in which it is fitted, but 30 minutes minimum
e. not described in (a), (b), (c) or (d) above.	Same as for the wall in which it is fitted, but add S <sub>a</sub> <sup>(2)</sup> if the door is used for progressive horizontal evacuation under the guidance to requirement B1	Same as for the wall in which it is fitted, but add S <sup>(2)</sup> if the door is used for progressive horizontal evacuation under the guidance to requirement B1
3. <b>In a compartment floor</b>	Same as for the floor in which it is fitted	Same as for the floor in which it is fitted

**Table C1 Continued**

Position of door	Minimum fire resistance of door in terms of integrity (minutes) when tested to the relevant European standard <sup>(1)</sup>	Minimum fire resistance of door in terms of integrity (minutes) when tested to <b>BS 476-22</b>
<b>4. Forming part of the enclosures of:</b>		
a. a protected stairway (except as described in item 9 or 11(b) below)	E 30 S <sub>a</sub> <sup>(2)</sup>	FD 30 S <sup>(2)</sup>
b. a lift shaft (see paragraph 3.99b) that does not form a protected shaft in 2(b), (c) or (d) above.	E 30	FD 30
<b>5. Forming part of the enclosure of:</b>		
a. a protected lobby approach (or protected corridor) to a stairway	E 30 S <sub>a</sub> <sup>(2)</sup>	FD 30 S <sup>(2)</sup>
b. any other protected corridor	E 20 S <sub>a</sub> <sup>(2)</sup>	FD 20 S <sup>(2)</sup>
c. a protected lobby approach to a lift shaft (paragraphs 3.102 to 3.104).	E 30 S <sub>a</sub> <sup>(2)</sup>	FD 30 S <sup>(2)</sup>
<b>6. Giving access to an external escape route</b>	E 30	FD 30
<b>7. Sub-dividing:</b>		
a. corridors connecting alternative exits	E 20 S <sub>a</sub> <sup>(2)</sup>	FD 20 S <sup>(2)</sup>
b. dead-end portions of corridors from the remainder of the corridor.	E 20 S <sub>a</sub> <sup>(2)</sup>	FD 20 S <sup>(2)</sup>
<b>8. Any door within a cavity barrier</b>	E 30	FD 30
<b>9. Any door that forms part of the enclosure to a protected entrance hall or protected landing in a flat</b>	E 20	FD 20
<b>10. Any door that forms part of the enclosure:</b>		
a. to a place of special fire hazard	E 30	FD 30
b. to ancillary accommodation in care homes (see paragraph 2.44 in Approved Document B Volume 2).	E 30	FD 30
<b>11. In a dwellinghouse:</b>		
a. between a dwellinghouse and a garage	E 30 S <sub>a</sub> <sup>(2)</sup>	FD 30 S <sup>(2)</sup>
b. forming part of the enclosures to a protected stairway in a single family dwellinghouse	E 20	FD 20
c. within any fire resisting construction in a dwellinghouse not described elsewhere in this table.	E 20	FD 20

**NOTES:**

- Classified in accordance with **BS EN 13501-2**. National classifications do not necessarily equate with European classifications, therefore products cannot typically assume a European class unless they have been tested accordingly.
- Unless pressurisation techniques that comply with **BS EN 12101-6** are used, these doors should also comply with one of the following conditions.
  - Have a leakage rate not exceeding 3m<sup>3</sup>/m<sup>2</sup>/hour (from head and jambs only) when tested at 25Pa under **BS 476-31.1**.
  - Meet the additional S<sub>a</sub> classification when tested to **BS EN 1634-3**.

## Appendix D: Methods of measurement

### Occupant number

- D1** The number of occupants of a room, storey, building or part of a building is either of the following.
- The maximum number of people it is designed to hold.
  - In buildings other than dwellings, the number of people calculated by dividing the area of a room or storey(s) (m<sup>2</sup>) by a floor space factor (m<sup>2</sup> per person) such as given in Table D1 for guidance.
- D2** Counters and display units should be included when measuring area. All of the following should be *excluded*.
- Stair enclosures.
  - Lifts.
  - Sanitary accommodation.
  - Any other fixed part of the building structure.

**Table D1 Floor space factors<sup>(1)</sup>**

Type of accommodation <sup>(2)(3)</sup>	Floor space factor (m <sup>2</sup> /person)
1. Standing spectator areas, bar areas (within 2m of serving point), similar refreshment areas	0.3
2. Amusement arcade, assembly hall (including a general purpose place of assembly), bingo hall, club, crush hall, dance floor or hall, venue for pop concerts and similar events and bar areas without fixed seating	0.5
3. Concourse or queuing area <sup>(4)</sup>	0.7
4. Committee room, common room, conference room, dining room, licensed betting office (public area), lounge or bar (other than in (1) above), meeting room, reading room, restaurant, staff room or waiting room <sup>(5)</sup>	1.0
5. Exhibition hall or studio (film, radio, television, recording)	1.5
6. Skating rink	2.0
7. Shop sales area <sup>(6)</sup>	2.0
8. Art gallery, dormitory, factory production area, museum or workshop	5.0
9. Office	6.0
10. Shop sales area <sup>(7)</sup>	7.0
11. Kitchen or library	7.0
12. Bedroom or study-bedroom	8.0
13. Bed-sitting room, billiards or snooker room or hall	10.0
14. Storage and warehousing	30.0
15. Car park	Two persons per parking space

**NOTES:**

1. As an alternative to using the values in the table, the floor space factor may be determined by reference to actual data taken from similar premises. Where appropriate, the data should reflect the average occupant density at a peak trading time of year.
2. Where accommodation is not directly covered by the descriptions given, a reasonable value based on a similar use may be selected.
3. Where any part of the building is to be used for more than one type of accommodation, the most onerous factor(s) should be applied. Where the building contains different types of accommodation, the occupancy of each different area should be calculated using the relevant space factor.
4. For detailed guidance on appropriate floor space factors for concourses in sports grounds refer to *Concourses* published by the Football Licensing Authority.
5. Alternatively the occupant number may be taken as the number of fixed seats provided, if the occupants will normally be seated.
6. Shops excluding those under item 10, but including: supermarkets and department stores (main sales areas), shops for personal services, such as hairdressing, and shops for the delivery or collection of goods for cleaning, repair or other treatment or for members of the public themselves carrying out such cleaning, repair or other treatment.
7. Shops (excluding those in covered shopping complexes but including department stores) trading predominantly in furniture, floor coverings, cycles, prams, large domestic appliances or other bulky goods, or trading on a wholesale self-selection basis (cash and carry).

## Travel distance

**D3** Travel distance is measured as the shortest route. Both of the following should be observed.

- If there is fixed seating or other fixed obstructions, the shortest route is along the centre line of the seatways and gangways.
- If the route includes a stair, the shortest route is along the pitch line on the centre line of travel.

## Width

**D4** Width is measured according to the following.

- For a **door (or doorway)**, the clear width when the door is open (Diagram D1).
- For an **escape route**, either of the following.
  - When the route is defined by walls: the width at 1500mm above finished floor level.
  - Elsewhere: the minimum width of passage available between any fixed obstructions.
- For a **stair**, the clear width between the walls or balustrades. On **escape routes** and stairs, handrails and strings intruding into the width by a maximum of 100mm on each side may be ignored. Rails used for guiding a stair-lift may be ignored, but it should be possible to park the lift's chair or carriage in a position that does not obstruct the stair or landing.

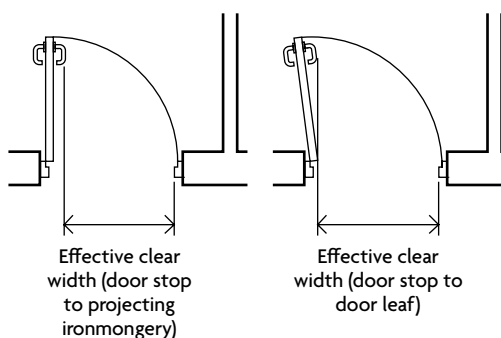
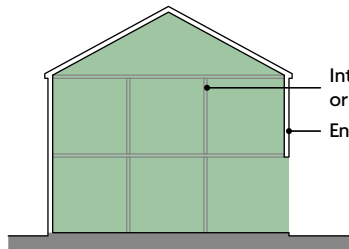
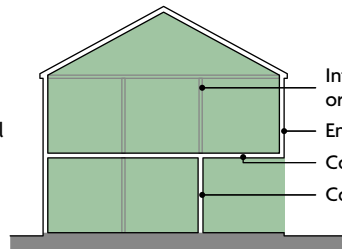


Diagram D1 Measurement of door width

## Building dimensions



**a. Cubic capacity of a building**



**b. Cubic capacity of compartments or separated part of a building**

In every case measure the volume contained by all of the following.

- Under surface of roof.
- Upper surface of lowest floor.
- Inner surface of enclosing walls. When there is not an outer enclosing wall, measure to the outermost edge of the floor slab.

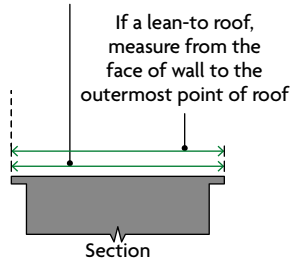
The measured volume should include internal walls and partitions.

Diagram D2 Cubic capacity

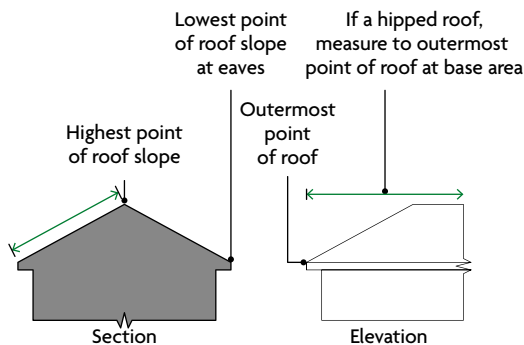
### a. Surface area: roofs and rooflights

In each case measure the visible area

Measure from outermost point of roof at eaves or verge

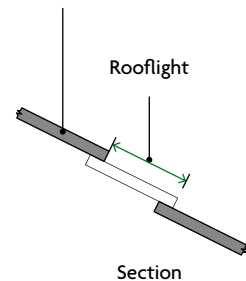


**i. Flat or monopitch roof**



**ii. Double pitch roof**

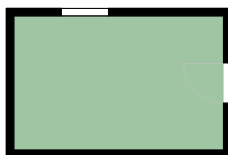
Roof sheeting



**iii. Rooflight**

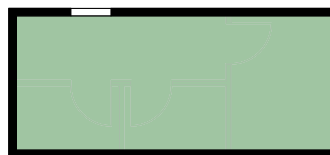
### b. Floor area:

Room, garage, conservatory or outbuilding, measure to inner surface of enclosing walls



### c. Floor area:

Storey, part or compartment, measure to inner surface of enclosing walls and include internal walls and partitions



When there is not an outer enclosing wall, measure to the outermost edge of the floor slab

Diagram D3 Area

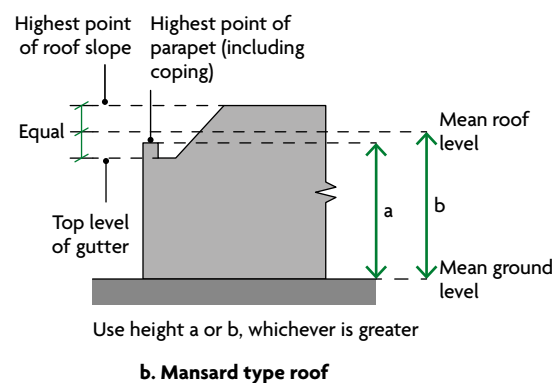
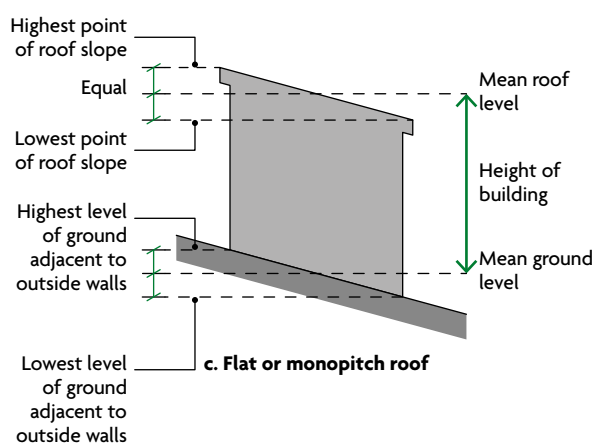
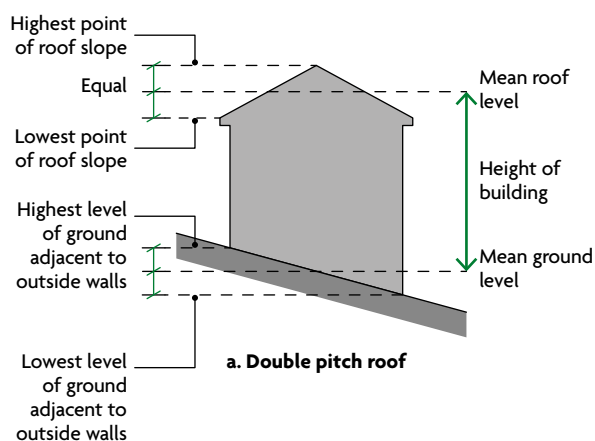
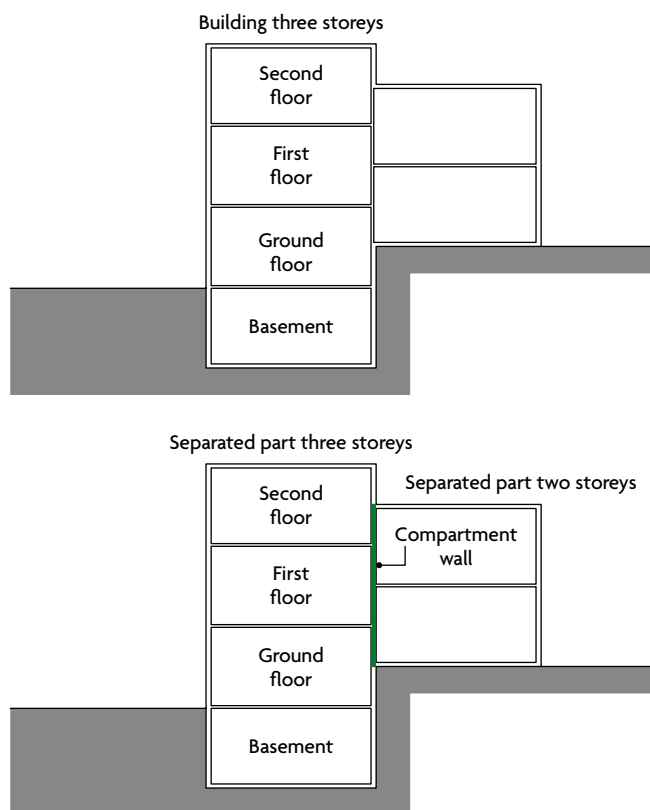


Diagram D4 Height of building



To count the number of storeys in a building, or in a separated part of a building, count only at the position which gives the greatest number and exclude any basement storeys.

**NOTES:**

1. In assembly buildings (purpose group 5), a gallery is included as a storey, but not if it is a loading gallery, fly gallery, stage grid, lighting bridge, or any gallery provided for similar purposes, or for maintenance and repair.
2. In other purpose group buildings, galleries are not counted as a storey.
3. For the definition of basement, see Appendix A.

Diagram D5 Number of storeys

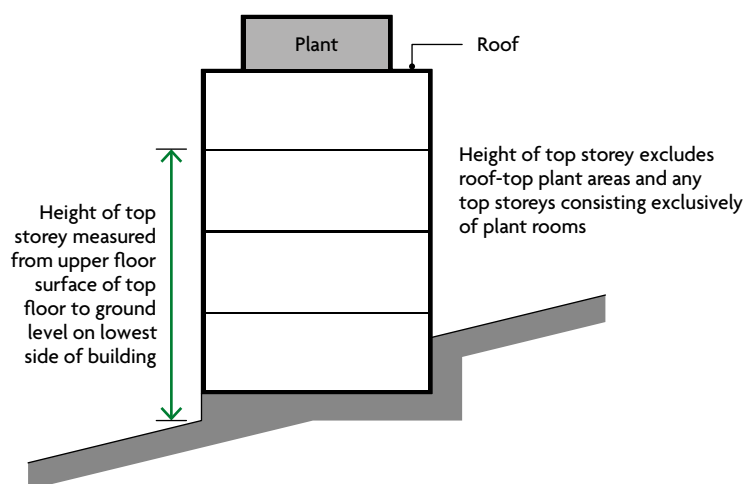
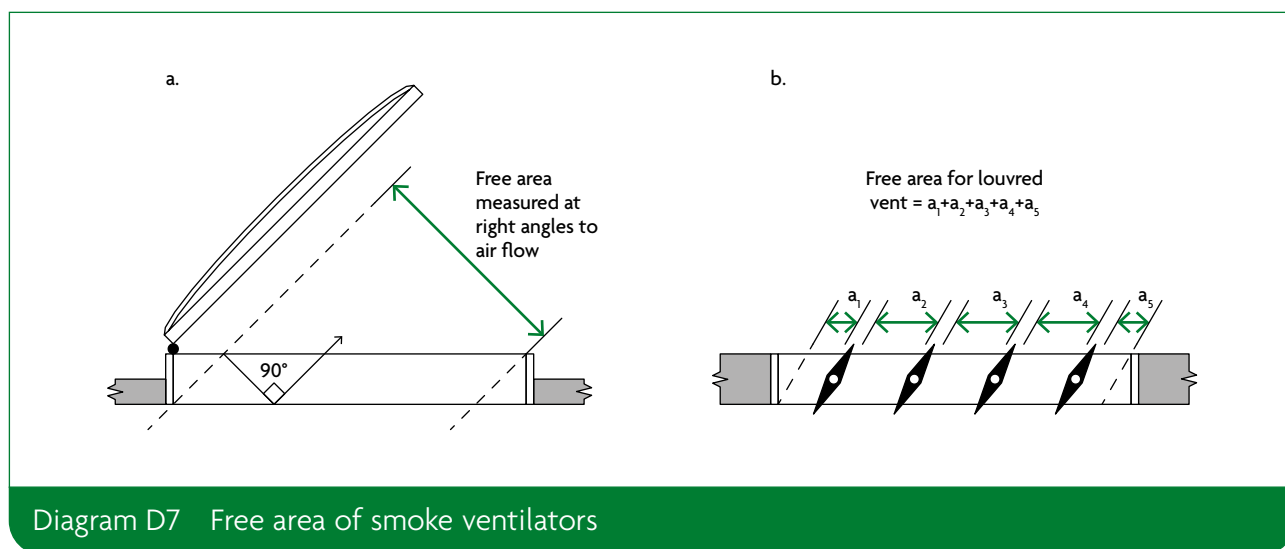


Diagram D6 Height of top storey in building

## Free area of smoke ventilators

- D5** The free area of a smoke ventilator should be measured by either of the following.
- The declared aerodynamic free area in accordance with **BS EN 12101-2**.
  - The total unobstructed cross-sectional area (geometric free area), measured in the plane where the area is at a minimum and at right angles to the direction of air flow (Diagram D7).



# Appendix E: Sprinklers

## Sprinkler systems

- E1** Sprinkler systems installed in **buildings** can reduce the risk to life and significantly reduce the degree of damage caused by fire within a **building**.
- E2** Further recommendations for the provision of sprinklers are provided in the following sections:

### Volume 1 – Dwellings

Functional requirement	Paragraph	Title
B1	2.6	Dwellinghouses with two or more storeys more than 4.5m above ground level
B1	2.23	Loft conversions
B1	3.21	Internal planning of multi-storey flats
B3	Table B4	Minimum periods of fire resistance
B3	7.4	Sprinklers
B4	11.15	Unprotected areas and fire resistance – portal frames
B4	11.21	Methods for calculating acceptable unprotected area – sprinkler systems
B5	15.7	Provision of firefighting shafts

### Volume 2 – Buildings other than dwellings

Functional requirement	Paragraph	Title
B1	2.46	Residential care homes – sprinkler systems
B1	3.21	Width of escape stairs – phased evacuation
B1	5.46	Shop store rooms
B3	7.7	Raised storage areas
B3	Table 8.1	Maximum dimensions of building or compartment
B3	Table B4	Minimum periods of fire resistance
B3	8.14	Sprinklers
B4	13.16	Unprotected areas and fire resistance – portal frames
B4	13.22	Methods for calculating acceptable unprotected area – sprinkler systems
B5	17.8	Location of firefighting shafts
B5	18.11	Provision of smoke outlets – mechanical smoke extract

## Design of sprinkler systems

- E3** Where required, sprinkler systems should be provided throughout the **building** or **separated part**, unless acting as a compensatory feature to address a specific risk. They should be designed and installed in accordance with the following.
- For residential **buildings**, the requirements of **BS 9251**.
  - For non-residential **buildings**, or residential **buildings** outside the scope of **BS 9251**, the requirements of **BS EN 12845**, including the relevant hazard classification together with additional measures to improve system reliability and availability as described in Annex F of the standard.

**NOTE:** Any sprinkler system installed to satisfy the requirements of Part B of the Building Regulations should be provided with additional measures to improve system reliability and availability and is therefore to be regarded as a life safety system. However, there may be some circumstances in which additional measures to improve system reliability and availability specified in Annex F of **BS EN 12845** are inappropriate or unnecessary.

- E4** If the provisions in a building vary from those in this document, sprinkler protection can also sometimes be used as a compensatory feature.

**BS 9251** makes additional recommendations when sprinklers are proposed as compensatory features.

## Water supplies and pumps

- E5** For non-residential sprinkler systems designed and installed to **BS EN 12845**, water supplies should consist of either of the following.
- Two single water supplies complying with clause 9.6.1, independent of each other.
  - Two stored water supplies meeting all of the following conditions.
    - Gravity or suction tanks should satisfy all the requirements of clause 9.6.2(b), other than capacity.
    - Any pump arrangements should comply with clause 10.2.
    - In addition to meeting the requirements for inflow, either of the following should apply.
      - The capacity of each tank should be at least half the specified minimum water volume of a single full capacity tank, appropriate to the hazard.
      - One tank should be at least equivalent to half the specified water volume of a single full capacity tank, and the other shall not be less than the minimum volume of a reduced capacity tank (see clause 9.3.4) appropriate to the hazard.

The total capacity of the water supply in (iii), including any inflow for a reduced capacity tank, should be at least that of a single full holding capacity tank that complies with Table 9, Table 10 or clause 9.3.2.3, as appropriate to the hazard and pipework design.

- E6** For the systems described in paragraph E5, both of the following apply if pumps are used to draw water from two tanks.
- Each pump should be able to draw water from either tank.
  - Any one pump, or either tank, should be able to be isolated.

The sprinkler water supplies should not be used as connections for other services or other fixed firefighting systems.

# Appendix F: Standards referred to

## European Standards

**NOTE:** All the British and European Standards can be purchased at the following address: <https://shop.bsigroup.com/>. Alternatively access to the British and European Standards may be gained at public reference libraries.

**BS EN 54** Fire detection and fire alarm systems

**BS EN 54-7** Smoke detectors. Point smoke detectors that operate using scattered light, transmitted light or ionization [2018]

**BS EN 54-11** Manual call points [2001]

**BS EN 81** Safety rules for the construction and installation of lifts

**BS EN 81-20** Lifts for the transport of persons and goods. Passenger and goods passenger lifts [2014]

**BS EN 81-58** Examination and tests. Landing doors fire resistance test [2018]

**BS EN 81-72** Particular applications for passenger and goods passenger lifts. Firefighters lifts [2015]

**BS EN ISO 306** Plastics. Thermoplastic materials. Determination of Vicat softening temperature (VST) [2013]

**BS EN 520** Gypsum plasterboards. Definitions, requirements and test methods [2004 + A1 2009]

**BS EN 1125** Building hardware. Panic exit devices operated by a horizontal bar, for use on escape routes. Requirements and test methods [2008]

**BS EN 1155** Building hardware. Electrically powered hold-open devices for swing doors. Requirements and test methods [1997]

**BS EN 1366** Fire resistance tests for service installations

**BS EN 1366-2** Fire dampers [2015]

**BS EN 1366-8** Smoke extraction ducts [2004]

**BS EN 1634** Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware

**BS EN 1634-1** Fire resistance test for door and shutter assemblies and openable windows [2014 + A1 2018]

**BS EN 1634-2** Fire resistance characterisation test for elements of building hardware [2008]

**BS EN 1634-3** Smoke control test for door and shutter assemblies [2004]

**BS EN 1993-1-2** Eurocode 3. Design of steel structures. General rules. Structural fire design [2005]

**BS ISO 3864-1** Graphical symbols. Safety colours and safety signs. Design principles for safety signs and safety markings [2011]

**BS EN 12101** Smoke and heat control systems

**BS EN 12101-2** Natural smoke and heat exhaust ventilators [2017]

**BS EN 12101-3** Specification for powered smoke and heat control ventilators (Fans) [2015]

**BS EN 12101-6** Specification for pressure differential systems. Kits [2005]

**BS EN 12845** Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance [2015]

**BS EN 13238** Reaction to fire tests for building products. Conditioning procedures and general rules for selection of substrates [2010]

**BS EN 13501** Fire classification of construction products and building elements

**BS EN 13501-1** Classification using data from reaction to fire tests [2018]

**BS EN 13501-2** Classification using data from fire resistance tests, excluding ventilation services [2016]

**BS EN 13501-3** Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers [2005 + A1 2009]

**BS EN 13501-4** Classification using data from fire resistance tests on components of smoke control systems [2016]

**BS EN 13501-5** Classification using data from external fire exposure to roof tests [2016]

**BS EN 14306** Thermal insulation products for building equipment and industrial installations. Factory made calcium silicate (CS) products. Specification [2015]

**BS EN 14604** Smoke alarm devices [2005]

**BS EN 15102** Decorative wall coverings. Roll and panel form [2007 + A1 2011]

**BS EN 15650** Ventilation for buildings. Fire dampers [2010]

**BS EN 15725** Extended application reports on the fire performance of construction products and building elements [2010]

**BS EN 50200** Method of test for resistance to fire of unprotected small cables for use in emergency circuits [2015]

## British Standards

**BS 476** Fire tests on building materials and structures

**BS 476-3** Classification and method of test for external fire exposure to roofs [2004]

**BS 476-6** Method of test for fire propagation for products [1989 + A1 2009]

**BS 476-7** Method of test to determine the classification of the surface spread of flame of products [1997]

**BS 476-8** Test methods and criteria for the fire resistance of elements of building construction [1972]

**BS 476-11** Method for assessing the heat emission from building materials [1982]

**BS 476-20** Method for determination of the fire resistance of elements of construction (general principles) [1987]

**BS 476-21** Methods for determination of the fire resistance of loadbearing elements of construction [1987]

**BS 476-22** Methods for determination of the fire resistance of non-loadbearing elements of construction [1987]

**BS 476-23** Methods for determination of the contribution of components to the fire resistance of a structure [1987]

**BS 476-24** Method for determination of the fire resistance of ventilation ducts [1987]

**BS 476-31.1** Methods for measuring smoke penetration through doorsets and shutter assemblies. Method of measurement under ambient temperature conditions [1983]

**BS 2782-0** Methods of testing. Plastics. Introduction [2011]

**BS 3251** Specification. Indicator plates for fire hydrants and emergency water supplies [1976]

**BS 4422** Fire. Vocabulary [2005]

**BS 4514** Unplasticized PVC soil and ventilating pipes of 82.4mm minimum mean outside diameter, and fittings and accessories of 82.4mm and of other sizes. Specification [2001]

**BS 5255** Specification for thermoplastics waste pipe and fittings [1989]

**BS 5266-1** Emergency lighting. Code of practice for the emergency lighting of premises [2016]

**BS 5395-2** Stairs, ladders and walkways. Code of practice for the design of helical and spiral stairs [1984]

**BS 5438** Methods of test for flammability of textile fabrics when subjected to a small igniting flame applied to the face or bottom edge of vertically oriented specimens [1989]

**BS 5446-2** Fire detection and fire alarm devices for dwellings. Specification for heat alarms [2003]

**BS 5499** Graphical symbols and signs

**BS 5499-4** Safety signs. Code of practice for escape route signing [2013]

**BS 5499-5** Safety signs, including fire safety signs. Signs with specific safety meanings [2002]

**BS 5839** Fire detection and fire alarm systems for buildings

**BS 5839-1** Code of practice for system design, installation, commissioning and maintenance of systems in non-domestic premises [2017]

**BS 5839-2** Specification for manual call points [1983]

**BS 5839-3** Specification for automatic release mechanisms for certain fire protection equipment [1988]

**BS 5839-6** Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises [2019]

**BS 5839-8** Code of practice for the design, installation, commissioning and maintenance of voice alarm systems [2013]

**BS 5839-9** Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems [2011]

**BS 5867-2** Fabrics for curtains and drapes. Flammability requirements. Specification [2008]

**BS 5906** Waste management in buildings. Code of practice [2005]

**BS 7157** Method of test for ignitability of fabrics used in the construction of large tented structures [1989]

**BS 7273** Code of practice for the operation of fire protection measures

**BS 7273-4** Actuation of release mechanisms for doors [2015]

**BS 7346-7** Components for smoke and heat control systems. Code of practice on functional recommendations and calculation methods for smoke and heat control systems for covered car parks [2013]

**BS 7974** Application of fire safety engineering principles to the design of buildings. Code of practice [2019]

**BS 8214** Timber-based fire door assemblies. Code of practice [2016]

**BS 8313** Code of practice for accommodation of building services in ducts [1997]

**BS 8414** Fire performance of external cladding systems

**BS 8414-1** Test method for non-loadbearing external cladding systems applied to the masonry face of a building [2015 + A1 2017]

**BS 8414-2** Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame [2015 + A1 2017]

**BS 8519** Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications. Code of practice [2010]

**BS 9251** Fire sprinkler systems for domestic and residential occupancies. Code of practice [2014]

**BS 9252** Components for residential sprinkler systems. Specification and test methods for residential sprinklers [2011]

**BS 9990** Non automatic fire-fighting systems in buildings. Code of practice [2015]

**BS 9991** Fire safety in the design, management and use of residential buildings. Code of practice [2015]

**BS 9999** Fire safety in the design, management and use of buildings. Code of practice [2017]

# Appendix G: Documents referred to

## Legislation

(available via [www.legislation.gov.uk](http://www.legislation.gov.uk))

Education Act 1996

Gas Safety (Installation and Use) Regulations 1998 (SI 1998/2451)

Lifts Regulations 1997 (SI 1997/831)

Pipelines Safety Regulations 1996 (SI 1996/825)

Prison Act 1952

Safety of Sports Grounds Act 1975

Regulatory Reform (Fire Safety) Order 2005 (SI 2005/1541)

Commission Decision 2000/367/EC of 3 May 2000 implementing Council Directive 89/106/EEC

Commission Decision 2000/553/EC of 6 September 2000 implementing Council Directive 89/106/EEC

European Parliament and Council Directive 95/16/EC

## Other documents

### Publications

**Association for Specialist Fire Protection (ASFP)**  
([www.asfp.org.uk](http://www.asfp.org.uk))

ASFP Red Book – *Fire-Stopping: Linear Joint Seals, Penetration Seals and Cavity Barriers*, Fourth Edition

ASFP Grey Book – *Volume 1: Fire Dampers (European Standards)*, Second Edition

ASFP Blue Book British Standard version – *Fire Resisting Ductwork, Tested to BS 476 Part 24*, Third Edition

ASFP Blue Book European version – *Fire Resisting Ductwork, Classified to BS EN 13501 Parts 3 and 4*, First Edition

*Ensuring Best Practice for Passive Fire Protection in Buildings*, Second Edition [2014]

**Building Research Establishment Limited (BRE)**  
([www.bre.co.uk](http://www.bre.co.uk))

BRE report (BR 135) *Fire Performance of External Thermal Insulation for Walls of Multi-storey Buildings*, Third Edition [2013]

BRE report (BR 187) *External Fire Spread: Building Separation and Boundary Distances*, Second Edition [2014]

BRE Digest 208 *Increasing the Fire Resistance of Existing Timber Floors* [1988]

BRE report (BR 274) *Fire Safety of PTFE-based Materials Used in Buildings* [1994]

### Department for Communities and Local Government

([www.gov.uk/government/publications/fire-performance-of-green-roofs-and-walls](http://www.gov.uk/government/publications/fire-performance-of-green-roofs-and-walls))

*Fire Performance of Green Roofs and Walls* [2013]

### Department for Education

([www.dfes.gov.uk](http://www.dfes.gov.uk))

Building Bulletin (BB) 100: *Design for Fire Safety in Schools* [2007]

### Department of Health

([www.dh.gov.uk](http://www.dh.gov.uk))

Health Technical Memorandum (HTM) 05-02: *Firecode. Guidance in Support of Functional Provisions (Fire Safety in the Design of Healthcare Premises)* [2015]

HTM 88: *Guide to Fire Precautions in NHS Housing in the Community for Mentally Handicapped (or Mentally Ill) People*

### Door and Hardware Federation (DHF) and Guild of Architectural Ironmongers (GAI)

([www.firecode.org.uk](http://www.firecode.org.uk))

*Hardware for Fire and Escape Doors* [2012]

### Door and Shutter Manufacturers' Association (DSMA)

([www.dhfonline.org.uk](http://www.dhfonline.org.uk))

*Code of Practice for Fire Resisting Metal Doorsets* [2010]

### Fire Protection Association (FPA)

([www.thefpa.co.uk](http://www.thefpa.co.uk))

RISCAuthority *Design Guide for the Fire Protection of Buildings* [2005]

### Football Licensing Authority

([www.flaweb.org.uk/home.php](http://www.flaweb.org.uk/home.php))

*Concourses* [2006]

### Glass and Glazing Federation (GGF)

([www.ggf.org.uk](http://www.ggf.org.uk))

*A Guide to Best Practice in the Specification and Use of Fire-resistant Glazed Systems* [2011]

### Health and Safety Executive (HSE)

([www.hse.gov.uk](http://www.hse.gov.uk))

*Safety Signs and Signals: The Health and Safety Regulations 1996. Guidance on Regulations, L64* [2015]

### HM Prison and Probation Service (HMPPS)

([www.hmppsintrinet.org.uk/uploads/HMPPSFireSafetyDesignGuide.pdf](http://www.hmppsintrinet.org.uk/uploads/HMPPSFireSafetyDesignGuide.pdf))

*Custodial Premises Fire Safety Design Guide*

### Passive Fire Protection Federation (PFPF)

([http://pfpf.org/pdf/publications/guide\\_to\\_uailoft.pdf](http://pfpf.org/pdf/publications/guide_to_uailoft.pdf))

*Guide to Undertaking Assessments in Lieu of Fire Tests* [2000]

### Sports Grounds Safety Authority

(<https://sgsa.org.uk/>)

*Guide to Safety at Sports Grounds* [2007]

### Steel Construction Institute (SCI)

(<https://steel-sci.com>)

SCI Publication P288 *Fire Safe Design: A New Approach to Multi-storey Steel-framed Buildings*, Second Edition [2006]

SCI Publication P313 *Single Storey Steel Framed Buildings in Fire Boundary Conditions* [2002]

### Timber Research and Development Associations (TRADA)

([www.trada.co.uk](http://www.trada.co.uk))

*Timber Fire Resisting Doorsets: Maintaining Performance under the New European Test Standard* [2002]

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# List of approved documents

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## **Approved Document A**

Structure

## **Approved Document B**

Fire safety

Volume 1: Dwellings

## **Approved Document B**

Fire safety

Volume 2: Buildings other than dwellings

## **Approved Document C**

Site preparation and resistance to contaminants and moisture

## **Approved Document D**

Toxic substances

## **Approved Document E**

Resistance to the passage of sound

## **Approved Document F**

Ventilation

## **Approved Document G**

Sanitation, hot water safety and water efficiency

## **Approved Document H**

Drainage and waste disposal

## **Approved Document J**

Combustion appliances and fuel storage systems

## **Approved Document K**

Protection from falling, collision and impact

## **Approved Document L1A**

Conservation of fuel and power in new dwellings

## **Approved Document L1B**

Conservation of fuel and power in existing dwellings

## **Approved Document L2A**

Conservation of fuel and power in new buildings other than dwellings

## **Approved Document L2B**

Conservation of fuel and power in existing buildings other than dwellings

## **Approved Document M**

Access to and use of buildings

Volume 1: Dwellings

## **Approved Document M**

Access to and use of buildings

Volume 2: Buildings other than dwellings

## **Approved Document P**

Electrical safety – Dwellings

## **Approved Document Q**

Security – Dwellings

## **Approved Document 7**

Materials and workmanship

The Building Regulations 2010, Approved Documents are available from:

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# The Building Regulations 2010

## Fire safety

### APPROVED DOCUMENT

# B

## Volume 2: Buildings other than 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 incorporating 2020 amendments –  
for use in England

# Main changes made by the 2020 amendments

The changes focus on the following fire safety provisions in blocks of flats (Volume 1):

- a. Sprinklers:  
A reduction in the trigger height from 30m to 11m.
- b. Wayfinding signage for the fire service:  
A new recommendation for floor identification and flat indication signage within blocks of flats with storeys over 11m.

In addition a typographical error is corrected in both volumes. Purpose group number 2 is now included in reference to 'residential' buildings in the guidance on boundaries.

The changes are set out in the May 2020 AD B amendments.

# The approved documents

## What is an approved document?

The Secretary of State has approved a series of documents that give practical guidance about how to meet the requirements of the Building Regulations 2010 for England. These approved documents give guidance on each of the technical parts of the regulations and on regulation 7 (see the back of this document). The approved documents provide guidance for common building situations.

It is the responsibility of those carrying out building works to meet the requirements of the Buildings Regulations 2010. Although it is ultimately for the courts to determine whether those requirements have been met, the approved documents provide practical guidance on potential ways to achieve compliance with the requirements of the regulations in England.

Although approved documents cover common building situations, compliance with the guidance set out in the approved documents does not provide a guarantee of compliance with the requirements of the regulations because the approved documents cannot cater for all circumstances, variations and innovations. Those with responsibility for meeting the requirements of the regulations will need to consider for themselves whether following the guidance in the approved documents is likely to meet those requirements in the particular circumstances of their case.

Note that there may be other ways to comply with the requirements than the methods described in an approved document. If you prefer to meet a relevant requirement in some other way than that described in an approved document, you should seek to agree this with the relevant building control body at an early stage.

Where the guidance in the approved document has been followed, a court or inspector will tend to find that there is no breach of the regulations. However, where the guidance in the approved document has not been followed, this may be relied upon as tending to establish breach of the regulations and, in such circumstances, the person carrying out building works should demonstrate that the requirements of the regulations have been complied with by some other acceptable means or method.

In addition to guidance, some approved documents include provisions that must be followed exactly, as required by regulations or where methods of test or calculation have been prescribed by the Secretary of State.

Each approved document relates only to the particular requirements of the Building Regulations 2010 that the document addresses. However, building work must also comply with all other applicable requirements of the Building Regulations 2010 and all other applicable legislation.

## How to use this approved document

This document uses the following conventions.

- a. **Text against a green background** is an extract from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations.
- b. **Key terms, printed in green**, are defined in Appendix A.

- c. References are made to appropriate standards or other documents, which can provide further useful guidance. When this approved document refers to a named standard or other reference document, the standard or reference document has been clearly identified in this document. Standards are highlighted in **bold** throughout. The full name and version of the document referred to is listed in Appendix F (standards) or Appendix G (other documents). However, if the issuing body has revised or updated the listed version of the standard or document, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations.
- d. Standards and technical approvals also address aspects of performance or matters that are not covered by the Building Regulations and may recommend higher standards than required by the Building Regulations. Nothing in this guidance precludes you from adopting higher standards.

## User requirements

The approved documents provide technical guidance. Users of the approved documents should have adequate knowledge and skills to understand and apply the guidance correctly to the building work being undertaken.

## Where you can get further help

If you are not confident that you possess adequate knowledge and skills to apply the guidance correctly or if you do not understand the technical guidance or other information in this approved document or the additional detailed technical references to which it directs you, you should seek further help. Help can be obtained through a number of routes, some of which are listed below.

- a. If you are the person undertaking the building work: either from your local authority building control service or from an approved inspector.
- b. If you are registered with a competent person scheme: from the scheme operator.
- c. If your query is technical: from a specialist or an industry technical body for the relevant subject.

# The Building Regulations

The following is a high level summary of the Building Regulations relevant to most types of building work. Where there is any doubt you should consult the full text of the regulations, available at [www.legislation.gov.uk](http://www.legislation.gov.uk).

## Building work

Regulation 3 of the Building Regulations defines ‘building work’. Building work includes:

- a. the erection or extension of a building
- b. the provision or extension of a controlled service or fitting
- c. the material alteration of a building or a controlled service or fitting.

Regulation 4 states that building work should be carried out in such a way that, when work is complete:

- a. For new buildings or work on a building that complied with the applicable requirements of the Building Regulations: the building complies with the applicable requirements of the Building Regulations.
- b. For work on an existing building that did not comply with the applicable requirements of the Building Regulations:
  - i. the work itself must comply with the applicable requirements of the Building Regulations, and
  - ii. the building must be no more unsatisfactory in relation to the requirements than before the work was carried out.

## Material change of use

Regulation 5 defines a ‘material change of use’ in which a building or part of a building that was previously used for one purpose will be used for another.

The Building Regulations set out requirements that must be met before a building can be used for a new purpose. To meet the requirements, the building may need to be altered in some way.

## Materials and workmanship

In accordance with regulation 7, building work must be carried out in a workmanlike manner using adequate and proper materials. Guidance on regulation 7(1) is given in Approved Document 7 and guidance on regulation 7(2) is provided in Approved Document B.

## Independent third party certification and accreditation

Independent schemes of certification and accreditation of installers can provide confidence that the required level of performance for a system, product, component or structure can be achieved.

Building control bodies may accept certification under such schemes as evidence of compliance with a relevant standard. However, a building control body should establish before the start of the building work that a scheme is adequate for the purposes of the Building Regulations.

## Energy efficiency requirements

Part 6 of the Building Regulations imposes additional specific requirements for energy efficiency.

If a building is extended or renovated, the energy efficiency of the existing building or part of it may need to be upgraded.

## Notification of work

Most building work and material changes of use must be notified to a building control body unless one of the following applies.

- a. It is work that will be self-certified by a registered competent person or certified by a registered third party.
- b. It is work exempted from the need to notify by regulation 12(6A) of, or Schedule 4 to, the Building Regulations.

## Responsibility for compliance

People who are responsible for building work (e.g. agent, designer, builder or installer) must ensure that the work complies with all applicable requirements of the Building Regulations. The building owner may also be responsible for ensuring that work complies with the Building Regulations. If building work does not comply with the Building Regulations, the building owner may be served with an enforcement notice.

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# Section 0: Approved Document B: Fire safety – buildings other than dwellings

## Summary

- 0.1** This approved document has been published in two volumes. Volume 1 deals solely with dwellings, including blocks of flats, while Volume 2 deals with all other types of building covered by the Building Regulations.

## Arrangement of sections

- 0.2** Requirements B1–B5 of Schedule 1 to the Building Regulations are dealt with separately in one or more sections. Each requirement is shown at the start of the relevant sections.

- 0.3** The provisions in this document have the following aims:

**Requirement B1:** When there is a fire, ensure both:

- a. satisfactory means of sounding an alarm
- b. satisfactory means of escape for people.

**Requirement B2:** Inhibit the spread of fire over internal linings of buildings.

**Requirement B3:** The building must be built such that all of the following are achieved in the event of a fire:

- a. the premature collapse of the building is avoided
- b. sufficient fire separation is provided within buildings and between adjoining buildings
- c. automatic fire suppression is provided where necessary
- d. the unseen spread of fire and smoke in cavities is restricted.

**Requirement B4:** Restrict both:

- a. the potential for fire to spread over external walls and roofs (including compliance with regulations 6(4) and 7(2))
- b. the spread of fire from one building to another.

**Requirement B5:** Ensure both:

- a. satisfactory access for the fire service and its appliances
- b. facilities in buildings to help firefighters save the lives of people in and around buildings.

**Regulation 38:** Provide fire safety information to building owners.

- 0.4** Guidance is given on each aspect separately, though many are closely interlinked. The document should be considered as a whole. The relationship between different requirements and their interdependency should be recognised. Particular attention should be given to the situation where one part of the guidance is not fully followed as this could have a negative effect on other provisions.

## Appendices: Information common to more than one requirement of Part B

**0.5** Guidance on matters that refer to more than one section of this document can be found in the following appendices.

Appendix A: Key terms

Appendix B: Performance of materials, products and structures

Appendix C: Fire doorsets

Appendix D: Methods of measurement

Appendix E: Sprinklers

Appendix F: Standards referred to

Appendix G: Documents referred to

## Management of premises

**0.6** The Building Regulations do not impose any requirements on the management of a **building**, but do assume that it will be properly managed. This includes, for example, keeping protected **escape routes** virtually 'fire sterile'.

Appropriate fire safety design considers the way in which a **building** will be managed. Any reliance on an unrealistic or unsustainable management regime cannot be considered to have met the requirements of the regulations.

Once the **building** is in use, the management regime should be maintained and a suitable risk assessment undertaken for any variation in that regime. Failure to take proper management responsibility may result in the prosecution of an employer, **building** owner or occupier under legislation such as the Regulatory Reform (Fire Safety) Order 2005.

## Property protection

**0.7** The Building Regulations are intended to ensure a reasonable standard of life safety in a fire. The protection of property, including the **building** itself, often requires additional measures. Insurers usually set higher standards before accepting the insurance risk.

Many insurers use the *RISCAuthority Design Guide for the Fire Protection of Buildings* by the Fire Protection Association (FPA) as a basis for providing guidance to the **building** designer on what they require.

Further information on the protection of property can be obtained from the FPA website: [www.thefpa.co.uk](http://www.thefpa.co.uk).

## Inclusive design

**0.8** The fire safety aspects of the Building Regulations aim to achieve reasonable standards of health and safety for people in and around **buildings**.

People, regardless of ability, age or gender, should be able to access **buildings** and use their facilities. The fire safety measures incorporated into a **building** should take account of the needs of everyone who may access the **building**, both as visitors and as people who live or work in it. It is not appropriate, except in exceptional circumstances, to assume that certain groups of people will be excluded from a **building** because of its use.

The provisions in this approved document are considered to be of a reasonable standard for most **buildings**. However, some people's specific needs might not be addressed. In some situations, additional measures may be needed to accommodate these needs. This should be done on a case-by-case basis.

## 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 Regulations' 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.

## Health care premises

- 0.10** Health care premises and the patients who use them are diverse. Patients using the premises require different types of care to suit their specific needs. The choice of fire safety strategy depends on both of the following.

- a. How a **building** is designed, furnished, staffed and managed.
- b. The needs of the patients.

The Department of Health (DoH) guidance documents on fire precautions in health care **buildings**, *Firecode*, take account of the particular characteristics of these **buildings** and should be followed.

*Firecode* contains managerial and other fire safety provisions that are outside the scope of the Building Regulations.

## Unsupervised group homes

- 0.11** An unsupervised group home for not more than six mental health service users should be regarded as having a **purpose group** of either of the following.

- a. An existing house of one or two **storeys** for which the **means of escape** are provided in accordance with DoH HTM 88 should be regarded as a **purpose group 1(c) building**.
- b. A new **building** may be more appropriately regarded as being in **purpose group 2(b)**.

## Shopping complexes

- 0.12** Although the guidance in this document may be readily applied to individual shops, shopping complexes present different escape problems. The design of units within a shopping complex should be compatible with the fire strategy for the complex as a whole. A suitable approach is given in Annex E of **BS 9999**.

## Assembly buildings

- 0.13** Assembly **buildings** where a large number of people are present require additional considerations for **means of escape**; for example, fixed seating may limit the ability of people to escape.

Guidance on fixed seating and other aspects of **means of escape** in assembly **buildings** is given in Annex D of **BS 9999**.

For **buildings** to which the Safety of Sports Grounds Act 1975 applies, the Sports Grounds Safety Authority's *Guide to Safety at Sports Grounds* should also be followed.

## Schools

- 0.14** The design of fire safety in **schools** is covered by *Building Bulletin 100*, which should be used. *Building Bulletin 100* contains fire safety provisions that are outside the scope of the Building Regulations.

## Prisons provided under section 33 of the Prisons Act 1952

- 0.15** Prisons are exempted from the functional requirements of Parts B1 to B5 of the Building Regulations under section 33 of the Prisons Act 1952. It is usual that prisons should comply with the fire safety requirements of the Building Regulations, except where the requirements are incompatible with safe custody, good order or security.

HM Prison and Probation Service (HMPPS) provides guidance documents on fire precautions in prisons, which take account of the public safety need to secure doors and exits while maintaining life safety objectives.

The HMPPS *Custodial Premises Fire Safety Design Guide* (FSDG) is the design standard for fire safety in prisons, providing structured guidance for those involved in the planning, designing or approval of new or altered **buildings**.

Further guidance documents on fire safety in prisons are provided by HMPPS. These documents may also be used for other places of lawful detention.

## Buildings containing one or more atria

- 0.16** A **building** with an **atrium** that passes through **compartment floors** may need special fire safety measures. Guidance is given in Annexes B and C of **BS 9999**.

## Buildings of special architectural or historic interest

- 0.17** Where Part B applies to existing **buildings**, particularly **buildings** of special architectural or historic interest for which the guidance in this document might prove too restrictive, some variation of the 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.

## Fire safety engineering

- 0.18** 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.

- 0.19** **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**.

## Purpose groups

- 0.20** Building uses are classified within different **purpose groups**, which represent different levels of hazard (see Table 0.1). A **purpose group** can apply to a whole **building** or to a **compartment** within the **building**, and should relate to the main use of the **building** or **compartment**.
- 0.21** Where a **building** or **compartment** has more than one use, it is appropriate to assign each different use to its own **purpose group** in the following situations.
- If the ancillary use is a **flat**.
  - If both of the following apply.
    - The **building** or **compartment** has an area of more than 280m<sup>2</sup>.
    - The ancillary use relates to an area that is more than one-fifth of the total floor area of the **building** or **compartment**.
  - In 'shop and commercial' (**purpose group 4**) **buildings** or **compartments**, if the ancillary use is storage and both of the following apply.
    - The **building** or **compartment** has an area of more than 280m<sup>2</sup>.
    - The storage area comprises more than one-third of the total floor area of the **building** or **compartment**.
- 0.22** Where there are multiple main uses that are not ancillary to one another (for example, shops with independent offices above), each use should be assigned to a **purpose group** in its own right. Where there is doubt as to which **purpose group** is appropriate, the more onerous guidance should be applied.

**Table 0.1 Classification of purpose groups**

Volume 1 purpose groups		
Title	Group	Purpose for which the building or compartment of a building is intended to be used
Residential (dwellings)	1(a) <sup>(1)</sup>	Flat.
	1(b) <sup>(2)</sup>	Dwellinghouse that contains a habitable storey with a floor level a minimum of 4.5m above ground level up to a maximum of 18m. <sup>(3)</sup>
	1(c) <sup>(2)(4)</sup>	Dwellinghouse that does not contain a habitable storey with a floor level a minimum of 4.5m above ground level.
Volume 2 purpose groups		
Residential (institutional)	2(a)	Hospital, home, school or other similar establishment, where people sleep on the premises. The building may be either of the following: <ul style="list-style-type: none"> <li>Living accommodation for, or accommodation for the treatment, care or maintenance of, either:               <ul style="list-style-type: none"> <li>people suffering from disabilities due to illness or old age or other physical or mental incapacity</li> <li>people under the age of 5 years.</li> </ul> </li> <li>A place of lawful detention.</li> </ul>
Residential (other)	2(b)	Hotel, boarding house, residential college, hall of residence, hostel or any other residential purpose not described above.

**Table 0.1 Continued**

Title	Group	Purpose for which the building or compartment of a building is intended to be used
Office	3	Offices or premises used for any of the following and their control: <ul style="list-style-type: none"><li>• administration</li><li>• clerical work (including writing, bookkeeping, sorting papers, filing, typing, duplicating, machine calculating, drawing and the editorial preparation of matter for publication, police and fire and rescue service work)</li><li>• handling money (including banking and building society work)</li><li>• communications (including postal, telegraph and radio communications)</li><li>• radio, television, film, audio or video recording</li><li>• performance (premises not open to the public).</li></ul>
Shop and commercial	4	Shops or premises used for either of the following. <ul style="list-style-type: none"><li>• A retail trade or business (including selling food or drink to the public for immediate consumption, retail by auction, self-selection and over-the-counter wholesale trading, the business of lending books or periodicals for gain, the business of a barber or hairdresser, and the rental of storage space to the public).</li><li>• Premises to which the public are invited either:<ul style="list-style-type: none"><li>– to deliver or collect goods in connection with their hire, repair or other treatment</li><li>– (except in the case of repair of motor vehicles) where the public themselves may carry out such repairs or other treatments.</li></ul></li></ul>
Assembly and recreation	5	Place of assembly, entertainment or recreation, including any of the following: <ul style="list-style-type: none"><li>• bingo halls, broadcasting, recording and film studios open to the public, casinos, dance halls</li><li>• entertainment, conference, exhibition and leisure centres</li><li>• funfairs and amusement arcades</li><li>• museums and art galleries, non-residential clubs, theatres, cinemas, concert halls</li><li>• educational establishments, dancing schools, gymnasia, swimming pool buildings, riding schools, skating rinks, sports pavilions, sports stadia</li><li>• law courts</li><li>• churches and other buildings of worship, crematoria</li><li>• libraries open to the public, non-residential day centres, clinics, health centres and surgeries</li><li>• passenger stations and termini for air, rail, road or sea travel</li><li>• public toilets</li><li>• zoos and menageries.</li></ul>
Industrial	6	Factories and other premises used for any of the following: <ul style="list-style-type: none"><li>• manufacturing, altering, repairing, cleaning, washing, breaking up, adapting or processing any article</li><li>• generating power</li><li>• slaughtering livestock.</li></ul>

**Table 0.1 Continued**

Title	Group	Purpose for which the building or compartment of a building is intended to be used
Storage and other non-residential <sup>(4)</sup>	7(a)	Either of the following: <ul style="list-style-type: none"> <li>place (other than described under 7(b)) for the storage or deposit of goods or materials</li> <li>any building not within purpose groups 1 to 6.</li> </ul>
	7(b)	Car parks designed to admit and accommodate only cars, motorcycles and passenger or light goods vehicles that weigh a maximum of 2500kg gross.

**NOTES:**

This table only applies to Part B.

See Approved Document B Volume 1 for guidance on dwellings (purpose group 1).

- Includes live/work units that meet the provisions of Approved Document B Volume 1, paragraph 3.24.
- Includes any surgeries, consulting rooms, offices or other accommodation that meets all of the following conditions.
  - A maximum of 50m<sup>2</sup> in total.
  - Part of a dwellinghouse.
  - Used by an occupant of the dwellinghouse in a professional or business capacity.
- 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.
- All of the following are included in purpose group 1(c).
  - A detached garage a maximum of 40m<sup>2</sup> in area.
  - A detached open carport a maximum of 40m<sup>2</sup> in area.
  - A detached building that consists of a garage and open carport, each a maximum of 40m<sup>2</sup> in area.

## Mixed use buildings

**0.23** This approved document includes reference to selected guidance for **dwellings**. For the design of mixed use **buildings** which include **dwellings**, Approved Document B Volume 1 should be consulted in addition to the guidance contained in this approved document.

**0.24** Where a complex mix of uses exists, the effect that one use may have on another in terms of risk should be considered. It could be necessary to use guidance from both volumes, apply other guidance (such as from HTM 05-02 or *Building Bulletin 100*), and/or apply special measures to reduce the risk.

## Requirement B1: Means of warning and escape

These sections deal with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
<b>Means of warning and escape</b>	
<b>B1.</b> The building shall be designed and constructed so that there are appropriate provisions for the early warning of fire, and appropriate means of escape in case of fire from the building to a place of safety outside the building capable of being safely and effectively used at all material times.	<p>Requirement B1 does not apply to any prison provided under section 33 of the Prison Act 1952<sup>(a)</sup> (power to provide prisons, etc.).</p> <p>(a) 1952 c. 52; section 33 was amended by section 100 of the Criminal Justice and Public Order Act 1994 (c. 33) and by S.I. 1963/597.</p>

### Intention

In the Secretary of State's view, requirement B1 is met by achieving all of the following.

- There are sufficient means for giving early warning of fire to people in the **building**.
- All people can escape to a place of safety without external assistance.
- Escape routes** are suitably located, sufficient in number and of adequate capacity.
- Where necessary, **escape routes** are sufficiently protected from the effects of fire and smoke.
- Escape routes** are adequately lit and exits are suitably signed.
- There are appropriate provisions to limit the ingress of smoke to the **escape routes**, or to restrict the spread of fire and remove smoke.

The extent to which any of these measures are necessary is dependent on the use of the **building**, its size and its **height**.

Building work and material changes of use subject to requirement B1 include both new and existing **buildings**.

# Section 1: Fire detection and alarm systems

## General provisions

- 1.1 All buildings should have arrangements for detecting fire and raising the alarm. In most buildings, fires are detected by people, either by sight or smell, and therefore often nothing more is needed.
- 1.2 In some small buildings/premises, the means of raising the alarm may be simple (for example, a shouted warning). In assessing appropriate solutions, warnings need to be heard and understood throughout the premises.

## Fire detection and alarm systems

- 1.3 Other than for some small buildings/premises, an electrically operated fire alarm system should be provided. In some situations, the alarm should be operated by a fire detection system. The detailed specification should be compatible with the fire strategy for the building.

**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.

- 1.4 In 'residential (institutional)' and 'residential (other)' occupancies (purpose groups 2(a) and 2(b)), automatic fire detection and alarms should be provided.
- 1.5 Automatic fire detection and alarm systems should be provided in non-residential occupancies where a fire could break out in an unoccupied part of the premises (e.g. a storage area or a part of the building that is not visited on a regular basis) and prejudice the means of escape from occupied part(s) of the premises.
- 1.6 Automatic fire detection will also be necessary where fire protection systems, such as pressure differential systems or door releases, need to operate automatically.
- 1.7 Every building design should be assessed individually. General guidance on the category of fire detection system that may need to be provided within a building can be found in Table A1 of BS 5839-1.
- 1.8 Where an electrically operated fire detection and alarm system is provided, it should comply with BS 5839-1.
- 1.9 BS 5839-1 specifies three categories of system.
  - a. Category L – for the protection of life.
  - b. Category M – manual fire detection and alarm systems.
  - c. Category P – for property protection.

Category L systems are divided into the following.

L1 – systems installed throughout the protected **building**.

L2 – systems installed only in defined parts of the protected **building** (a category L2 system will normally include the coverage required of a category L3 system).

L3 – systems designed to warn of fire at an early enough stage to enable all occupants, other than possibly those in the **room** where the fire started, to escape safely before the **escape routes** become impassable because of fire, smoke or toxic gases.

L4 – systems installed within those parts of the **escape routes** that comprise circulation areas and **circulation spaces**, such as corridors and stairs.

L5 – systems in which the protected area(s) and/or the location of detectors are designed to satisfy a specific fire safety objective (other than that of a category L1, L2, L3 or L4 system).

Type P systems are divided into the following.

P1 – systems installed throughout the protected **building**.

P2 – systems installed only in defined parts of the protected **building**.

**1.10** Electrical alarm system call points should comply with either of the following.

a. **BS 5839-2**.

b. **BS EN 54-11** Type A (direct operation).

Call points should be installed in accordance with **BS 5839-1**.

Type B (indirect operation) call points of **BS EN 54-11** should only be used with the approval of the **building control body**.

**1.11** A voice alarm system complying with **BS 5839-8**, and giving a fire warning different from other signals in general use, may be considered if either of the following applies.

a. People might not respond quickly to a fire warning.

b. People are unfamiliar with the fire warning arrangements.

**1.12** In premises where lots of members of the public are present, an initial general alarm may be undesirable. Any **fire alarm system** that first alerts staff should comply with **BS 5839-1**.

**1.13** Where the escape strategy is based on simultaneous evacuation, actuation of the **fire alarm system** should give warning from all fire alarm sounders. Where phased evacuation is planned, a staged alarm system is appropriate. See paragraph 3.21.

**1.14** **BS 9999** provides guidance for fire detection and alarm systems in **buildings** containing **atria**.

## Warnings for people with impaired hearing

**1.15** Clause 18 of **BS 5839-1** gives detailed guidance on the design and selection of fire alarm warnings for people with impaired hearing. In **buildings** or part of a **building** where people may be in relative isolation, a visual and audible fire alarm may be the most appropriate solution. In **buildings** where the population is managed, a vibrating personal paging system may be more appropriate.

## Design and installation of systems

- 1.16** Fire detection and alarm systems must be properly designed, installed and maintained. A design, installation and commissioning certificate should be provided for fire detection and alarm systems. Third party certification schemes for fire protection products and related services are an effective means of providing assurances of quality, reliability and safety.

### Interface between fire detection and alarm systems and other systems

- 1.17** Fire detection and alarm systems sometimes trigger other systems. The interface between systems must be reliable. Particular care should be taken if the interface is facilitated via another system. Where any part of **BS 7273** applies to the triggering of other systems, the recommendations of that part of **BS 7273** should be followed.

## Section 2: Design for horizontal escape

### Introduction

- 2.1** Means of escape should be provided from any point on a storey to the storey exit, for all types of building. The general principle is that any person confronted by a fire within a building can turn away from it and escape safely.
- 2.2** For small shop, office, industrial, storage and other similar premises, the guidance on small premises (see section 4) may be followed instead of the provisions in this section, if they meet both of the following conditions.
- No storey has an area more than 280m<sup>2</sup>.
  - There is a maximum of two storeys plus a basement storey.

### Escape route design

#### Number of escape routes and exits

- 2.3** The number of escape routes and exits that should be provided depends on both of the following.
- The number of occupants in the room, tier or storey.
  - The limits on travel distance to the nearest exit given in Table 2.1 (which apply only to the nearest exit; other exits may be further away).
- 2.4** In multi-storey buildings, if more than one stair is needed for vertical escape, every part of each storey should have access to more than one stair. An area may be in a dead end provided the alternative stair is accessible.
- 2.5** In mixed use buildings, separate means of escape should be provided from any storeys or parts of storeys used for the 'residential' or 'assembly and recreation' purpose groups (purpose groups 1, 2 and 5).

## Single escape routes and exits

**2.6** A single **escape route** is acceptable for either of the following.

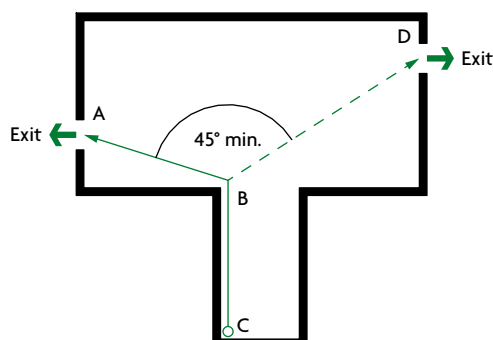
- a. Parts of a floor from which a **storey exit** can be reached within the limit for **travel distance** in one direction shown in Table 2.1 (see also paragraph 2.8), provided the following apply.
  - i. For places of assembly and bars, no one **room** in this situation has more than 60 people.
  - ii. For 'residential (institutional)' **buildings** (**purpose group 2(a)**), no one **room** in this situation has more than 30 people. Occupant number calculations are described in Appendix D.
- b. A **storey** with no more than 60 people, where the limits on **travel distance** in one direction only are satisfied (see Table 2.1).

**2.7** In many cases, the beginning of a route will not have an **alternative escape route** (for example, a single exit from a **room** into a corridor where escape is possible in two directions). This is acceptable if both of the following apply.

- a. The **travel distance** to the nearest **storey exit** is within the limits for routes where escape is possible in more than one direction (Table 2.1).
- b. The **travel distance** for the 'one direction only' section of the route does not exceed the limit for **travel distance** where there is no **alternative escape route** (Table 2.1).

Diagram 2.1 shows how to measure **travel distances** from a **dead end** in an open **storey** layout.

See para 2.7



Travel distance in a dead-end condition should meet all of the following.

- a. Angle ABD should be at least 45 degrees.
- b. Distance CBA or CBD (whichever is less) should be no more than the maximum travel distance given for alternative escape routes.
- c. Distance CB should be no more than the maximum travel distance where there are no alternative escape routes.

Diagram 2.1 Travel distance in dead-end condition

**Table 2.1 Limitations on travel distance**

Purpose group	Use of the premises or part of the premises		Maximum travel distance <sup>(1)</sup> where travel is possible in:	
			One direction only (m)	More than one direction (m)
2(a)	Residential (institutional)		9	18
2(b)	Residential (other):			
	a. in bedrooms <sup>(2)</sup>		9	18
	b. in bedroom corridors		9	35
	c. elsewhere		18	35
3	Office		18	45
4	Shop and commercial		18	45
5	Assembly and recreation:			
	a. buildings primarily for disabled people		9	18
	b. areas with seating in rows		15	32
	c. elsewhere		18	45
6	Industrial <sup>(3)</sup>	Normal hazard	25	45
		Higher hazard	12	25
7	Storage and other non-residential <sup>(3)</sup>	Normal hazard	25	45
		Higher hazard	12	25
2–7	Place of special fire hazard <sup>(4)</sup>		9 <sup>(5)</sup>	18 <sup>(5)</sup>
2–7	Plant room or roof-top plant:			
	a. distance within the room		9	35
	b. escape route not in open air (overall travel distance)		18	45
	c. escape route in open air (overall travel distance)		60	100

**NOTES:**

1. If the internal layout of partitions, fittings, etc. is not known, direct distances, rather than travel distances, should be assessed. The direct distance should be assumed to be two-thirds of the actual travel distance.
2. Maximum part of travel distance within the room. This limit applies within the bedroom and any associated dressing room, bathroom or sitting room, etc. The distance is measured to the door to the protected corridor that serves the room or suite. Sub-item (b) applies from that point along the bedroom corridor to a storey exit.
3. In industrial and storage buildings, the appropriate travel distance depends on the level of fire hazard associated with the processes and materials being used.  
Higher hazard includes manufacturing, processing or storage of significant amounts of hazardous goods or materials, including any of the following.
  - Any compressed, liquefied or dissolved gas.
  - Any substance that becomes dangerous by interaction with either air or water.
  - Any liquid substance with a flash point below 65°C, including whisky or other alcoholic liquor.
  - Any corrosive substance.
  - Any oxidising agent.
  - Any substance liable to spontaneous combustion.
  - Any substance that changes or decomposes readily, giving out heat when doing so.
  - Any solid substance with a flash point less than 120°C.
  - Any substance that is likely to spread fire by flowing from one part of a building to another.
4. Places of special fire hazard are listed in the definitions in Appendix A.
5. Maximum part of travel distance within the room/area. Travel distance outside the room/area should comply with the limits for the purpose group of the building or part.

## Access control measures

- 2.8** Measures to restrict access to the **building** (or parts of it) should not adversely affect fire safety provisions. It may be reasonable to close some **escape routes** outside normal business hours, but measures should remain to safely evacuate people left inside the **building** (see paragraph 5.6).

## Number of occupants and exits

- 2.9** The **building** design should be based on the number of occupants. If the number is not known, use the appropriate floor space factors (Appendix D).

Table 2.2 gives the minimum number of **escape routes** and exits from a **room** or **storey** for different numbers of occupants. This number is likely to be increased by the need to observe **travel distances** and other practical considerations.

The width of **escape routes** and exits is given in paragraph 2.18.

**Table 2.2 Minimum number of escape routes and exits from a room, tier or storey**

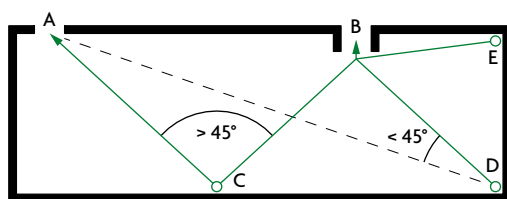
Maximum number of people	Minimum number of escape routes/exits
60	1
600	2
More than 600	3

## Alternative escape routes

- 2.10** **Alternative escape routes** should satisfy one of the following criteria.

- They are in directions 45 degrees or more apart (Diagram 2.2).
- They are in directions less than 45 degrees apart, but separated from each other by **fire resisting** construction.

See para 2.10



Alternative escape routes are available from C because angle ACB is 45 degrees or more and therefore distance CA or CB (whichever is the less) should be no more than the maximum travel distance given for alternative escape routes.

Alternative escape routes are not available from D because angle ADB is less than 45 degrees (therefore see Diagram 2.1).

There is also no alternative escape route from E.

**Diagram 2.2** Alternative escape routes

## Inner rooms

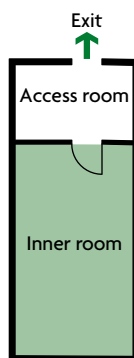
- 2.11** An **inner room** is at risk if a fire starts in the **access room** (Diagram 2.3). Such an arrangement should only be accepted if all of the following conditions are satisfied.
- The occupant number of the **inner room** *does not* exceed:
    - 30 people for 'residential (institutional)' buildings (purpose group 2(a))
    - 60 people for other **purpose groups**.
  - The **inner room** is not a bedroom.
  - The **inner room** is entered directly from the **access room** (but not via a corridor).
  - The **escape route** from the **inner room** does not pass through more than one **access room**.
  - The **travel distance** from any point in the **inner room** to the exits from the **access room** does not exceed the distances in Table 2.1.
  - The **access room** meets both of the following conditions.
    - It is not a **place of special fire hazard**.
    - It is in the control of the same occupier.
  - One of the following arrangements is made.
    - The enclosures (walls or partitions) of the **inner room** stop a minimum of 500mm below the **ceiling**.
    - The door or walls of the **inner room** contain a vision panel (minimum 0.1m<sup>2</sup>), so people can see if a fire starts in the **access room**.
    - The **access room** is fitted with an automatic fire detection and alarm system to warn occupants of the **inner room** if a fire starts in the **access room**.

See para 2.11

**Arrangement A**



**Arrangement B**



**NOTES:**

Arrangement A Needs no special provision.

Arrangement B Should observe the inner room provisions in paragraph 2.11.

Diagram 2.3 Inner room and access room

## Planning of exits in a central core

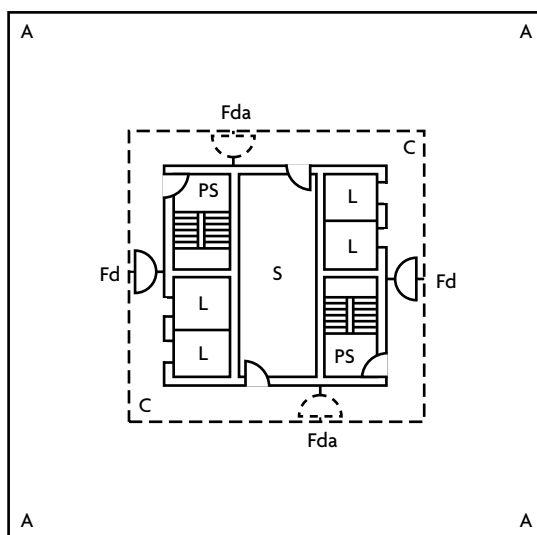
**2.12** Where a central core has more than one exit, **storey exits** should be remote from one another and no two exits should be approached from the same lift hall, common lobby or undivided corridor (Diagram 2.4).

## Open spatial planning

**2.13** **Escape routes** should not be within 4.5m of openings between floors, such as for an escalator, unless either of the following applies.

- The direction of travel is away from the opening.
- An **alternative escape route** does not pass within 4.5m of the open connection (Diagram 2.5).

See para 2.12

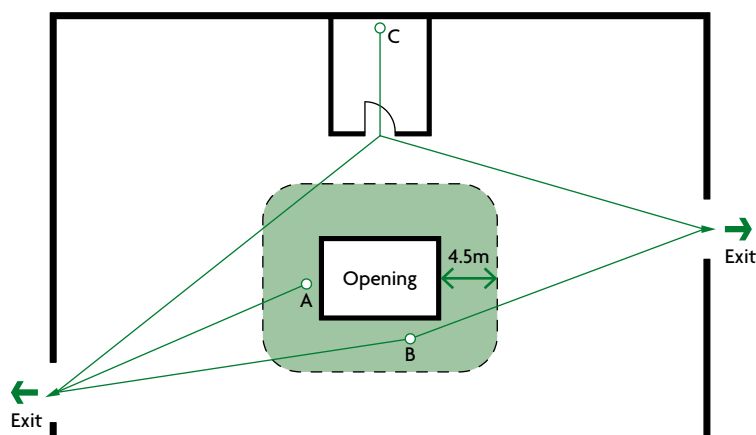


**NOTE:** The doors at both ends of the area marked 'S' should be self-closing fire doorsets unless the area is sub-divided such that any fire in that area will not be able to prejudice both sections of corridor at the same time. If that area is a lift lobby, doors should be provided as shown in Figure 9 in **BS 9999**.

- L Lift
- S Services, toilets, etc.
- Fd Self-closing E 20 S<sub>a</sub> fire doorsets
- Fda Possible alternative position for fire doorset
- C Corridor off which accommodation opens
- PS Protected stairway
- A Accommodation (e.g. office space)

Diagram 2.4 Exits in a central core

See para 2.13



- Area within 4.5m of the opening
- Escape route

From A and B at least one direction of travel is away from the opening. From C, where the initial direction of travel is towards the opening, one of the escape routes is not less than 4.5m from the opening.

Diagram 2.5 Open connections

## Access to storey exits

- 2.14** Where a **storey** has more than one escape stair, it should be planned so that it is not necessary to pass through one stair to reach another. However, it would be acceptable to pass through one stair's **protected lobby** to reach another stair.

## Separation of circulation routes from protected stairways

- 2.15** Where they serve **protected stairways** that are part of primary circulation routes, self-closing fire doors should be fitted with an **automatic release mechanism**, to avoid them being rendered ineffective by misuse. Otherwise, the stair (and any associated **exit passageway**) *should not* form part of the primary circulation route between different parts of the **building** at the same level.

## Storeys divided into different uses

- 2.16** If a **storey** contains areas for consuming food and/or drink, and where that is not the main use of the **building**, then both of the following apply.
- A minimum of two **escape routes** should be provided from each area, except from **inner rooms** that meet the conditions in paragraph 2.11.
  - Those **escape routes** should lead directly to a **storey exit** without entering a kitchen or similar area of high fire hazard.

## Storeys divided into different occupancies

- 2.17** Where a **storey** is divided into areas of occupancy under separate ownership or tenancy, then both of the following apply.
- The **means of escape** from each occupancy should not pass through any other occupancy.
  - If a common corridor or **circulation space** is on the **escape route**, one of the following should apply.
    - It should be a **protected corridor**.
    - A suitable automatic fire detection and alarm system should be installed throughout the **storey**.

## Width of escape routes and exits

- 2.18** The width of **escape routes** and exits should meet the provisions in Table 2.3, as well as the guidance in Approved Document M.
- 2.19** If the maximum number of people likely to use the **escape route** and exit is not known, it should be calculated using the occupant number guidance in Appendix D.
- 2.20** Guidance on the spacing of fixed seating for auditoria is given in Annex D of **BS 9999**.

**Table 2.3 Widths of escape routes and exits**

Maximum number of people	Minimum width (mm) <sup>(1)(2)(3)</sup>
60	750 <sup>(4)</sup>
110	850
220	1050
More than 220	5 per person <sup>(5)</sup>

**NOTES:**

1. See Appendix D for methods of measurement.
2. Widths may need to be increased to meet guidance in Approved Document M.
3. Widths less than 1050mm should not be interpolated.
4. May be reduced to 530mm for gangways between fixed storage racking, other than in public areas of 'shop and commercial' (purpose group 4) buildings.
5. 5mm/person does not apply to an opening serving fewer than 220 people.

## Calculating exit capacity

**2.21** Where multiple **storey exits** are available, fire might prevent one from being used. Remaining exits need to be wide enough for all occupants, so when using Table 2.3, the largest exit should be discounted.

Stairs should be at least as wide as any **storey exit** leading onto them. While some stairs are not subject to discounting (paragraphs 3.14 and 3.15), because the stairs will be available for other floors, the **storey exits** onto them are.

**2.22** To calculate how many people two or more available exits (after discounting) can accommodate, add together the maximum numbers of people that each exit width can accommodate.

For example, three exits each 850mm wide accommodate  $3 \times 110 = 330$  people.

**2.23** If a ground floor **storey exit** and a stair share a **final exit** (via a ground floor lobby), then the **final exit** should be wide enough to evacuate people at a maximum flow rate equal to or greater than from the **storey exit** and stair combined (Diagram 2.6).

See para 2.23

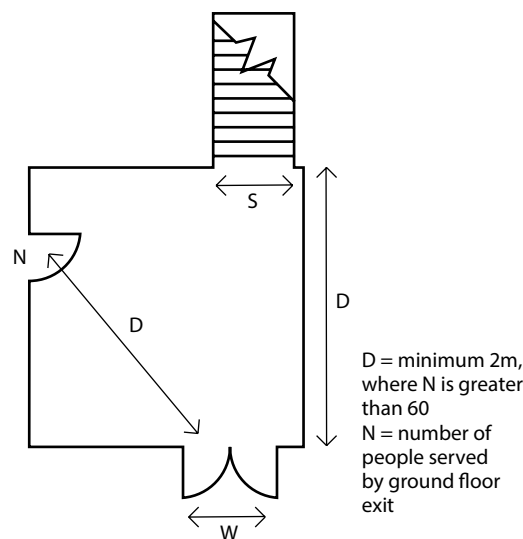


Diagram 2.6 Merging flows at final exit

This can be calculated using the following formula:

$$W = ((N/2.5) + (60S))/80$$

where:

W is the width of final exit in metres

N is the number of people served by ground floor storey exit

S is the stair width in metres.

If the number of people (N) entering the lobby from the ground storey is more than 60, then the distance from the foot of the stair or the storey exit to the final exit should be a minimum of 2m (see Diagram 2.6).

If that minimum distance cannot be achieved, the width of the final exit (W) should be at least the width of the stair plus the width of the storey exit.

## Worked example

A ground floor storey exit serving 250 people shares a common final exit with a 1.2m wide stair.

$$\text{Required final exit width} = ((250/2.5) + (1.2 \times 60))/80 = 2.150\text{m}$$

## Protected corridors

**2.24** A corridor serving as part of the means of escape in any of the following circumstances should be a protected corridor.

- Every corridor that serves bedrooms.
- Every dead-end corridor (excluding recesses and extensions a maximum of 2m deep, as shown in Diagrams 2.7 and 2.8).
- Any corridor shared by two or more occupancies (paragraph 2.17).

See para 2.24

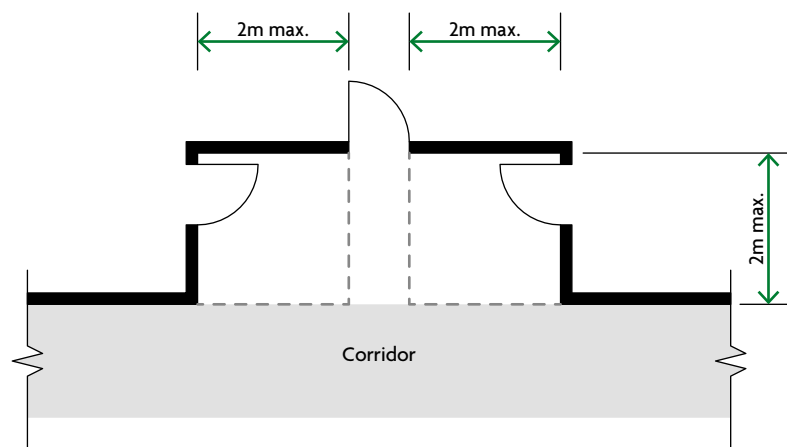


Diagram 2.7 Recesses off corridors

See para 2.24

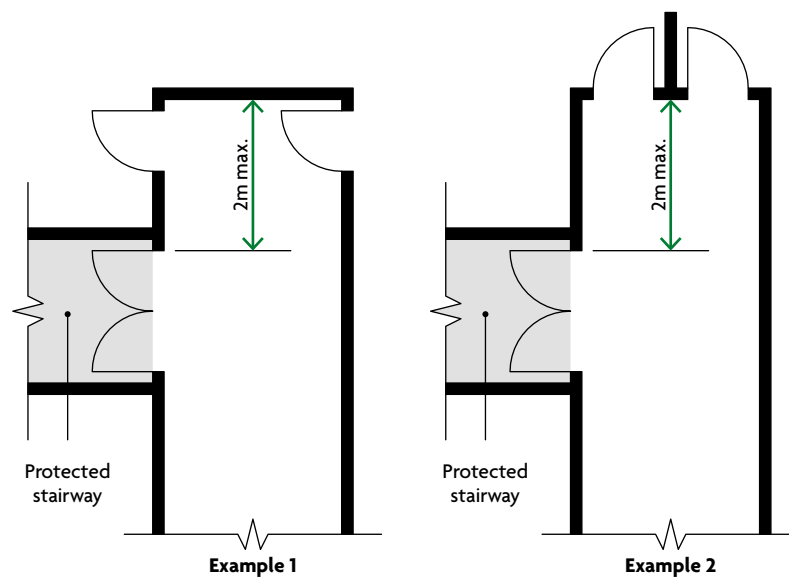


Diagram 2.8 Extension of corridor beyond a protected stairway

## Enclosure of corridors that are not protected corridors

**2.25** If a corridor is used for a **means of escape** but is not a **protected corridor**, even though the enclosing partitions may have no **fire resistance**, both of the following should be met to inhibit the spread of smoke.

- a. Partitions should continue to the soffit of the structural floor above, or to a **suspended ceiling**.
- b. Openings into **rooms** from the corridor should be fitted with doors, which do not need to be **fire doorsets**.

Open planning will not inhibit the spread of smoke, but occupants can become aware of a fire quickly.

## Division of corridors

**2.26** A corridor providing access to **alternative escape routes** *should be divided by fire doorsets fitted with a self-closing device* (and associated screens) where both of the following apply.

- a. It is more than 12m long.
- b. It connects two or more **storey exits**.

The **fire doorsets** (including any screens) should be approximately mid-way between the two **storey exits**. They should safeguard the route from smoke, while considering the layout of the corridor and any adjacent fire risks.

**2.27** For **buildings** other than **dwellings** (**purpose groups** 2 to 7): if a **cavity** exists above the enclosures to a corridor as described above (because the enclosures are not carried to full **storey** height or the underside of the roof covering at the top **storey**), the potential for smoke to bypass the enclosure should be restricted by one of the following methods.

- a. Method 1 – Fitting **cavity barriers** on the line of the enclosure(s) to and across the corridor (Diagram 2.9).
- b. Method 2 – Dividing the **storey** using **fire resisting** construction that passes through the line of the division of the corridor (Diagram 2.9). Any **cavity** above this division should be fitted with **cavity barriers** on the line of division of the **storey** and the corridor.
- c. Method 3 – Enclosing the **cavity** on the lower side by a **fire resisting ceiling** that extends throughout the **building, compartment** or **separated part**.

Any door that could provide a path for smoke to bypass the division should be fitted with a **self-closing device** (but need not necessarily be **fire resisting**).

See para 2.27

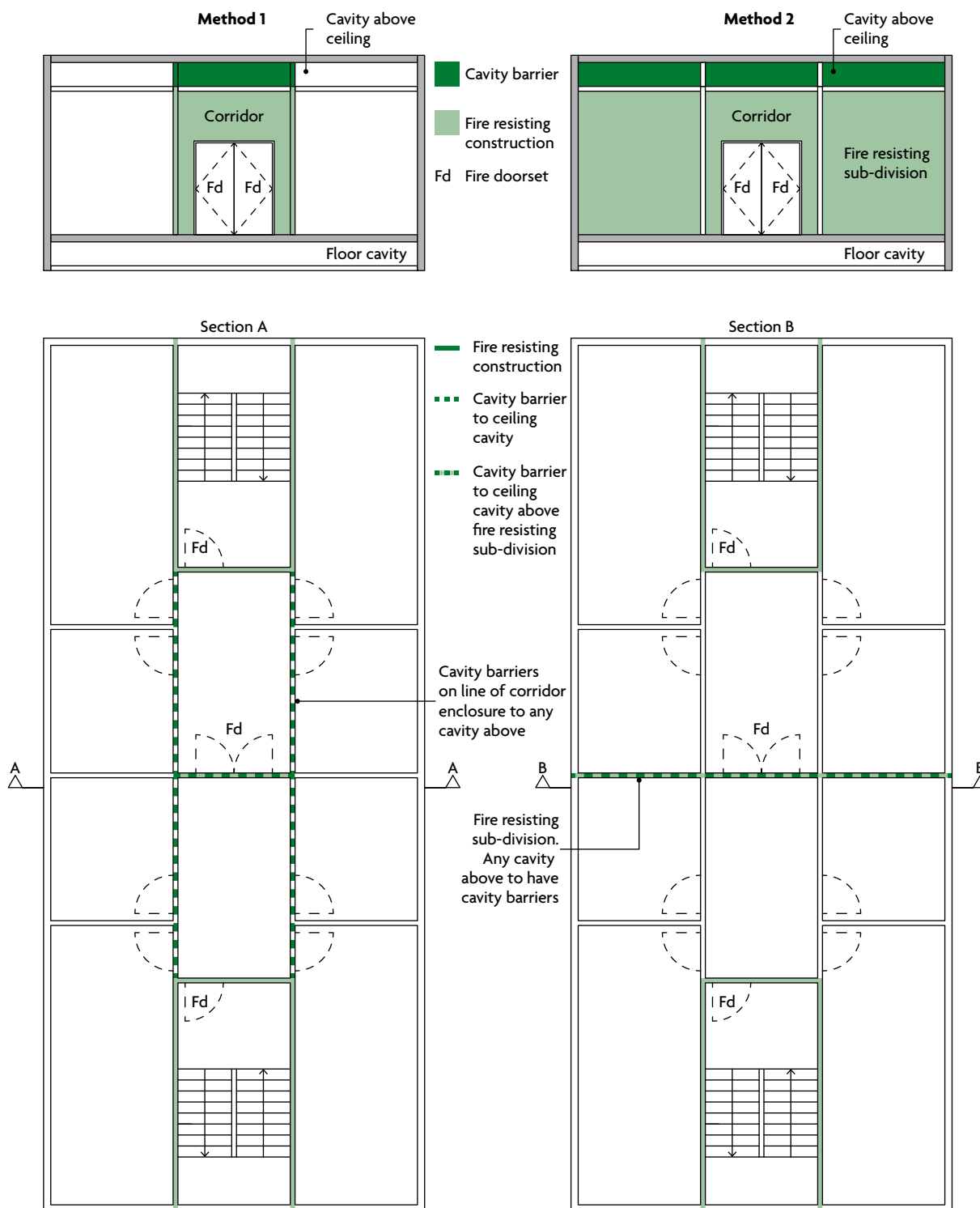
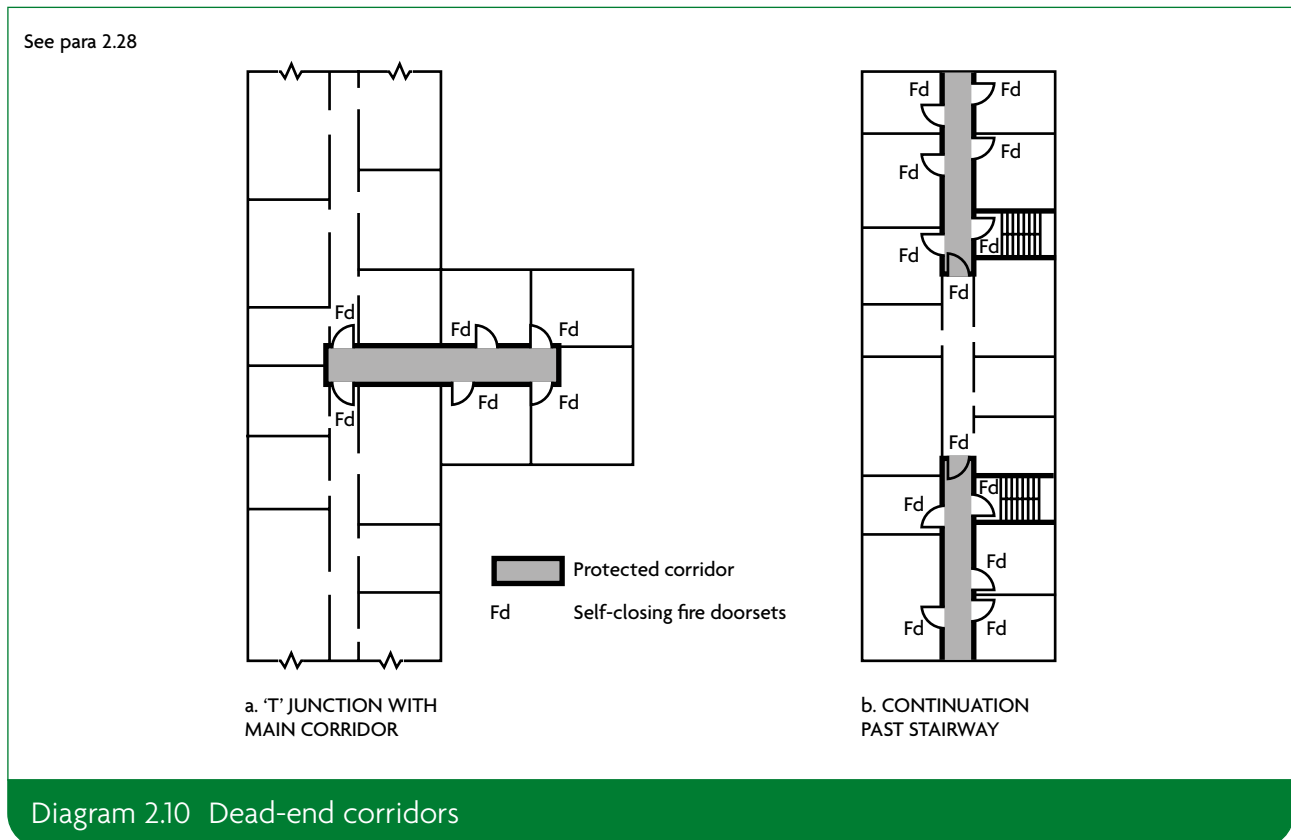


Diagram 2.9 Division of corridors

**2.28** Where **dead ends** of corridors exceeding 4.5m long provide access to a point from which **alternative escape routes** are available, they should be separated by **self-closing fire doorsets** (together with any associated screens) from any part of the corridor that either:

- Provides two directions of escape (Diagram 2.10a)
- Continues past one **storey exit** to another (Diagram 2.10b).

Alternatively, the stairs and corridors may be protected by a pressurisation system complying with **BS EN 12101-6**.



## Cavity barriers

**2.29** Additional measures to safeguard **means of escape** from smoke are given in Section 10.

## External escape routes

**2.30** Where an external **escape route** is beside an **external wall** of the **building**, the **external wall** should be of **fire resisting** construction in both of the following zones.

- Within 1800mm of the **escape route**.
- Up to 1100mm above the surface of the **escape route**.

This *does not* apply to external escape stairs (see paragraph 3.32).

## Escape over flat roofs

**2.31** Where a **storey** or part of a **building** has multiple **escape routes** available, one may be over a flat roof if it does not serve a 'residential (institutional)' (**purpose group 2(a)**) **building**, or part of a **building** intended for use by members of the public.

- 2.32** Where an **escape route** over a flat roof is provided, the roof should comply with all of the following.
- It should be part of the same **building** from which escape is being made.
  - The route across the roof should lead to a **storey exit** or external **escape route**.
  - The part of the roof forming the **escape route** and its supporting structure, together with any opening within 3m of the **escape route**, should be **fire resisting** (minimum REI 30).
  - The route should be clearly defined and guarded by walls and/or protective barriers to protect from falling.

## Residential care homes

### General provisions

- 2.33** The choice of fire safety strategy depends on the way a **building** is designed, furnished, staffed and managed, and on the level of dependency of the residents.
- 2.34** In care homes for the elderly, some or all residents are likely to need help to evacuate. **Buildings** should generally be designed for progressive horizontal evacuation (PHE) in accordance with paragraphs 2.35 to 2.46.

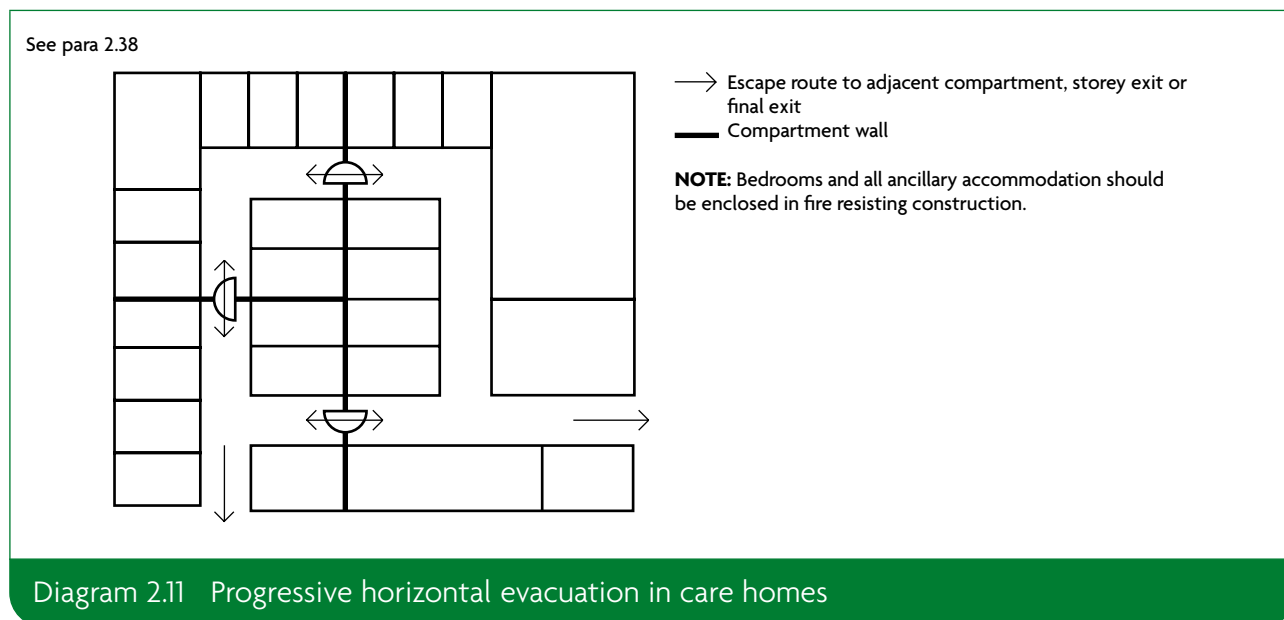
For other care home types, the most appropriate of either a PHE or simultaneous evacuation strategy should be identified. The approach adopted in the design of a **building** must be recorded and communicated to the **building** management team, who can adopt procedures compatible with the **building** design.

### Planning for progressive horizontal evacuation

- 2.35** The guidance below on PHE is for care homes where the provisions of the *Firecode* documents *do not* apply (see paragraph 0.10).
- PHE requires areas used for the care of residents to be divided into protected areas by **compartment walls** and **compartment floors**. Protected areas provide a place of relative safety, from which further evacuation can be made if necessary.
- 2.36** Each **storey** used for the care of residents should be divided by **compartment walls** into at least three protected areas. All floors should be **compartment floors**.
- 2.37** Every protected area should have a minimum of two exits to adjoining protected areas. Maximum **travel distances** within a protected area should be both of the following.
- To the exit to the adjoining protected area: as shown in Table 2.1.
  - From any point to a **storey exit** or a **final exit**: 64m.
- 2.38** A fire in one protected area should not prevent occupants of other areas from reaching a **final exit** (Diagram 2.11). **Escape routes** *should not* pass through ancillary accommodation listed in paragraph 2.44.
- 2.39** The number of residents' beds in protected areas should be based on an assessment of both of the following.
- The number of staff likely to be available.
  - The level of assistance that residents may require.

The maximum number of residents' beds in one protected area *should not* exceed 10, but may need to be lower depending on the assessment.

- 2.40** A protected area used for horizontal evacuation from an adjoining protected area should have a floor area able to accommodate its own occupants plus those from the largest adjoining protected area.



## Fire detection and alarm

- 2.41** A fire detection and alarm system should be provided to L1 standard in accordance with **BS 5839-1**.

## Bedrooms

- 2.42** Each bedroom in a care home should be enclosed in **fire resisting** construction (minimum REI 30) with **fire resisting** doors (minimum E 30). Every corridor serving bedrooms should be a **protected corridor** (see paragraph 2.24).

- 2.43** Bedrooms should not contain more than one single or double bed.

## Ancillary accommodation

- 2.44** Ancillary accommodation such as all of the following should be enclosed by **fire resisting** construction (minimum REI 30).

- Chemical stores.
- Cleaners' **rooms**.
- Clothes storage.
- Day **rooms**.
- Smoking **rooms**.
- Disposal **rooms**.
- Plant **rooms**.
- Linen stores.

- i. Kitchens.
- j. Laundry rooms.
- k. Staff changing and locker rooms.
- l. Store rooms.

### Door closing devices

**2.45** If doors fitted with a self-closing device could present an obstacle to residents, the following hardware in accordance with **BS EN 1155** is appropriate.

- a. Bedrooms: free-swing door closers.
- b. Circulation spaces: hold-open devices.

### Sprinkler systems

**2.46** When a sprinkler system is provided in accordance with Appendix E, the following variations to the guidance given in paragraphs 2.35 to 2.45 are acceptable.

- a. Fire doorsets to bedrooms do not need to be fitted with self-closing devices.
- b. Protected areas may contain more than 10 beds.
- c. Bedrooms may contain more than one bed.

If any of the variations are made, the management procedures should take account of the larger number of residents that may need assistance, and the need to manually close bedroom doors during sleeping hours.

## Section 3: Design for vertical escape

### Introduction

- 3.1** The limits on horizontal travel escape distances mean most people should be able to independently reach a protected **escape route** or **final exit**. The following guidance also includes measures for people who are unable to use stairs without help.

In larger **buildings**, some escape stairs may need to serve as **firefighting stairs**, and Section 17 will also apply.

### Number of escape stairs

#### Mixed use buildings

- 3.2** If a **building** contains **storeys**, or parts of **storeys**, in different **purpose groups**, it is necessary to consider providing either of the following.
- Separate **escape routes** from the areas of different use.
  - Other effective means to protect common **escape routes**.

#### Single escape stairs

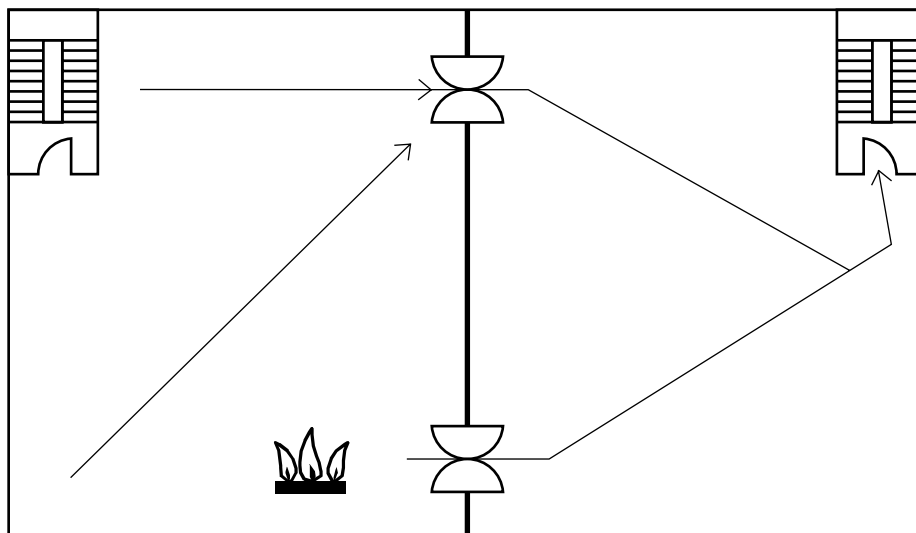
- 3.3** A single escape stair may serve a **building** (or part of a **building**) in the following situations.
- When independent **escape routes** from areas in different **purpose groups** are not necessary (see paragraph 3.2).
  - From a basement that is allowed to have a single **escape route** in accordance with paragraph 2.6b and Table 2.1.
  - In small premises, provided it meets the conditions in paragraph 4.2.
  - From a **building** that meets both of the following conditions.
    - It has no **storey** with a floor level more than 11m above ground level.
    - It is allowed to have only a single **escape route** in every **storey** in accordance with paragraph 2.6b and Table 2.1.
  - An office **building** with a maximum of five **storeys** above the ground **storey** where both of the following apply.
    - The **travel distance** from every point in each **storey** does not exceed the distances given in Table 2.1 for escape in one direction only.
    - Every **storey** with a floor level more than 11m above ground level has an alternative **means of escape**.

- f. A factory comprising no more than either of the following.
  - i. For low risk **buildings**, two **storeys** above the ground **storey**.
  - ii. For normal risk **buildings**, one **storey** above the ground **storey**, provided the **travel distance** from every point on each **storey** does not exceed the distances given in Table 2.1 for escape in one direction only.
- g. Process plant **buildings** with a maximum of 10 people.

## Provision of refuges

- 3.4** Refuges form part of the management plan and offer relatively safe areas for people to wait for a short period only. Refuges should meet the following conditions.
- a. Refuges should be provided on every **storey** (except ones consisting only of plant **rooms**) of each **protected stairway** providing an exit from that **storey**.
  - b. Refuges do not need to be located within the stair enclosure, but should enable direct access to the stair.
  - c. The number of refuge spaces does not need to equal the number of wheelchair users who may be in the **building**. A single refuge may be occupied by more than one person during the evacuation procedure.
- 3.5** The following are both examples of satisfactory refuges.
- a. An enclosure such as a **compartment** (Diagram 3.1), **protected lobby**, **protected corridor** or **protected stairway** (Diagram 3.2).
  - b. An area in the open air, such as a flat roof, balcony, podium or similar place, that meets both of the following.
    - i. It is protected (or remote) from any fire risk.
    - ii. It has its own **means of escape**.
- 3.6** Refuges should be a minimum of 900mm × 1400mm in size and accessible by someone in a wheelchair. Where sited in a **protected stairway**, **protected lobby** or **protected corridor**, they should not reduce the width of the **escape route** or obstruct the flow of people escaping.
- 3.7** Refuges should be provided with an emergency voice communication (EVC) system complying with **BS 5839-9**. It should consist of Type B outstations communicating with a master station in the **building control room** (if one exists) or next to the fire detection and alarm panel. In some **buildings**, wireless technology may be more appropriate.
- 3.8** Refuges and **evacuation lifts** should be clearly identified. In **protected lobbies** and **protected stairways** there should be a blue mandatory sign worded 'Refuge – keep clear' in addition to fire safety signs.
- 3.9** Paragraph 5.32 gives guidance on using lifts, including **evacuation lifts**, during a fire.

See para 3.5

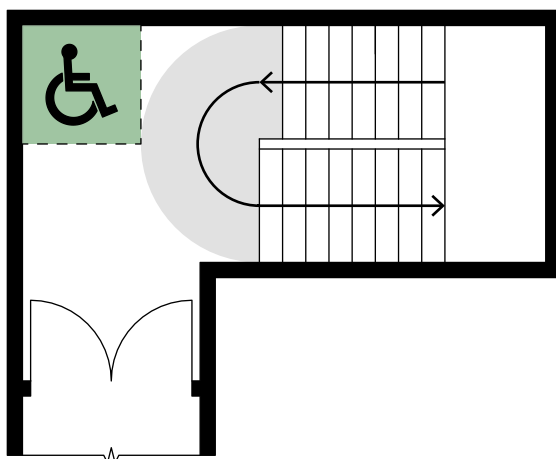


Storey divided into two refuges by compartment wall (stairways not provided with wheelchair space).

**NOTE:** People occupying the left-hand compartment would not reach a refuge until they had entered the right-hand compartment. Two fire doorsets in the partition are necessary in case access to one of the doorsets is blocked by fire.

Diagram 3.1 Refuge formed by compartmentation

See para 3.5



Provision where access to the refuge is counter to the access flow within the stairway.



Wheelchair space



Occupied by escape flow

Diagram 3.2 Refuge formed in a protected stairway

## Width of escape stairs

**3.10** The width of escape stairs should meet all of the following conditions.

- It should be at least as wide as any exits giving access to the stairs.

- b. It should be no less than the minimum widths given in Table 3.1.
  - c. It should not reduce at any point on the way to a **final exit**.
  - d. It should not exceed 1400mm in stairs taller than 30m, unless a central handrail is provided. When a central handrail is provided, the stair width on each side of it should be considered separately when assessing stair capacity.
- 3.11** Approved Document K requires stairs more than 2000mm wide in public **buildings** to have a central handrail.
- 3.12** If an exit route from a stair is also the **escape route** from the ground **storey** and/or **basement storey**, the width of the exit route may need to be increased (see paragraph 2.23).

**Table 3.1 Minimum widths of escape stairs**

Situation of stair	Maximum number of people served <sup>(1)</sup>	Minimum stair width (mm)
1a. In a 'residential (institutional)' building (unless the stair will only be used by staff)	150	1000 <sup>(2)</sup>
1b. In an 'assembly and recreation' building and serving an area used for assembly purposes (unless the area is less than 100m <sup>2</sup> )	220	1100
1c. In any other building and serving an area with an occupancy of more than 50	Over 220	See note 3
2. Any stair not described above	50	800 <sup>(4)</sup>

**NOTES:**

1. Assessed as likely to use the stair in a fire emergency.
2. Section 6 of **BS 9999** recommends that firefighting stairs should be at least 1100mm wide.
3. See Table 3.2 for the size of stairs for simultaneous evacuation, and Table 3.3 for phased evacuation.
4. To comply with the guidance in Approved Document M on minimum widths for areas accessible to disabled people, this may need to be increased to 1000mm.

## Calculation of minimum stair width

- 3.13** The width depends on the number of stairs provided and the escape strategy (simultaneous or phased evacuation). If the maximum number of people needing to use escape stairs is unknown, calculate it using the floor space factors in Appendix D.

## Discounting of stairs

- 3.14** Regardless of escape strategy, where two or more stairs are provided, it should be assumed that one might not be available during a fire. Each stair should be discounted in turn to ensure the capacity of the remaining stairs is adequate. This applies to **buildings** with or without a sprinkler system.
- 3.15** Paragraph 3.14 does not apply if either of the following applies.
- a. Escape stairs are protected by a smoke control system designed in accordance with **BS EN 12101-6**.
  - b. Escape stairs are approached on each **storey** (except the top **storey**) through a **protected lobby**.
- Despite these exceptions, at least one **storey exit** still needs to be discounted (paragraph 2.21).

Paragraph 3.34 identifies cases where stairs need lobby protection.

## Simultaneous evacuation

**3.16** The width of escape stairs should take account of the number of people using them while evacuating all **storeys** at the same time. The following stairs should be designed to allow simultaneous evacuation.

- All stairs serving basements.
- All stairs serving **buildings** with **open spatial planning**.
- All stairs serving 'residential (other)' (**purpose group 2(b)**) or 'assembly and recreation' (**purpose group 5**) **buildings**.

Annexes B and C of **BS 9999** include designs based on simultaneous evacuation.

**3.17** The capacity of stairs of widths from 1000mm to 1800mm is given in Table 3.2.

**Table 3.2 Capacity of stairs for basements and for simultaneous evacuation of the building**

No. of floors served	Maximum number of people served by a stair of width:								
	1000mm	1100mm	1200mm	1300mm	1400mm	1500mm	1600mm	1700mm	1800mm
1	150	220	240	260	280	300	320	340	360
2	190	260	285	310	335	360	385	410	435
3	230	300	330	360	390	420	450	480	510
4	270	340	375	410	445	480	515	550	585
5	310	380	420	460	500	540	580	620	660
6	350	420	465	510	555	600	645	690	735
7	390	460	510	560	610	660	710	760	810
8	430	500	555	610	665	720	775	830	885
9	470	540	600	660	720	780	840	900	960
10	510	580	645	710	775	840	905	970	1035

### NOTES:

- The capacity of stairs that serve more than 10 storeys may be obtained by using linear extrapolation.
- The capacity of stairs not less than 1100mm wide may also be obtained by using the formulas in paragraph 3.18.
- Unless a central handrail is provided, stairs with a rise of more than 30m should be a maximum width of 1400mm (see paragraph 3.10).
- Stairs wider than 2000mm should have a central handrail (see paragraph 3.11).

**3.18** As an alternative to Table 3.2, the capacity of stairs 1100mm wide or wider can be found using either of the following formulas:

- $P = 200W + 50 (W - 0.3)(N - 1)$
- $W = P + 15N - 15 / 150 + 50N$

where:

P is the number of people that can be served

W is the width of the stair, in metres

N is the number of **storeys** served.

Separate calculations should be made for stairs serving **basement storeys** and stairs serving upper **storeys**.

The population, P, should be divided by the number of available stairs.

The formula is useful to determine the width of stairs where people are not distributed evenly – either within a **storey** or between **storeys**.

In the formula,  $200W$  represents the number of people estimated to have left the stair after 2.5 minutes of evacuation, and  $50(W - 0.3)(N - 1)$  represents the number of people estimated to be on the stair after 2.5 minutes of evacuation.

## Worked examples

A 14 storey building contains 12 storeys of offices (ground + 11). The top two storeys contain flats that are served by separate stairs. What is the minimum width needed for the stairs that serve the office floors, for simultaneous evacuation? In the 11 above-ground-floor offices, 1200 people use the stairs. (People in the ground floor offices do not use the stairs.) In this example, two stairs are shown to satisfy the travel distance limitations.

### a. The population is distributed evenly

The top office storey is at a height greater than 18m, therefore both stairs need lobby protection (see paragraph 3.34). Because both stairs are entered at each level via a protected lobby, both stairs can be assumed to be available (see paragraph 3.15).

$$P = 1200/2 = 600, N = 11$$

From the formula:

$$600 = 200W + 50(W - 0.3)(11 - 1)$$

$$600 = 200W + (50W - 15)(10)$$

$$600 = 200W + 500W - 150$$

$$750 = 700W$$

$$W = 1070\text{mm}$$

Therefore both stairs should be at least 1070mm wide. But this needs to be increased to 1100mm, because the formula applies to stairs 1100mm wide or wider (see paragraph 3.18).

This width will also be adequate when one storey exit is discounted as described in paragraph 2.21. It also complies with paragraph 3.10a (i.e. the stair widths are not less than the minimum widths needed for 110 people in Table 2.3).

### b. The population is not distributed evenly

(e.g. 1000 people occupy floors 1 to 9, and 200 occupy floors 10 and 11).

The top office storey is at a height greater than 18m, therefore both stairs need lobby protection (see paragraph 3.34). Because both stairs are entered at each level via a protected lobby, both stairs can be assumed to be available (see paragraph 3.15).

To find the width of:

- the stairs serving floors 10 and 11:

$$P = 200/2 = 100, N = 2$$

From the formula:

$$100 = 200W + 50 (W - 0.3)(2 - 1)$$

$$100 = 200W + (50W - 15)(1)$$

$$100 = 200W + 50W - 15$$

$$115 = 250W$$

$$W = 460\text{mm}$$

Therefore both stairs between the 9th floor landing and the top floor should be at least 460mm wide. But this needs to be increased to 1100mm, because the formula applies to stairs 1100mm wide or wider (see paragraph 3.18).

This width will also be adequate when one storey exit is discounted as described in paragraph 2.21. It also complies with paragraph 3.10a (i.e. the stair widths are not less than the minimum widths needed for 100 people in Table 2.3).

- the stairs serving floors 1 to 9:

$$P = 1200/2 = 600, N = 9$$

From the formula:

$$600 = 200W + 50 (W - 0.3)(9 - 1)$$

$$600 = 200W + (50W - 15)(8)$$

$$600 = 200W + 400W - 120$$

$$720 = 600W$$

$$W = 1200\text{mm}$$

Therefore both stairs between the ninth floor landing and the ground floor should be at least 1200mm wide.

This width will also be adequate when one storey exit is discounted as described in paragraph 2.21. It also complies with paragraph 3.10a (i.e. the stair widths are not less than the minimum widths needed for 134 people in Table 2.3).

## Phased evacuation

**3.19** Phased evacuation cannot be used in every type of **building**, but can be advantageous for escape stairs in high **buildings**. It requires supporting facilities, such as fire detection and alarm systems, to be provided and maintained.

In a phased evacuation, the first people to be evacuated are those with reduced mobility and those on the **storey** most immediately affected by the fire. If needed, subsequent evacuation is done two floors at a time, reducing disruption in large **buildings**.

Phased evacuation enables stairs to be narrower than with simultaneous evacuation, and may be used for any **building** provided it is not identified in paragraph 3.16.

**3.20** Phased evacuation in buildings over 30m in height introduces the potential for escaping people to impede firefighters entering and operating within the building. This can be addressed by consulting with the fire and rescue service about special management procedures.

In very tall buildings, typically over 45m in height, physical measures may need to be incorporated, such as by discounting a stair.

**3.21** A building (or part of a building) designed for phased evacuation should satisfy all of the following criteria.

- At each storey except a top storey, stairs should be approached through a protected lobby or protected corridor.
- At each storey, the lifts should be approached through a protected lobby (see paragraph 5.37).
- Every floor should be a compartment floor (REI depending on height and use of the building).
- If there is a storey with a floor over 30m above ground level, the building should be protected throughout by an automatic sprinkler system in accordance with Appendix E.
- The building should be fitted with an appropriate fire warning system conforming to at least the L3 standard given in **BS 5839-1**.
- An internal speech communication system should provide communication between a control point at fire and rescue service access level and a fire warden on every storey. The recommendations for phased evacuation provided in **BS 5839-1** should be followed. Where it is deemed appropriate to install a voice alarm, this should be in accordance with **BS 5839-8**.

**3.22** The minimum width of stairs needed for phased evacuation is given in Table 3.3.

**Table 3.3 Minimum width of stairs designed for phased evacuation**

Maximum number of people in any storey	Stair width (mm)
100	1000
120	1100
130	1200
140	1300
150	1400
160	1500
170	1600
180	1700
190	1800

**NOTES:**

- This table assumes a phased evacuation of the fire floor first followed by evacuation of not more than two floors at a time.
- Unless a central handrail is provided, stairs with a rise of more than 30m should be a maximum width of 1400mm (see paragraph 3.10).
- As an alternative to using this table, the minimum width (in mm) may be calculated from:  
 $(P \times 10) - 100$   
 where P = the number of people on the most heavily occupied storey.  
 However, the minimum width of a stair should be 1000mm.

### Worked example using Table 3.3

What is the minimum width needed for the stairs serving a 15 storey office building (ground + 14 office floors), assuming a total population of 2500 people (excluding the ground floor population, which does not use the stairs)? To satisfy the travel distance limitations, three stairs are required.

The building is over 45m in height and designed for phased evacuation. It has been decided to discount one stair to take account of fire and rescue service operations as described in paragraph 3.20. Therefore:

- Number of people per storey =  $2500/14 = 179$ .

Each remaining stair must be able to accommodate half the population of one storey (i.e. 90 people).

Thus each stair should be 1000mm wide (maximum capacity 100 people).

This width will also be adequate when one storey exit is discounted as described in paragraph 2.21. It also complies with paragraph 3.10a (i.e. the stair widths are not less than the minimum width needed for 90 people in Table 2.3).

- At least one of those stairs needs to be a firefighting stair, therefore a minimum width of 1100mm is needed (see note 2 to Table 3.1).

### Additional worked example using Table 3.3

What is the minimum width needed for the stairs serving a 9 storey office building (ground + 8 office floors), assuming a total population of 1920 people (excluding the ground floor population, which does not use the stairs)? To satisfy the travel distance limitations, two stairs are required.

As both stairs need to be entered at each level through a protected lobby (see paragraph 3.21), both stairs can be assumed to be available (see paragraph 3.15). Therefore:

- Number of people per storey =  $1920/8 = 240$ .
- Each stair must be able to accommodate half the population of one storey (i.e.  $240/2 = 120$  people).
- Thus both stairs would require a width of 1100mm (maximum capacity 120 people) according to Table 3.3, but:
- Each storey exit needs to be able to serve 240 people, because of discounting as described in paragraph 2.21. The minimum exit width needed for 240 people in Table 2.3 is 1200mm. As described in paragraph 3.10a, the stair should be at least as wide as the storey exit serving it.
- The required stair width is therefore 1200mm.

## Design and protection of escape stairs

### Enclosure of escape stairs

**3.23** Every internal escape stair should be a **protected stairway** (within a **fire resisting** enclosure). If it is also a **protected shaft** or **firefighting shaft**, additional guidance in Sections 8 and 17 applies.

There is one exception: an unprotected stair (e.g. an accommodation stair) may form part of an internal route to a **storey exit** or **final exit**, provided that the distance of travel and the number of people involved are very limited. For example, small premises (Section 4) and raised storage areas (see paragraphs 7.6 and 7.7).

## Construction of escape stairs

- 3.24** The flights and landings of escape stairs should be constructed of materials achieving class A2-s3, d2 or better in all of the following situations.
- If the escape stair is the only stair serving the **building** or part of the **building**, *unless the building has two or three storeys and is an office building*.
  - If the escape stair is within a **basement storey**.
  - If the escape stair serves any **storey** that has a floor level more than 18m above ground or access level.
  - If the escape stair is external, except where the stair connects the ground floor or ground level with a floor or flat roof a maximum of 6m above or below ground level.
  - If the escape stair is a **firefighting stair**.

Materials achieving class B-s3, d2 or worse may be added to the top horizontal surface, except on **firefighting stairs**.

- 3.25** Further guidance on **firefighting stairs** is given in Section 17. Dimensional constraints on the design of stairs are given in Approved Document K.

## Single steps

- 3.26** Single steps on **escape routes** should be prominently marked. A single step on the line of a doorway is acceptable, subject to paragraph 5.22.

## Helical stairs and spiral stairs

- 3.27** Helical stairs and spiral stairs may form part of an **escape route** provided they are designed in accordance with **BS 5395-2**. If they are intended to serve members of the public, stairs should be type E (public) stairs.

## Fixed ladders

- 3.28** Fixed ladders should not be provided as a **means of escape** for members of the public. They should only be provided where a conventional stair is impractical, such as for access to plant **rooms** which are not normally occupied.

## External walls adjacent to protected stairways

- 3.29** With some configurations of **external wall**, a fire in one part of a **building** could subject the **external wall** of a **protected stairway** to heat (for example, where the two are adjacent at an internal angle in the façade, as shown in Diagram 3.3).
- 3.30** If a **protected stairway** projects beyond, is recessed from or is in an internal angle of the adjoining **external wall** of the **building**, then the minimum distance between an **unprotected area** of the **building** enclosure and an **unprotected area** of the stair enclosure should be 1800mm.

See para 3.29

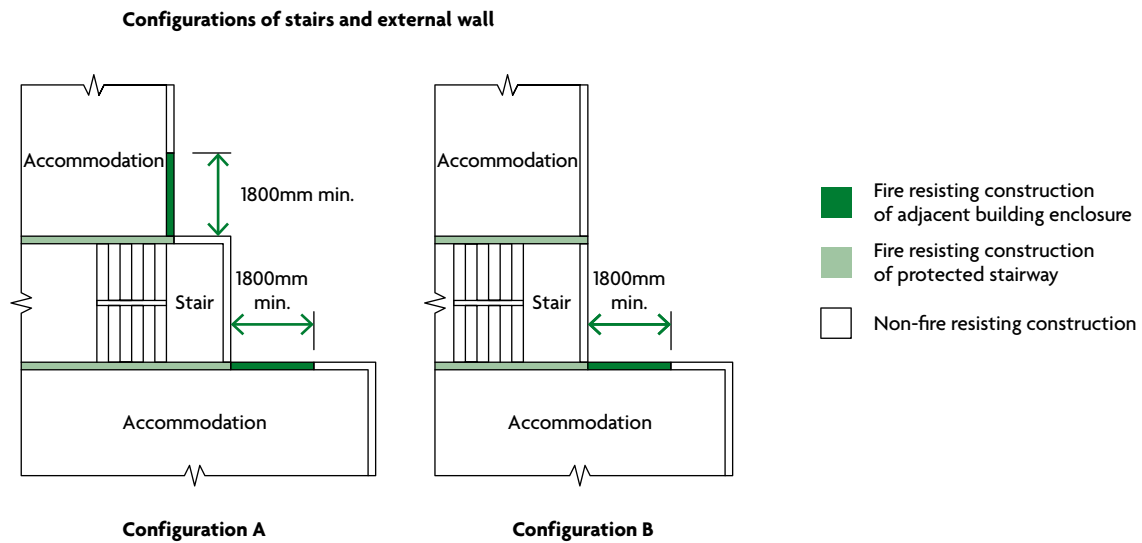


Diagram 3.3 External protection to protected stairways

## External escape stairs

**3.31** Where a storey or part of the building has more than one escape route available, some of the escape routes may be via an external escape stair, provided the following conditions are met.

- a. There is at least one internal escape stair from every part of each storey (excluding plant areas).
- b. In the case of an 'assembly and recreation' (purpose group 5) building, the route is not intended for use by the public.
- c. In the case of a 'residential (institutional)' (purpose group 2(a)) building, the route serves only office or residential staff accommodation.

**3.32** Any external escape stair should meet all of the following conditions (Diagram 3.4).

- a. Doors to the stair should be fire resisting (minimum E 30) and be fitted with a self-closing device, except for a single exit door from the building to the top landing of a downward-leading external stair, provided it is the only door onto the landing.
- b. Fire resisting construction (minimum RE 30) is required for the building envelope within the following zones, measured from the flights and landings of the external stair.
  - i. 1800mm above and horizontally.
  - ii. 9m vertically below.
  - iii. 1100mm above the top landing of the stair (except where the stair leads from basement to ground level).
- c. Fire resisting construction (minimum RE 30) should be provided for any part of the building (including doors) within 1800mm of the escape route from the foot of the stair to a place of safety. This does not apply if there are alternative escape routes from the foot of the external escape stair.

- d. Stairs more than 6m in height should be protected from adverse weather. Protection should prevent the build-up of snow or ice but does not require full enclosure.
- e. Glazing in areas of fire resisting construction should be fixed shut and fire resisting, in terms of integrity but not insulation (minimum E 30).

**3.33** Access to an external escape stair may be via a flat roof, provided the flat roof meets the requirements of paragraphs 2.31 and 2.32.

See para 3.32

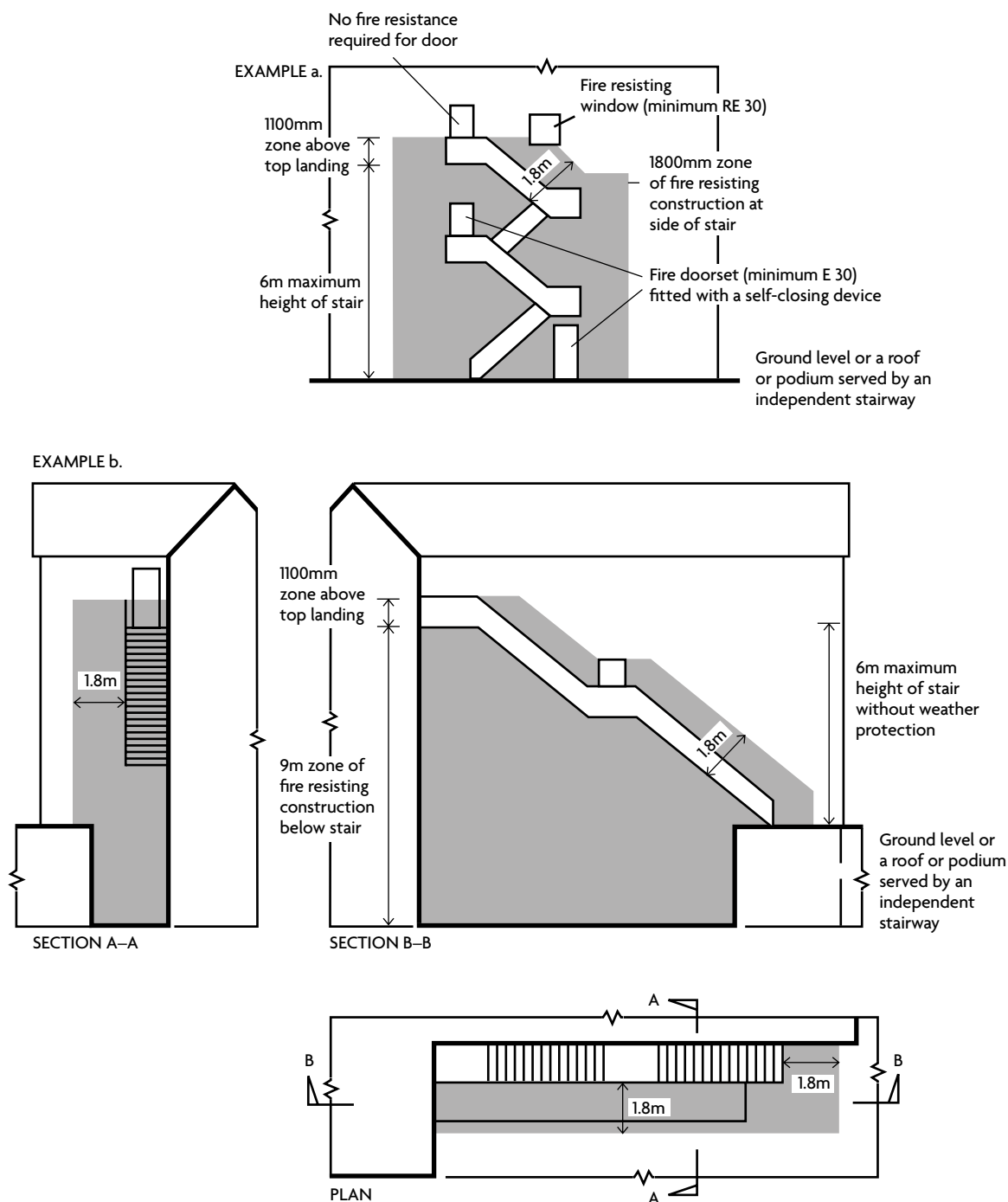


Diagram 3.4 Fire resistance of areas near to external stairs

## Access lobbies and corridors

**3.34** In the following situations, **protected lobbies** or **protected corridors** should be provided at all **storeys** above ground, except the top **storey**.

- If the stair is the only one serving a **building** or part of a **building** that has more than one **storey** above or below the ground **storey**.
- If the stair serves any **storey** at a **height** of 18m or more above ground level.
- If the **building** is designed for phased evacuation.
- If the stair is a **firefighting stair**.
- If the option in paragraph 3.15b has been used so as not to discount one stair when calculating stair widths.

As an alternative to (a) to (c), a smoke control system as described in paragraph 3.15a may be used.

**3.35** A **protected lobby** should be provided between an escape stair and a **place of special fire hazard** to protect from the ingress of smoke. The lobby should have a minimum 0.4m<sup>2</sup> of permanent ventilation, or be protected by a mechanical smoke control system.

## Exits from protected stairways

**3.36** Every **protected stairway** should lead to a **final exit**, either directly or via an **exit passageway**. Any protected exit corridor or stair should have the same standard of **fire resistance** and lobby protection as the stair it serves. The exit from a **protected stairway** should comply with paragraphs 5.20 to 5.24.

## Separation of adjoining protected stairways

**3.37** The construction separating two adjacent **protected stairways** (or **exit passageways**) leading to different **final exits** should be imperforate.

## Use of space within protected stairways

**3.38** A **protected stairway** may only include any of the following.

- Sanitary accommodation or washrooms, as long as the accommodation is not used as a cloakroom. A gas water heater or sanitary towel incinerator may be installed in the accommodation, but no other gas appliance.
- If the **protected stairway** is not a **firefighting stair**:* a lift well.
- If the **protected stairway** is not the only stair serving the **building** or part of the **building**:* a reception desk or enquiry office area at ground or access level. The reception or enquiry office area should have a maximum area of 10m<sup>2</sup>.
- If the **protected stairway** is not the only stair serving the **building** or part of the **building**:* cupboards enclosed with **fire resisting** construction.

## Gas service and installation pipes in protected stairways

**3.39** Gas service and installation pipes and meters should not be within a protected stairway, unless installed in accordance with the Pipelines Safety Regulations 1996 and the Gas Safety (Installation and Use) Regulations 1998.

## Basement stairs

**3.40** An escape stair forming part of the only escape route from an upper storey should *not* continue down to serve a basement storey. The basement storey should be served by a separate escape stair.

**3.41** Where multiple escape stairs serve the upper storeys, only one needs to end at ground level. Other stairs may connect with the basement storeys if there is a protected lobby or a protected corridor between the stairs and accommodation at each basement level.

## Section 4: Small premises

- 4.1** A 'small premises' is generally limited both in its size and in its number of occupants. When undivided, all of its parts are likely to be clearly visible to occupants. Occupants of small premises will be able to reach an exit quickly in an emergency and therefore a reduction in the number of exits and stairs is acceptable.

This guidance is not applicable to small premises where highly flammable materials are sold, stored or used.

- 4.2** Small premises should meet all of the following general conditions.

- a.
  - i. It should be single occupancy.
  - ii. It should not comprise more than a **basement storey**, ground **storey** and first **storey**.
  - iii. No **storey** should have a floor area more than 280m<sup>2</sup>.
- b. Any kitchen or other open cooking arrangements should be at the extremity of any **dead end** remote from the exits.
- c. For a bar or restaurant, the seating or standing accommodation (Table D1) should be planned for a maximum of 30 people per **storey**. The seating or standing accommodation for the ground **storey** may be planned for 100 people if it has a **final exit** independent of the stair.

- 4.3** The following paragraphs *only* apply in place of those provisions elsewhere in this Approved Document which relate to the following.

- a. The number and position of exits and **protected stairways**.
- b. Measuring distances of travel.
- c. Open escape stairs.

For provisions other than those listed above, the guidance elsewhere in this Approved Document should be followed.

### Construction

- 4.4** Except in kitchens, ancillary offices and stores, floor areas should be undivided so exits are clearly visible from all parts.
- 4.5** Store **rooms** should be enclosed with **fire resisting** construction (minimum REI 30).

### Travel distance and number of escape routes

- 4.6** **Escape routes** should be sited so that the **travel distance** from any point of a **storey** to the nearest **storey exit** does not exceed the distance given in Table 4.1 (see Diagrams 4.1, 4.2 and 4.3). The siting of two or more exits or stairs should give effective alternative directions of travel from any point in a **storey**.

**Table 4.1 Maximum travel distances in small premises**

Storey	Maximum travel distance (m)
Ground storey with a single exit	27
Basement or first storey with a single stair	18
Storey with more than one exit/stair	45

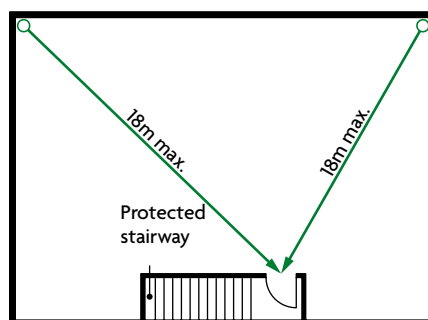
**NOTES:**

If the internal layout of partitions, fittings, etc. is not known, direct distances, rather than travel distances, should be assessed. The direct distance should be assumed to be two-thirds of the travel distance.

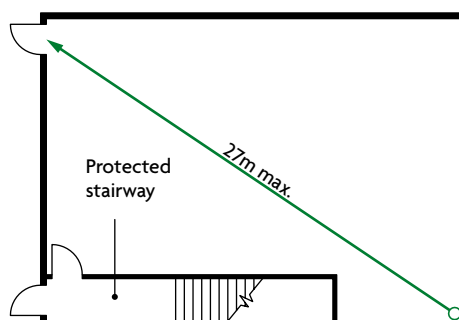
The travel distance in small premises with an open stair is measured as follows.

- In a basement: to the foot of the stair.
- On a first storey: to the head of the stair.

See para 4.6



**Basement and/or first storey**

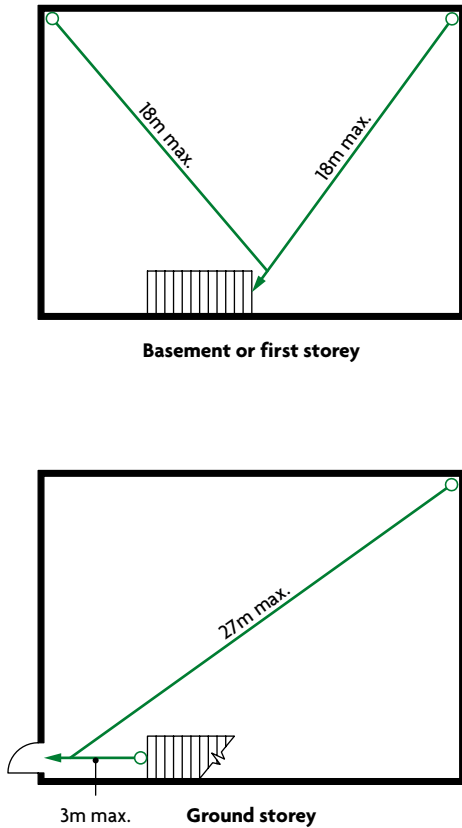


**Ground storey**

**NOTE:** Maximum floor area in any one storey 280m<sup>2</sup>. Restricted accommodation if used as a restaurant or bar.

**Diagram 4.1** Maximum travel distances in a small two or three storey premises with a single protected stairway to each storey

See para 4.6

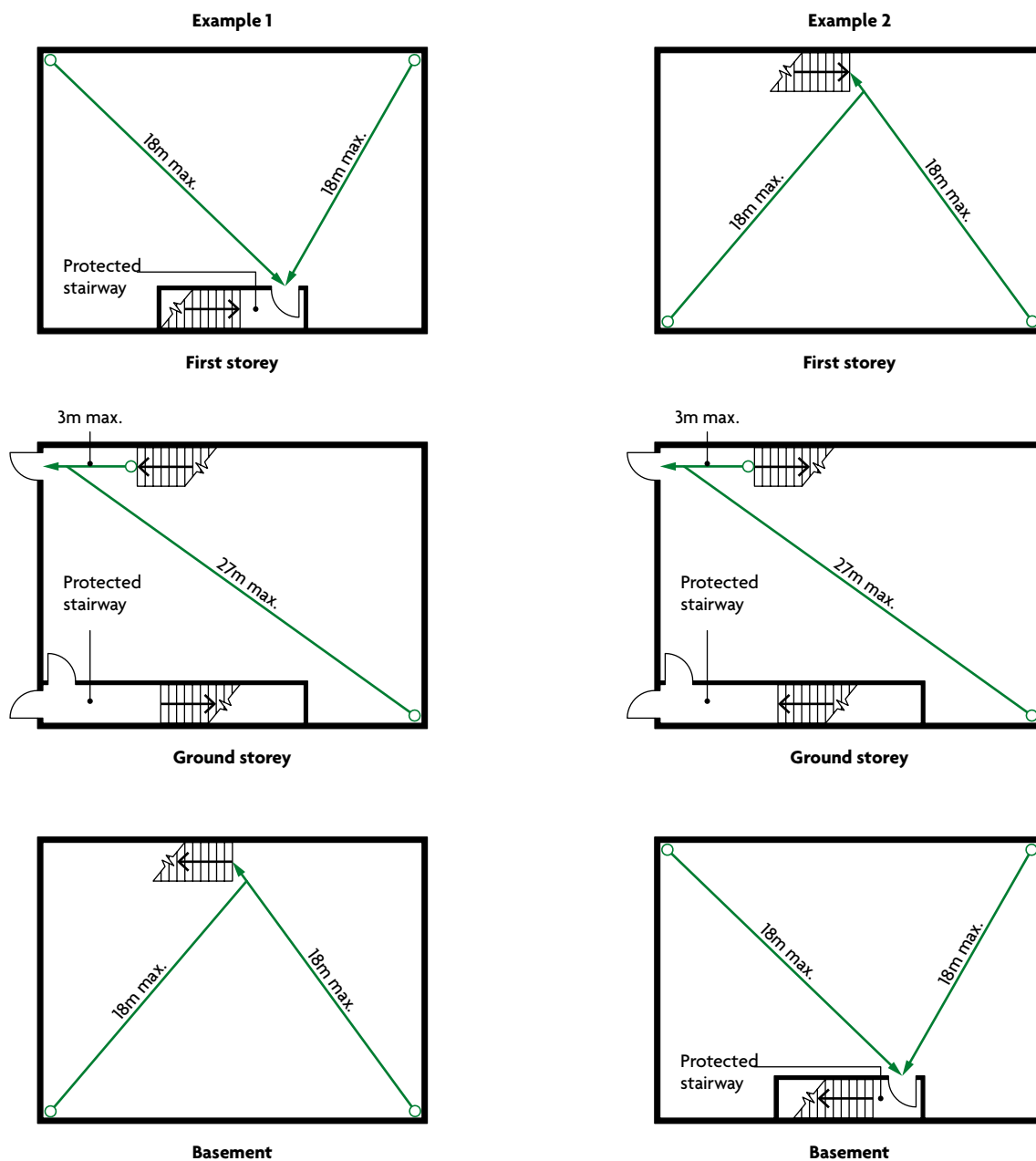


**NOTES:**

1. Maximum floor area in any one storey 90m<sup>2</sup>.
2. The premises may not be used as a restaurant or bar.
3. Only acceptable in two storey premises (first + ground storey or basement + ground storey).
4. Travel distances are set out in Table 4.1.

Diagram 4.2 Maximum travel distances in a small three storey premises with a single open stair

See para 4.6



#### NOTES:

1. Maximum floor area in any one storey 90m<sup>2</sup>.
2. Enclosed stair at ground storey level may be from either the basement or the first storey.
3. The premises may not be used as a restaurant or bar.
4. Travel distances are set out in Table 4.1.

Diagram 4.3 Maximum travel distances in a small three storey premises with a single stair to each storey

## Escape stairs in small premises

- 4.7** A single escape stair may be used in small premises.
- 4.8** An open stair may be used as a **means of escape** if all of the following apply.
- The stair connects a maximum of two **storeys**.
  - The stair enters the ground **storey** a maximum of 3m from the **final exit** (see Diagrams 4.2 and 4.3).
  - The premises is not a bar or restaurant.
  - Either of the following applies.
    - The **storey** is also served by a **protected stairway**.
    - The stair is a single stair and the floor area of any single **storey** is a maximum of 90m<sup>2</sup>.
- 4.9** Where the premises contains three **storeys** and a single open stair serves a top or bottom **storey**, the stair serving the other **storey** should be enclosed with **fire resisting** construction at the ground **storey** level and discharge to a **final exit** independent of the ground **storey** (see Diagram 4.3).

## Section 5: General provisions

### Introduction

- 5.1** This section applies to all **buildings** and deals with the design, construction and protection of **escape routes** and service installations.

### Protection of escape routes

#### Fire resistance of enclosures

- 5.2** **Fire resistance** test criteria are set out in Appendix B. Standards of performance are summarised in Tables B3 and B4. Apart from specific situations described in Sections 1 and 2, and requirements B3 and B5, a minimum performance of REI 30 is sufficient to protect **means of escape**.

#### Fire resistance of doors

- 5.3** **Fire resistance** test criteria are set out in Appendix C. Standards of performance are summarised in Table C1.

#### Fire resistance of glazed elements

- 5.4** If glazed elements in **fire resisting** enclosures and doors can only meet the required integrity performance, their use is limited. These limitations depend on whether the enclosure forms part of a **protected shaft** (see Section 8) and the provisions set out in Appendix B, Table B5. If both integrity and insulation performance can be met, there is no restriction in this document on the use or amount of glass.
- 5.5** Glazed elements should also comply with the following, where necessary.
- If the enclosure forms part of a **protected shaft**: Section 8.
  - Appendix B, Table B5.
  - Guidance on the safety of glazing: Approved Document K.

### Doors on escape routes

- 5.6** Doors should be readily openable to avoid undue delay to people escaping. Doors on **escape routes** (both within and from the **building**) should comply with paragraphs 5.7 to 5.15. Guidance on door closing and 'hold open' devices for **fire doorsets** is set out in Appendix C.

#### Door fastenings

- 5.7** In general, doors on **escape routes** (whether or not the doors are **fire doorsets**) should be either of the following.
- Not fitted with a lock, latch or bolt fastenings.
  - Fitted only with simple fastenings that are all of the following.
    - Easy to operate; it should be apparent how to undo the fastening.

- ii. Operable from the side approached by people escaping.
- iii. Operable without a key.
- iv. Operable without requiring people to manipulate more than one mechanism.

Doors may be fitted with hardware to allow them to be locked when **rooms** are empty.

In places such as hotel bedrooms, locks may be fitted that are key operated from the outside and manually opened from the inside.

If a secure door is operated by code or combination keypad, swipe or proximity card, biometric data, etc., a security mechanism override should be possible from the side approached by people escaping.

- 5.8** Electrically powered locks should return to the unlocked position in all of the following situations.
- a. If the fire detection and alarm system operates.
  - b. If there is loss of power or system error.
  - c. If the security mechanism override is activated.

Security mechanism overrides for electrically powered locks should be a Type A call point as described in **BS 7273-4**. The call point should be positioned on the side approached by people escaping. If the door provides escape in either direction, a call point should be installed on both sides of the door.

- 5.9** In places of assembly and shop and commercial **buildings** (**purpose groups** 4 and 5), doors on **escape routes** from **rooms** with more than 60 people should be either of the following.
- a. *Not* fitted with locks, latches or bolts.
  - b. Fitted with panic fastenings in accordance with **BS EN 1125**.

In non-residential **buildings** (**purpose groups** 3 to 7), some **final exit** doors feature security locks that are used only when the **building** is empty. Such locks may be appropriate, but management procedures must emphasise their safe use.

- 5.10** Guidance on door closing and 'hold open' devices for **fire doorsets** is set out in Appendix C.

## Direction of opening

- 5.11** The door of any doorway or exit should be hung to open in the direction of escape whenever reasonably practicable. It should always be hung to open in the direction of escape if either of the following conditions applies.
- a. More than 60 people might be expected to use it during a fire.
  - b. There is a very high risk of fire with potential for rapid fire growth, such as with some industrial activities.

## Amount of opening and effect on associated escape routes

- 5.12** All doors on **escape routes** should be hung to meet both of the following conditions.
- a. Open by a minimum of 90 degrees.
  - b. Open with a swing that complies with both of the following.
    - i. Is clear of any change of floor level, other than a threshold or single step on the line of the doorway.
    - ii. Does not reduce the effective width of any **escape route** across a landing.

- 5.13** Any door opening towards a corridor or a stair should be recessed to prevent its swing encroaching on the effective width.

### Vision panels in doors

- 5.14** Doors should contain vision panels in both of the following situations.

- a. Where doors on **escape routes** divide corridors.
- b. Where doors are hung to swing both ways.

Approved Document M contains guidance about vision panels in doors across accessible corridors and Approved Document K contains guidance about the safety of glazing.

### Revolving and automatic doors

- 5.15** Where revolving doors, automatic doors and turnstiles are placed across **escape routes** they should comply with one of the following.

- a. They are automatic doors of the required width and comply with one of the following conditions.
  - i. Their failsafe system provides outward opening from any open position.
  - ii. They have a monitored failsafe system to open the doors if the mains electricity supply fails.
  - iii. They failsafe to the open position if the power fails.
- b. Non-automatic swing doors of the required width are provided immediately adjacent to the revolving or automatic door or turnstile.

## General provisions

### Headroom in escape routes

- 5.16** **Escape routes** should have a minimum clear headroom of 2m. The only projections allowed below this height are door frames.

### Flooring of escape routes

- 5.17** **Escape route** floor finishes should minimise their slipperiness when wet. Finishes include the treads of steps and surfaces of ramps and landings.

### Ramps and sloping floors

- 5.18** A ramp forming part of an **escape route** should meet the provisions in Approved Document M. Any sloping floor or tier should have a pitch of not more than 35 degrees to the horizontal.
- 5.19** Guidance for where there is fixed seating is given in both of the following.
- a. Approved Documents K and M give guidance on the design of ramps and associated landings, and on aisles and gangways where there is fixed seating.
  - b. Section 2 of this document refers to Annex D of **BS 9999**, which gives guidance on the design of **means of escape** in places with fixed seating.

### Final exits

- 5.20** The width of a **final exit** should be at least the same as the minimum required width of the **escape route** it serves.

- 5.21** People should be able to rapidly leave the area around the **building**. Direct access to a street, passageway, walkway or open space should be available. The route away from the **building** should comply with the following.
- Be well defined.
  - If necessary, have suitable guarding.
- 5.22** **Final exits** should not present a barrier for disabled people. Where the route to a **final exit** does not include stairs, a level threshold and, where necessary, a ramp should be provided.
- 5.23** **Final exit** locations should be clearly visible and recognisable.
- 5.24** **Final exits** should avoid outlets of basement smoke vents and openings to transformer chambers, refuse chambers, boiler **rooms** and similar risks.

**Table 5.1 Provisions for escape lighting**

Use of the building or part of the building	Areas requiring escape lighting
Residential	All common escape routes <sup>(1)</sup>
Office, industrial, storage and other non-residential	<ol style="list-style-type: none"> <li>Underground or windowless accommodation</li> <li>Stairs either: <ul style="list-style-type: none"> <li>in a central core</li> <li>that serve storey(s) more than 18m above ground level</li> </ul> </li> <li>Internal corridors more than 30m long</li> <li>Open-plan areas of more than 60m<sup>2</sup></li> </ol>
Shop and commercial, and car parks	<ol style="list-style-type: none"> <li>Underground or windowless accommodation</li> <li>Stairs either: <ul style="list-style-type: none"> <li>in a central core</li> <li>that serve storey(s) more than 18m above ground level</li> </ul> </li> <li>Internal corridors more than 30m long</li> <li>Open-plan areas of more than 60m<sup>2</sup></li> <li>All escape routes (other than the following exception) to which the public are admitted.<sup>(1)</sup> The exception is shops that meet all of the following: <ul style="list-style-type: none"> <li>have a maximum of three storeys</li> <li>have no sales floor of more than 280m<sup>2</sup></li> <li>are <i>not</i> a restaurant or bar</li> </ul> </li> </ol>
Assembly and recreation	<ol style="list-style-type: none"> <li>All escape routes<sup>(1)</sup></li> <li>Accommodation except for that which is open on one side to view sport or entertainment during normal daylight hours</li> </ol>
Any purpose group	<ol style="list-style-type: none"> <li>All toilet accommodation with a minimum floor area of 8m<sup>2</sup></li> <li>Electricity and generator rooms</li> <li>Switch room/battery room for emergency lighting system</li> <li>Emergency control rooms</li> </ol>
<b>NOTE:</b> 1. Including external escape routes.	

## Lighting of escape routes

- 5.25** All **escape routes** should have adequate artificial lighting. If the mains electricity power supply fails, **escape lighting** should illuminate the routes listed in Table 5.1.
- 5.26** Escape stair lighting should be on a separate circuit from the electricity supply to any other part of the **escape route**.
- 5.27** **Escape lighting** should conform to **BS 5266-1**.

## Exit signs

- 5.28** Every doorway or other exit providing access to a **means of escape**, other than exits in ordinary use (e.g. main entrances), should be distinctively and conspicuously marked by an exit sign in accordance with **BS ISO 3864-1** and **BS 5499-4**.

Advice on fire safety signs, including emergency escape signs, is given in the HSE publication *Safety Signs and Signals: Guidance on Regulations*.

Some **buildings** may require additional signs to comply with other legislation.

## Protected power circuits

- 5.29** To limit potential damage to cables in **protected circuits**, all of the following should apply.
- Cables should be sufficiently robust.
  - Cable routes should be carefully selected and/or physically protected in areas where cables may be exposed to damage.
  - Methods of cable support should be class A1 rated and offer at least the same integrity as the cable. They should maintain circuit integrity and hold cables in place when exposed to fire.
- 5.30** A **protected circuit** to operate equipment during a fire should achieve all of the following.
- Cables should achieve PH 30 classification when tested in accordance with **BS EN 50200** (incorporating Annex E) or an equivalent standard.
  - It should only pass through parts of the **building** in which the fire risk is negligible.
  - It should be separate from any circuit provided for another purpose.
- 5.31** Guidance on cables for large and complex **buildings** is given in **BS 5839-1**, **BS 5266-1** and **BS 8519**.

## Lifts

### Evacuation lifts

- 5.32** Generally, lifts should not be used when there is a fire in the **building**, unless their use forms part of a management plan for evacuating people and the following conditions are met.
- Lifts are appropriately sited and protected.
  - Lifts contain safety features to ensure they remain usable during a fire.

Guidance on the design and use of **evacuation lifts** is given in Annex G to **BS 9999**.

- 5.33** Where a **firefighting lift** is provided, it can be used to evacuate disabled people. Management plans should describe how this would be managed, and what will happen when the fire and rescue service arrives.

## Fire protection of lift installations

- 5.34** Lift wells should comply with one of the following conditions.
- Be sited within the enclosures of a **protected stairway**.
  - Be enclosed with **fire resisting** construction (minimum REI 30) when in a position that might prejudice the **means of escape**.
- 5.35** A lift well connecting different **compartments** should form a **protected shaft** (see Section 8).
- 5.36** Lifts that rise within a large volume such as a mall or **atrium** and do not have a conventional well, such as wall-climber or feature lifts, may be at risk if they run through a smoke reservoir. Care should be taken to maintain the integrity of the smoke reservoir and protect people in the lift.
- 5.37** In **buildings** designed for phased evacuation or progressive horizontal evacuation, if the lift well is not within the enclosures of a **protected stairway**, its entrance should be separated at every **storey** by a **protected lobby** (minimum REI 30).
- 5.38** In basements and enclosed car parks, the lift should be within the enclosure of a **protected stairway**. Otherwise, the lift should be approached only via a **protected lobby** or **protected corridor** (minimum REI 30).
- 5.39** If a lift delivers into a **protected corridor** or **protected lobby** serving sleeping accommodation and also serves a **storey** containing a high fire risk (such as a kitchen, communal areas, stores, etc.) then the lift should be separated from the high fire risk area(s) by a **protected lobby** or **protected corridor** (minimum REI 30).
- 5.40** A lift shaft serving **storeys** above ground level should not serve any basement if either of the following applies.
- There is only one escape stair serving **storeys** above ground level and smoke from a basement fire would adversely affect **escape routes** in the upper **storeys**.
  - The lift shaft is within the enclosure to an escape stair that terminates at ground level.
- 5.41** Lift machine **rooms** should be sited over the lift well where possible. Where **buildings** or part of a **building** with only one stairway make this arrangement impractical, the lift machine **room** should be sited outside the **protected stairway**.

## Refuse chutes and storage

- 5.42** Refuse storage chambers, refuse chutes and refuse hoppers should be sited and constructed in accordance with **BS 5906**.
- 5.43** Refuse chutes and **rooms** for storing refuse should meet both of the following conditions.
- Be separated from other parts of the **building** by **fire resisting** construction (minimum REI 30 in **buildings** with a top **storey** up to 5m above ground level; otherwise REI 60).
  - Not be situated within a **protected stairway** or **protected lobby**.
- 5.44** The approach to **rooms** containing refuse chutes or for storing refuse should comply with one of the following conditions.
- Be directly from the open air.
  - Be through a **protected lobby** with a minimum 0.2m<sup>2</sup> of permanent ventilation.
- 5.45** Access openings to refuse storage chambers should *not* be sited next to **escape routes** or **final exits**.

## Shop store rooms

- 5.46** Fully enclosed walk-in store rooms should be separated from retail areas with fire resisting construction (minimum REI 30) if they negatively affect the means of escape. The fire resisting construction is not necessary if the walk-in store room complies with either of the following.
- Has an automatic fire detection and alarm system.
  - Is fitted with sprinklers.

## Requirement B2: Internal fire spread (linings)

This section deals with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
<b>Internal fire spread (linings)</b>	
<b>B2.</b> (1) To inhibit the spread of fire within the building, the internal linings shall— <ul style="list-style-type: none"> <li>(a) adequately resist the spread of flame over their surfaces; and</li> <li>(b) have, if ignited, either a rate of heat release or a rate of fire growth, which is reasonable in the circumstances.</li> </ul> (2) In this paragraph “internal linings” means the materials or products used in lining any partition, wall, ceiling or other internal structure.	

### Intention

In the Secretary of State’s view, requirement B2 is met by achieving a restricted spread of flame over internal linings. The **building** fabric should make a limited contribution to fire growth, including a low rate of heat release.

It is particularly important in **circulation spaces**, where linings may offer the main means by which fire spreads and where rapid spread is most likely to prevent occupants from escaping.

Requirement B2 *does not* include guidance on the following.

- a. Generation of smoke and fumes.
- b. The upper surfaces of floors and stairs.
- c. Furniture and fittings.

## Section 6: Wall and ceiling linings

### Classification of linings

6.1 The surface linings of walls and ceilings should meet the classifications in Table 6.1.

**Table 6.1 Classification of linings**

Location	Classification
Small rooms of maximum internal floor area:	D-s3, d2
a. 4m <sup>2</sup> in residential accommodation	
b. 30m <sup>2</sup> in non-residential accommodation	
Other rooms (including garages)	C-s3, d2
Other circulation spaces	B-s3, d2 <sup>(1)</sup>
<b>NOTE:</b>	
1. Wallcoverings which conform to <b>BS EN 15102</b> , achieving at least class C-s3, d2 and bonded to a class A2-s3, d2 substrate, will also be acceptable.	

### Walls

- 6.2 For the purposes of this requirement, a wall includes both of the following.
- The internal surface of internal and external glazing (except glazing in doors).
  - Any part of a ceiling which slopes at an angle greater than 70 degrees to the horizontal.
- 6.3 For the purposes of this requirement, a wall *does not* include any of the following.
- Doors and door frames.
  - Window frames and frames in which glazing is fitted.
  - Architraves, cover moulds, picture rails, skirtings and similar narrow members.
  - Fireplace surrounds, mantle shelves and fitted furniture.
- 6.4 Parts of walls in rooms may be of lower performance than stated in Table 6.1, but no worse than class D-s3, d2. In any one room, the total area of lower performance wall lining should be less than an area equivalent to half of the room's floor area, up to a maximum of:
- 20m<sup>2</sup> in residential accommodation.
  - 60m<sup>2</sup> in non-residential accommodation.

### Ceilings

- 6.5 For the purposes of this requirement, a ceiling includes all of the following.
- Glazed surfaces.

- b. Any part of a wall at 70 degrees or less to the horizontal.
  - c. The underside of a gallery.
  - d. The underside of a roof exposed to the room below.
- 6.6** For the purposes of this requirement, a ceiling *does not* include any of the following.
- a. Trap doors and their frames.
  - b. The frames of windows or rooflights and frames in which glazing is fitted.
  - c. Architraves, cover moulds, picture rails, exposed beams and similar narrow members.

## Fire resisting ceilings

- 6.7** The need for cavity barriers in concealed floor or roof spaces can be reduced by installing a fire resisting ceiling (minimum EI 30) below the cavity, complying with Diagram 9.3.

## Rooflights

- 6.8** Rooflights should meet the following classifications, according to material. No guidance for European fire test performance is currently available, because there is no generally accepted test and classification procedure.
- a. Non-plastic rooflights should meet the relevant classification in Table 6.1.
  - b. Plastic rooflights, if the limitations in Table 6.2 and Table 14.2 are observed, should be a minimum class D-s3, d2 rating. Otherwise they should meet the relevant classification in Table 6.1.

## Special applications

- 6.9** Any flexible membrane covering a structure, other than an air-supported structure, should comply with Appendix A of **BS 7157**.
- 6.10** Guidance on the use of PTFE-based materials for tension-membrane roofs and structures is given in BRE report BR 274.

## Fire behaviour of insulating core panels used internally

- 6.11** Insulating core panels consist of an inner core of insulation sandwiched between, and bonded to, a membrane, such as galvanised steel or aluminium.

Where they are used internally they can present particular problems with regard to fire spread, and should meet all of the following conditions.

- a. Panels should be sealed to prevent exposure of the core to a fire. This includes at joints and where services penetrate the panel.
- b. In high fire risk areas, such as kitchens, places of special fire hazard, or in proximity to where hot works occur, only class A1 cored panels should be used.
- c. Fixing systems for all panels should be designed to take account of the potential for the panel to delaminate. For instance, where panels are used to form a suspended ceiling, the fixing should pass through the panel and support it from the lower face.

## Other controls on internal surface properties

**6.12** Guidance on the control of flame spread is given in the following sections.

- Stairs and landings: Section 3 (escape stairs) and Section 17 (firefighting shafts).
- Section 9: exposed surfaces above fire-protecting suspended ceilings.

## Thermoplastic materials

### General provisions

**6.13** Thermoplastic materials that do not meet the classifications in Table 6.1 can be used as described in paragraphs 6.14 to 6.18. No guidance for European fire test performance is currently available, because there is no generally accepted test and classification procedure.

Thermoplastic materials are defined in Appendix B, paragraph B11. Classifications used here are explained in paragraph B13.

### Windows

**6.14** Thermoplastic material classified as a TP(a) rigid product may be used to glaze external windows to rooms, but not external windows to circulation spaces. Approved Document K includes guidance on the safety of glazing.

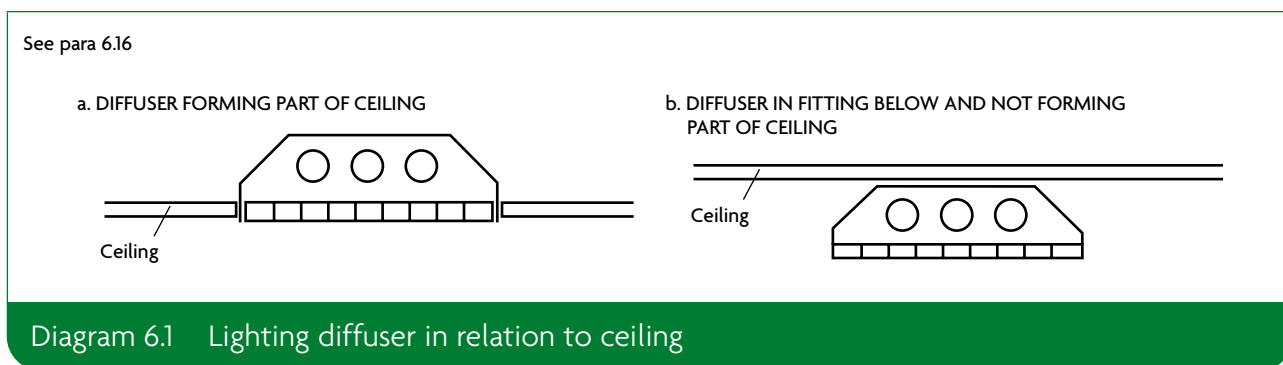
### Rooflights

**6.15** In rooms and circulation spaces other than protected stairways, rooflights may be constructed of thermoplastic material if they comply with both of the following.

- The lower surface is classified as TP(a) rigid or TP(b).
- The size and location of the rooflights follow the limits in Table 6.2 and in Table 14.2 and Table 14.3.

### Lighting diffusers

**6.16** The following paragraphs apply to lighting diffusers forming part of a ceiling. Diffusers may be part of a luminaire or used below sources of light. The following paragraphs *do not* apply to diffusers of light fittings attached to the soffit of a ceiling or suspended beneath a ceiling (Diagram 6.1).



- 6.17** Diffusers constructed of thermoplastic material may be incorporated in ceilings to rooms and circulation spaces, but not to protected stairways, if both of the following conditions are met.
- Except for the upper surfaces of the thermoplastic panels, wall and ceiling surfaces exposed in the space above the suspended ceiling should comply with paragraph 6.1.
  - Diffusers should be classified as one of the following.
    - TP(a) rigid – no restrictions on their extent.
    - TP(b) – limited in their extent (see Table 6.2 and Diagram 6.2).

## Suspended or stretched-skin ceilings

- 6.18** A ceiling constructed from TP(a) flexible panels should meet the following conditions.
- Have a maximum area of 5m<sup>2</sup>.
  - Be supported on all sides.

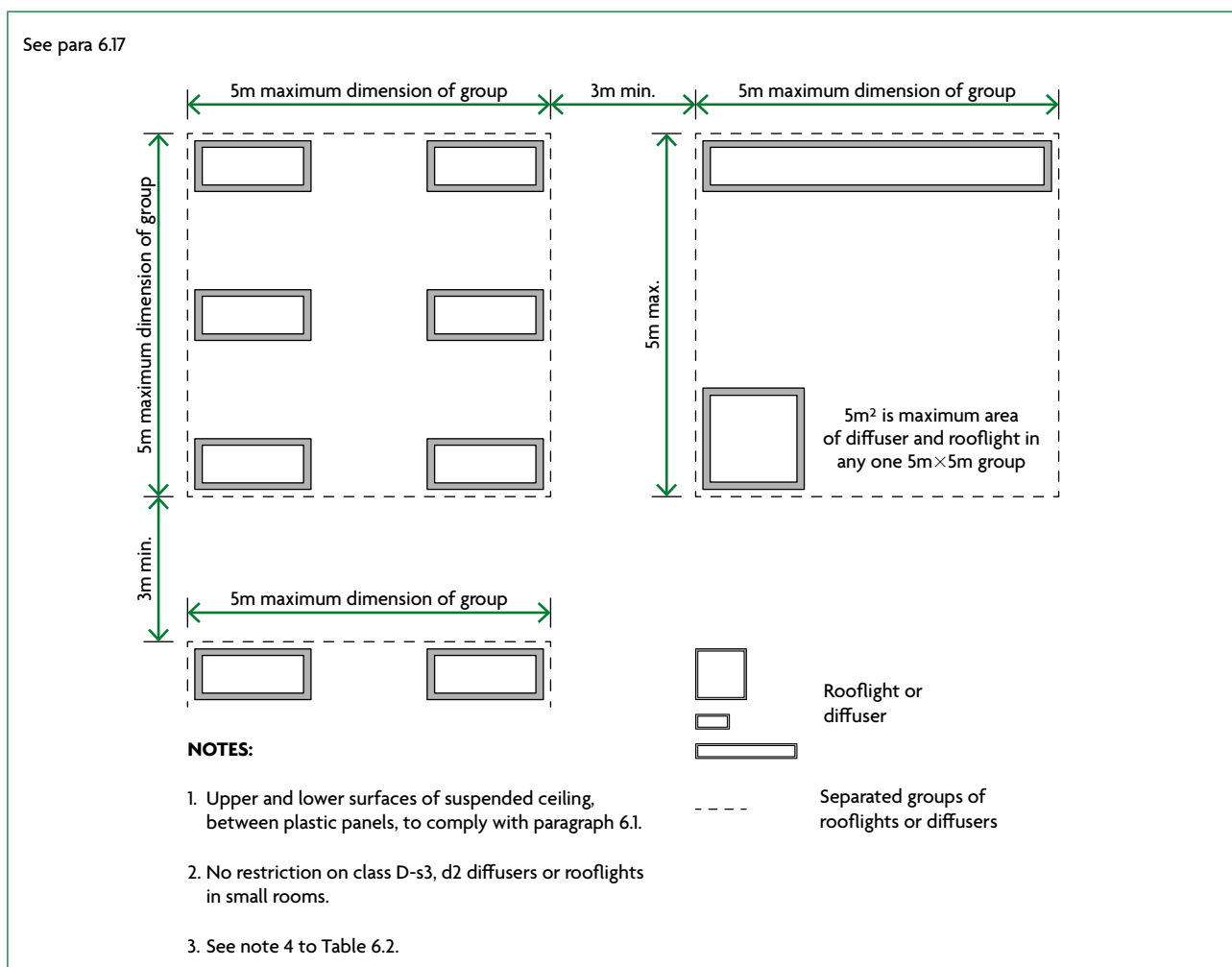


Diagram 6.2 Layout restrictions on class D-s3, d2 plastic rooflights, TP(b) rooflights and TP(b) lighting diffusers

**Table 6.2 Limitations applied to thermoplastic rooflights and lighting diffusers in suspended ceilings and class D-s3, d2 plastic rooflights<sup>(1)</sup>**

Minimum classification of lower surface	Use of space below the diffusers or rooflight	Maximum area of each diffuser or rooflight <sup>(2)</sup> (m <sup>2</sup> )	Maximum total area of diffusers and rooflights as a percentage of floor area of the space in which the ceiling is located (%)	Minimum separation distance between diffusers or rooflights <sup>(2)</sup> (m)
TP(a)	Any except protected stairway	No limit <sup>(3)</sup>	No limit	No limit
D-s3, d2 <sup>(4)</sup> or TP(b)	Rooms	1	50 <sup>(5)(6)</sup>	A distance equal to the largest plan dimension of the largest diffuser or rooflight (see Diagram 6.3)
		5	50 <sup>(5)(6)</sup>	3 <sup>(6)</sup>
	Circulation spaces except protected stairways	5	15 <sup>(5)</sup>	3

**NOTES:**

1. This table does not apply to products that meet the provisions in Table 6.1.
2. Smaller rooflights and diffusers can be grouped together provided that both of the following satisfy the dimensions in Diagram 6.2 or 6.3.
  - a. The overall size of the group.
  - b. The space between one group and any others.
3. Lighting diffusers of TP(a) flexible rating should be used only in panels of a maximum of 5m<sup>2</sup> each. See paragraph 6.18.
4. There are no limits on the use of class D-s3, d2 materials in small rooms. See Table 6.1.
5. The minimum 3m separation given in Diagram 6.2 between each 5m<sup>2</sup> group must be maintained. Therefore, in some cases, it may not be possible to use the maximum percentage quoted.
6. Class D-s3, d2 rooflights to rooms in industrial and other non-residential purpose group buildings (purpose groups 3 to 7) may be spaced 1800mm apart provided both of the following conditions are met.
  - a. The rooflights are evenly distributed.
  - b. The total area of the rooflights does not exceed 20% of the area of the room.

See Table 6.2

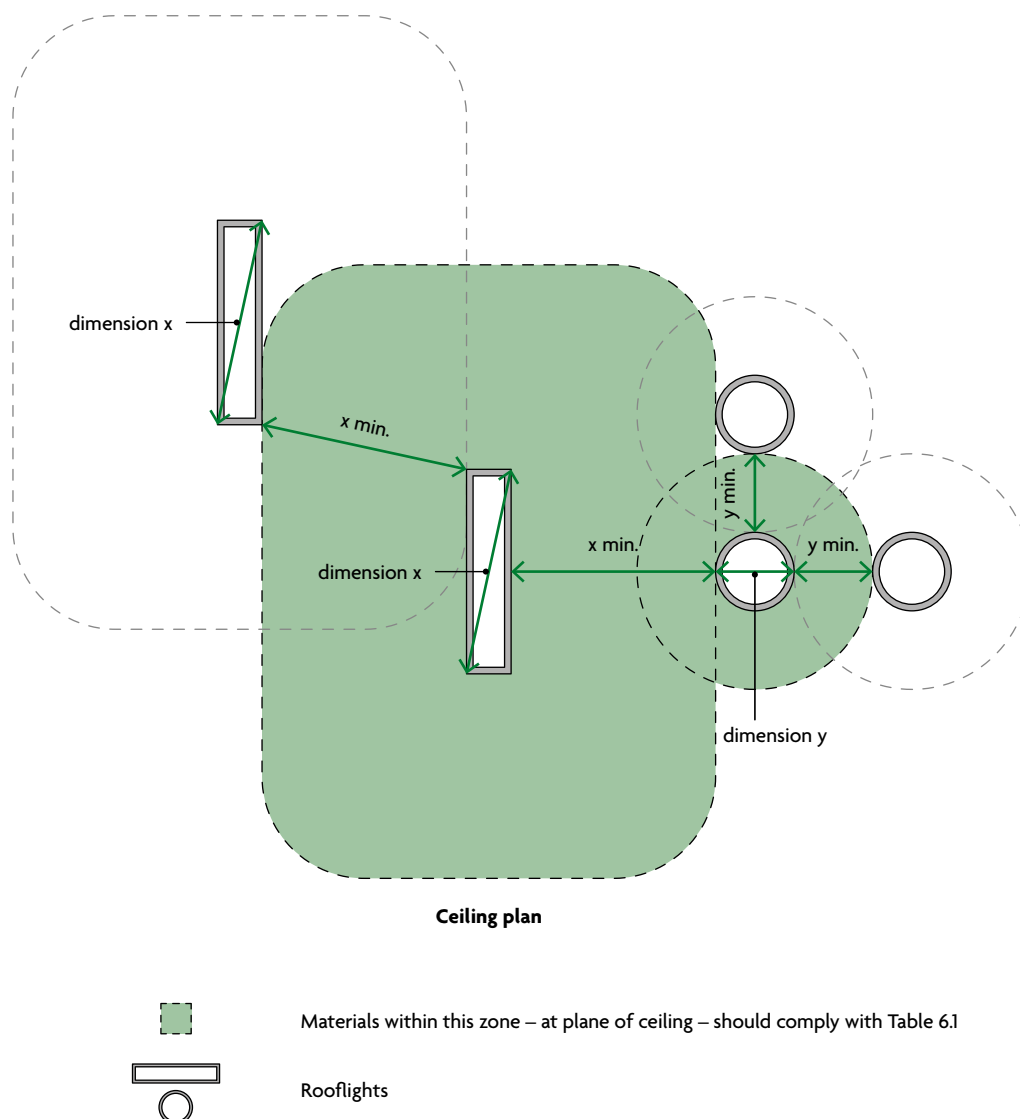


Diagram 6.3 Layout restrictions on small class D-s3, d2 plastic rooflights, TP(b) rooflights and TP(b) lighting diffusers

## Requirement B3: Internal fire spread (structure)

These sections deal with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
<b>Internal fire spread (structure)</b>	
<b>B3.</b> (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— <ul style="list-style-type: none"> <li>(a) sub-division of the building with fire-resisting construction;</li> <li>(b) installation of suitable automatic fire suppression systems.</li> </ul>	
(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.	
	Requirement B3(3) does not apply to material alterations to any prison provided under section 33 of the Prison Act 1952.

## Intention

In the Secretary of State's view, requirement B3 is met by achieving all of the following.

- a. For defined periods, loadbearing **elements of structure** withstand the effects of fire without loss of stability.
- b. Compartmentation of **buildings** by **fire resisting** construction elements.
- c. Automatic fire suppression is provided where it is necessary.
- d. Protection of openings in **fire-separating elements** to maintain continuity of the fire separation.
- e. Inhibition of the unseen spread of fire and smoke in **cavities**, to reduce the risk of structural failure and spread of fire and smoke, where they pose a threat to the safety of people in and around the **building**.

The extent to which any of these measures are necessary is dependent on the use of the **building** and, in some cases, its size, and on the location of the elements of construction.

## Section 7: Loadbearing elements of structures

### Fire resistance standard

- 7.1** Elements such as structural frames, beams, columns, loadbearing walls (internal and external), floor structures and gallery structures should have, as a minimum, the fire resistance given in Appendix B, Table B3.
- 7.2** Appendix B includes guidance on all of the following.
- Provisions to ensure that where one element of structure supports or stabilises another element of structure, the supporting element has no less fire resistance than the other element (see Table B4).
  - Measures so that elements common to more than one building or compartment are constructed to the standard of the more onerous of the relevant provisions.
  - Special provisions about fire resistance of elements of structure in single storey buildings.
  - Concessions in respect of fire resistance of elements of structure in basements where one or more sides of the basement are open at ground level.

### Exclusions from the provisions for elements of structure

- 7.3** The following are excluded from the definition of 'element of structure'.
- A structure that supports only a roof, unless either of the following applies.
    - The roof performs the function of a floor, such as for parking vehicles, or as a means of escape.
    - The structure is essential for the stability of an external wall that needs to be fire resisting (e.g. to achieve compartmentation or for the purposes of preventing fire spread between buildings).
  - The lowest floor of the building.
  - A platform floor.
  - A loading gallery, fly gallery, stage grid, lighting bridge or any gallery provided for similar purposes or for maintenance and repair.
  - External walls, such as curtain walls or other forms of cladding, which transmit only self weight and wind loads and do not transmit floor load.

**NOTE:** In some cases, structural members within a roof may be essential for the structural stability system of the building. In these cases, the structural members in the roof do not just support a roof and must demonstrate the relevant fire resistance for the building as required by paragraph 7.2a above.

## Additional guidance

**7.4** If a loadbearing wall is any of the following, guidance in other sections may also apply.

- a. A **compartment wall** (including a wall common to two **buildings**): Section 8.
- b. Enclosing a **place of special fire hazard**: Section 8, paragraph 8.7.
- c. Protecting a **means of escape**: Sections 2 to 5.
- d. An **external wall**: Sections 12 and 13.
- e. Enclosing a **firefighting shaft**: Section 17.

**7.5** If a floor is also a **compartment floor**, see Section 8.

## Raised storage areas

**7.6** The normal provisions for **fire resistance** may be too onerous to apply to raised, free-standing floors (sometimes supported by racking) in **single storey buildings** used for industrial and storage purposes. The introduction of raised storage areas can alter the effective number of **storeys** in the **building** (see the definition of 'storey' in Appendix A).

**7.7** A structure that does not have the minimum **fire resistance** specified in Appendix B, Table B4, is acceptable if it satisfies all of the following conditions.

- a. The structure meets both of the following conditions.
  - i. It has only one tier.
  - ii. It is used for storage purposes *only*.
- b. The people likely to be on the floor at any one time are both of the following.
  - i. Few in number.
  - ii. Not members of the public.
- c. The floor is open above and below to the **room** or space in which it is situated.
- d. The **means of escape** from the floor is in accordance with Sections 2 to 5.
- e. The floor meets both of the following conditions.
  - i. It is not more than 10m in width or length.
  - ii. It is a maximum of half the floor area of the space in which it is situated.

The limitations in (e) may be adjusted if any of the following apply.

- f. If the lower level has an automatic fire detection and alarm system meeting the recommendations of **BS 5839-1**, then the floor size may be increased to not more than 20m in either width or length.
- g. If agreed with the **building control body** and the fire and rescue service, then it may be possible to vary this dimension and area. However, the safety of firefighters and the distance they may need to travel over or under the floor must be considered.
- h. If the **building** is fitted throughout with an automatic sprinkler system complying with Appendix E, then no limits are set for the size of the floor.

## Section 8: Compartmentation/sprinklers

### Provision of compartmentation

#### All purpose groups

- 8.1 All of the following should be provided as **compartment walls** and **compartment floors** and should have, as a minimum, the **fire resistance** given in Appendix B, Table B3.
- 8.2 A wall common to two or more **buildings** should be a **compartment wall**.
- 8.3 Parts of a **building** occupied mainly for different purposes should be separated from one another by **compartment walls** and/or **compartment floors**. Compartmentation is not needed if one of the different purposes is ancillary to the other. See paragraphs 0.23 and 0.24.
- 8.4 Effective compartmentation relies on both of the following.
  - a. **Fire resistance** should be continuous at the join between elements forming a **compartment**.
  - b. Any openings between two **compartments** should not reduce the **fire resistance**.
- 8.5 The lowest floor in a **building** does not need to be a **compartment floor**.

#### Protected shafts

- 8.6 Stairs and service shafts connecting **compartments** should be protected to restrict the spread of fire between the **compartments**. These are called **protected shafts**. Walls or floors surrounding a **protected shaft** are considered to be **compartment walls** or **compartment floors**.

#### Places of special fire hazard

- 8.7 **Fire resisting** construction enclosing these places should achieve minimum REI 30. These walls and floors are not **compartment walls** and **compartment floors**.

#### ‘Residential (institutional)’ buildings including health care

- 8.8 All floors should be constructed as **compartment floors**.
- 8.9 Paragraphs 2.35 and 2.36 give guidance on the provisions for **compartment walls** in care homes that use progressive horizontal evacuation.

#### ‘Residential (other)’ buildings

- 8.10 In ‘residential (other)’ (**purpose group** 2(b)) **buildings**, all floors should be **compartment floors**.

## Non-residential buildings

- 8.11** In buildings in a non-residential purpose group (purpose groups 3 to 7), the following should be compartment walls and compartment floors.
- Every wall needed to divide the building to observe the compartment size limits in Table 8.1 (Diagram 8.1a).
  - Every floor, if the building or separated part of the building (see paragraph 8.19) has a top storey that is more than 30m above ground level (Diagram 8.1b).
  - The floor of the ground storey, if the building has one or more basements (Diagram 8.1c), except in small premises (see paragraph 4.2).
  - The floor of every basement storey (except the lowest floor), if the building or separated part has a basement more than 10m below ground level (Diagram 8.1d).
  - If the building comprises 'shop and commercial', 'industrial' or 'storage' premises (purpose groups 4, 6, 7): every wall or floor dividing a building into separate occupancies (spaces used by different organisations, whether they fall within the same purpose group or not).
  - See also the provision in paragraph 5.46 for store rooms in shops to be separated from retail areas by fire resisting construction (minimum REI 30).
- 8.12** In two storey 'shop and commercial' or 'industrial' buildings (purpose groups 4 or 6), where the use of the upper storey is ancillary to the use of the ground storey, the ground storey may be treated as a single storey building for fire compartmentation purposes where all of the following apply.
- The area of the upper storey does not exceed the lower of:
    - 20% of the area of the ground storey
    - 500m<sup>2</sup>.
  - The upper storey is compartmented from the lower one.
  - The upper storey has a means of escape independent of the lower storey escape routes.
- Every place of special fire hazard (see Appendix E) should be enclosed with fire resisting construction.

## Buildings containing one or more atria

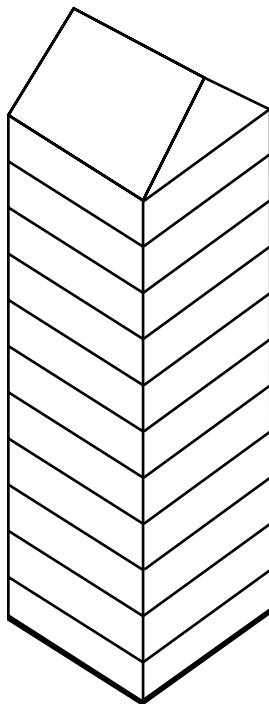
- 8.13** Detailed advice on atria in buildings is given in Annexes B and C of BS 9999. For the purposes of this document, BS 9999 applies *only where the atrium breaches a compartment*.

See para 8.11

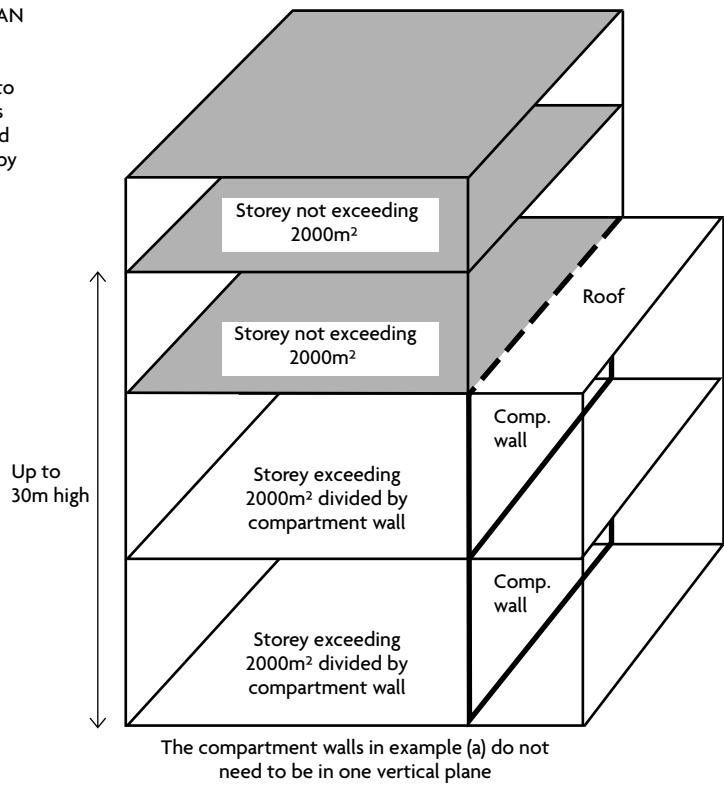
## A. EXAMPLE OF COMPARTMENTATION IN AN UNSPRINKLERED SHOP see paragraph 8.11a

None of the floors in this case would need to be compartment floors, but the two storeys exceeding 2000m<sup>2</sup> would need to be divided into compartments a maximum of 2000m<sup>2</sup> by compartment walls.

## B. COMPARTMENTATION IN TALL BUILDINGS see paragraph 8.11b

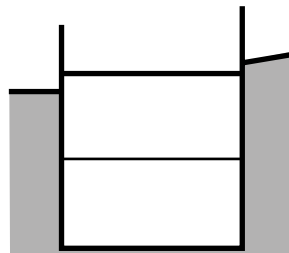


In a building over 30m in height all storeys should be separated by compartment floors. For advice on the special conditions in atrium buildings see Annex B of BS 9999



## C. SHALLOW BASEMENT see paragraph 8.11c

Only the floor of the ground storey need be a compartment floor if the lower basement is at a depth of not more than 10m



## D. DEEP BASEMENTS see paragraph 8.11d

All basement storeys to be separated by compartment floors if any storey is at a depth of more than 10m

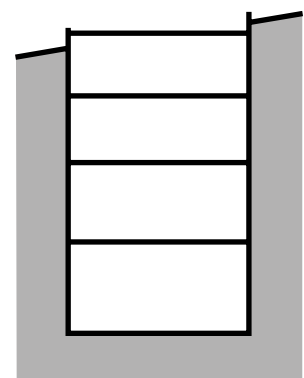


Diagram 8.1 Compartment floors: illustration of guidance in paragraph 8.11

**Table 8.1 Maximum dimensions of building or compartment (non-residential buildings)**

Purpose group of building or part	Height of floor of top storey above ground level (m)	Maximum floor area of any one storey in the building or any one storey in a compartment (m <sup>2</sup> )		
		Single storey buildings		Multi-storey buildings
Office	No limit <sup>(1)</sup>	No limit		No limit
Assembly and recreation, shop and commercial:				
a. Shops – without sprinkler system	No limit <sup>(1)</sup>	2000		2000
Shops – with sprinkler system <sup>(2)</sup>	No limit	No limit		4000
b. Elsewhere – without sprinkler system	No limit <sup>(1)</sup>	No limit		2000
Elsewhere – with sprinkler system <sup>(2)</sup>	No limit	No limit		4000
Industrial <sup>(3)</sup>				
Without sprinkler system <sup>(1)</sup>	Not more than 18 More than 18	No limit N/A		7000 2000 <sup>(4)</sup>
With sprinkler system <sup>(2)</sup>	Not more than 18 More than 18	No limit N/A		14,000 4000 <sup>(4)</sup>
	Height of floor of top storey above ground level (m)	Maximum floor area (m <sup>2</sup> )	Maximum height (m) <sup>(5)</sup>	Maximum compartment volume (m <sup>3</sup> )
		Single storey buildings		Multi-storey buildings
Storage <sup>(3)</sup> and other non-residential:				
a. Car park for light vehicles	No limit	No limit	No limit	No limit
b. Any other building or part:				
Without sprinkler system <sup>(1)</sup>	Not more than 18 More than 18	20,000 N/A	18 N/A	20,000 4000 <sup>(4)</sup>
With sprinkler system <sup>(2)</sup>	Not more than 18 More than 18	No limit	No limit	40,000 8000 <sup>(4)</sup>

**NOTES:**

This table recommends that where the maximum size limitations placed on a building without a sprinkler system are exceeded, a sprinkler system in accordance with Appendix E should be provided.

1. See Appendix B, Table B4 for sprinkler system height requirements.
2. 'With sprinkler system' means that the building is fitted throughout with an automatic sprinkler system in accordance with Appendix E.
3. In certain industrial and storage uses that are subject to other legislation, for example the storage of LPG and certain chemicals, additional limitations on floor area and/or additional sprinkler provisions might apply.
4. This reduced limit applies only to storeys that are a minimum of 18m above ground level. Below this height the higher limit applies.
5. Compartment height is measured from finished floor level to the underside of the roof or ceiling.

## Sprinklers

- 8.14** Buildings within the ‘office’, ‘shop and commercial’, ‘assembly and recreation’, ‘industrial’ and ‘storage and other non-residential’ (except car parks for light vehicles) purpose groups (purpose groups 3 to 7(a)) require sprinklers where there is a top storey above 30m. The sprinkler system should be provided in accordance with Appendix E.

## Construction of compartment walls and compartment floors

### General provisions

- 8.15** All compartment walls and compartment floors should achieve both of the following.
- Form a complete barrier to fire between the compartments they separate.
  - Have the appropriate fire resistance, as given in Appendix B, Tables B3 and B4.
- 8.16** Timber beams, joists, purlins and rafters may be built into or carried through a masonry or concrete compartment wall if the openings for them are both of the following.
- As small as practicable.
  - Fire-stopped.
- If trussed rafters bridge the wall, failure of the truss due to a fire in one compartment should not cause failure of the truss in another compartment.
- 8.17** Where services could provide a source of ignition, the risk of fire developing and spreading into adjacent compartments should be controlled.

### Compartment walls between buildings

- 8.18** Adjoining buildings should only be separated by walls, not floors. Compartment walls common to two or more buildings should comply with both of the following.
- Run the full height of the building in a continuous vertical plane.
  - Be continued through any roof space to the underside of the roof.

### Separated parts of buildings

- 8.19** Compartment walls forming a separated part of a building should run the full height of the building in a continuous vertical plane.
- Separated parts can be assessed independently to determine the appropriate standard of fire resistance in each. The two separated parts can have different standards of fire resistance.

### Other compartment walls

- 8.20** Compartment walls not described in paragraphs 8.18 and 8.19 should run the full height of the storey in which they are situated.
- 8.21** Compartment walls in a top storey beneath a roof should be continued through the roof space.

### Junction of compartment wall or compartment floor with other walls

- 8.22** At the junction with another compartment wall or an external wall, the fire resistance of the compartmentation should be maintained. Fire-stopping that meets the provisions in paragraphs 10.24 to 10.29 should be provided.

**8.23** At the junction of a **compartment floor** and an **external wall** with no **fire resistance**, the **external wall** should be restrained at floor level. The restraint should reduce movement of the wall away from the floor if exposed to fire.

**8.24** **Compartment walls** should be able to accommodate deflection of the floor, when exposed to fire, by either of the following means.

- a. Between the wall and floor, provide a head detail that is capable of maintaining its integrity while deforming.
- b. Design the wall so it maintains its integrity by resisting the additional vertical load from the floor above.

Where **compartment walls** are located within the middle half of a floor between vertical supports, the deflection may be assumed to be 40mm unless a smaller value can be justified by assessment. Outside this area, the limit can be reduced linearly to zero at the supports.

For steel beams that do not have the required **fire resistance**, reference should be made to SCI Publication P288.

## Junction of compartment wall with roof

**8.25** A **compartment wall** should achieve both of the following.

- a. Meet the underside of the roof covering or deck, with **fire-stopping** to maintain the continuity of **fire resistance**.
- b. Be continued across any eaves.

**8.26** To reduce the risk of fire spreading over the roof from one **compartment** to another, a 1500mm wide zone of the roof, either side of the wall, should have a covering classified as  $B_{ROOF}(t_4)$ , on a substrate or deck of a material rated class A2-s3, d2 or better, as set out in Diagram 8.2a.

Thermoplastic **rooflights** that, because of paragraph 14.7, are regarded as having a  $B_{ROOF}(t_4)$  classification are *not* suitable for use in that zone.

**8.27** Materials achieving class B-s3, d2 or worse used as a substrate to the roof covering and any timber tiling battens, fully bedded in mortar or other suitable material for the width of the wall (Diagram 8.2b), may extend over the **compartment wall** in **buildings** that are both of the following.

- a. A maximum of 15m high.
- b. In one of the following **purpose groups**.
  - i. All residential **purpose groups** (**purpose groups** 1 and 2) other than 'residential (institutional)' (**purpose group** 2(a)).
  - ii. 'Office' (**purpose group** 3).
  - iii. 'Assembly and recreation' (**purpose group** 5).

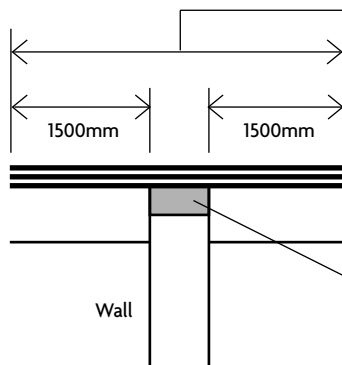
**8.28** Double-skinned insulated roof sheeting should incorporate a band of material rated class A2-s3, d2 or better, a minimum of 300mm in width, centred over the wall.

**8.29** As an alternative to the provisions of paragraph 8.26 or 8.27, the **compartment wall** may extend through the roof for a minimum of either of the following (see Diagram 8.2c).

- a. Where the height difference between the two roofs is less than 375mm, 375mm above the top surface of the adjoining roof covering.
- b. 200mm above the top surface of the adjoining roof covering where either of the following applies.
  - i. The height difference between the two roofs is 375mm or more.
  - ii. The roof coverings either side of the wall are of a material classified as  $B_{ROOF}(t_4)$ .

See paras 8.26 to 8.29

a. ANY BUILDING OR COMPARTMENT



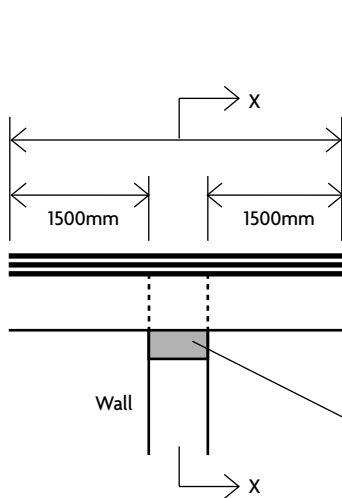
Roof covering over this distance to be designated  $B_{ROOF}(t4)$  rated on deck of material of class A2-s3, d2 or better. Roof covering and deck could be composite structure, e.g. profiled steel cladding.

Double-skinned insulated roof sheeting should incorporate a band of material rated class A2-s3, d2 or better, a minimum of 300mm in width, centred over the wall.

If roof support members pass through the wall, fire protection to these members for a distance of 1500mm on either side of the wall may be needed to delay distortion at the junction (see paragraph 8.16).

Fire-stopping to be carried up to underside of roof covering, e.g. roof tiles.

b. RESIDENTIAL (OTHER), OFFICE, OR ASSEMBLY AND RECREATION USE, AND NOT MORE THAN 15M HIGH



Roof covering to be designated  $B_{ROOF}(t4)$  rated for at least this distance.

Boarding (used as a substrate) or timber tiling battens may be carried over the wall provided that they are fully bedded in mortar (or other no less suitable material) where over the wall.

Thermoplastic insulation materials should not be carried over the wall.

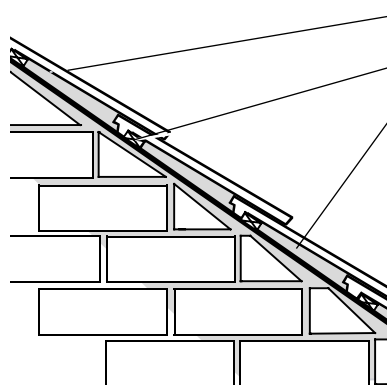
Double-skinned insulated roof sheeting with a thermoplastic core should incorporate a band of material of class A2-s3, d2 at least 300mm wide centred over the wall.

Sarking felt may also be carried over the wall.

If roof support members pass through the wall, fire protection to these members for a distance of 1500mm on either side of the wall may be needed to delay distortion at the junction (see paragraph 8.16).

Fire-stopping to be carried up to underside of roof covering, boarding or slab.

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Roof covering to be designated  $B_{ROOF}(t4)$  rated for at least 1500mm either side of wall.

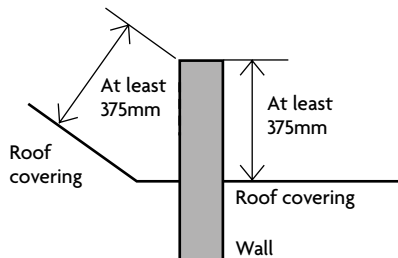
Roofing battens and sarking felt may be carried over the wall.

Fire-stopping to be carried up to underside of roof covering above and below sarking felt.

**NOTES:**

1. Fire-stopping should be carried over the full thickness of the wall.
2. Fire-stopping should be extended into any eaves.
3. The compartment wall does not necessarily need to be constructed of masonry.

c. ANY BUILDING OR COMPARTMENT



The wall should be extended up through the roof for a height of at least 375mm above the top surface of the adjoining roof covering.

Where there is a height difference of at least 375 mm between two roofs or where the roof coverings on either side of the wall are  $B_{ROOF}(t4)$  rated, the height of the upstand/parapet wall above the highest roof may be reduced to 200mm.

Diagram 8.2 Junction of compartment wall with roof

## Openings in compartmentation

### Openings in compartment walls separating buildings or occupancies

**8.30** Openings in a **compartment wall** common to two or more **buildings**, or between different occupancies in the same **building**, should be limited to those for either of the following.

- a. A **fire doorset** providing a **means of escape**, which has the same **fire resistance** as the wall and is fitted in accordance with the provisions in Appendix C.
- b. The passage of a **pipe** that complies with the provisions in Section 10.

### Openings in other compartment walls or in compartment floors

**8.31** Openings should be limited to those for any of the following.

- a. **Fire doorsets** fitted in accordance with the provisions in Appendix C.
- b. **Pipes**, ventilation ducts, service cables, chimneys, **appliance ventilation ducts** or ducts encasing one or more flue pipes, complying with the provisions in Section 10.
- c. Refuse chutes of class A1 construction.
- d. **Atria** designed in accordance with Annexes B and C of **BS 9999**.
- e. **Protected shafts** that conform to the provisions in the following paragraphs.

## Protected shafts

**8.32** Any stair or other shaft passing directly from one **compartment** to another should be enclosed in a **protected shaft**. **Protected shafts** should be used for the following only, but may also include sanitary accommodation and washrooms.

- a. Stairs.
- b. Lifts.
- c. Escalators.
- d. Chutes.
- e. Ducts.
- f. **Pipes**.
- g. Additional provisions apply for both of the following.
  - i. **Protected shafts** that are **protected stairways**: Sections 2 to 5.
  - ii. Stairs that are also **firefighting stairs**: Section 17.

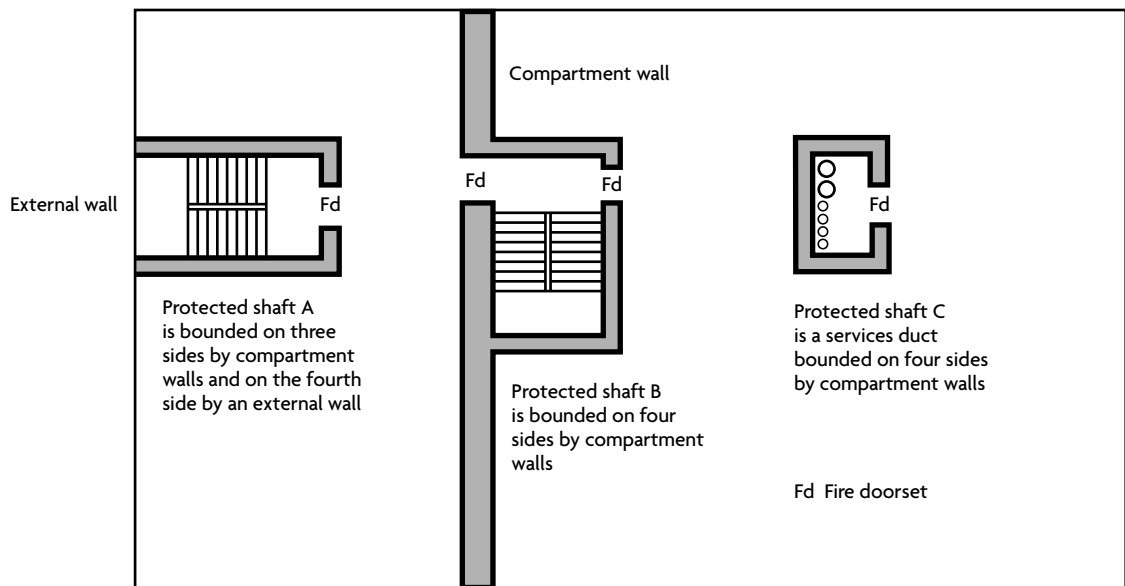
### Construction of protected shafts

**8.33** The construction enclosing a **protected shaft** (Diagram 8.3) should do all of the following.

- a. Form a complete barrier to fire between the **compartments** connected by the shaft.
- b. Have the appropriate **fire resistance** given in Appendix B, Table B3, *except for uninsulated glazed screens that meet the provisions of paragraph 8.34*.
- c. Satisfy the provisions for ventilation and the treatment of openings in paragraphs 8.38 and 8.39.

See para 8.33

The diagram shows three common examples which illustrate the principles. The elements enclosing the shaft (unless formed by adjacent external walls) are compartment walls and floors.



The shaft structure (including any openings) should meet the relevant provisions for: compartment walls (see paragraphs 8.15 to 8.31), external walls (see sections 12 and 13 and Diagram 3.3).

Diagram 8.3 Protected shafts

## Uninsulated glazed screens to protected shafts

**8.34** An uninsulated glazed screen may be incorporated in the enclosure to a **protected shaft** between a stair and a lobby or corridor entered from the stair. The enclosure must conform to Diagram 8.4 and meet all of the following conditions.

- The standard of **fire resistance** required for the **protected stairway** is not more than REI 60.
- The glazed screen complies with the following.
  - It achieves a minimum rating of E 30.
  - It complies with the guidance on limits on areas of uninsulated glazing in Appendix B, Table B5.
- The lobby or corridor is enclosed with **fire resisting** construction achieving a minimum rating of REI 30.

**8.35** Where the measures in Diagram 8.4 are not provided, then both of the following apply.

- The enclosing walls should comply with Appendix B, Table B3.
- The doors should comply with Appendix B, Table B5.

See para 8.34

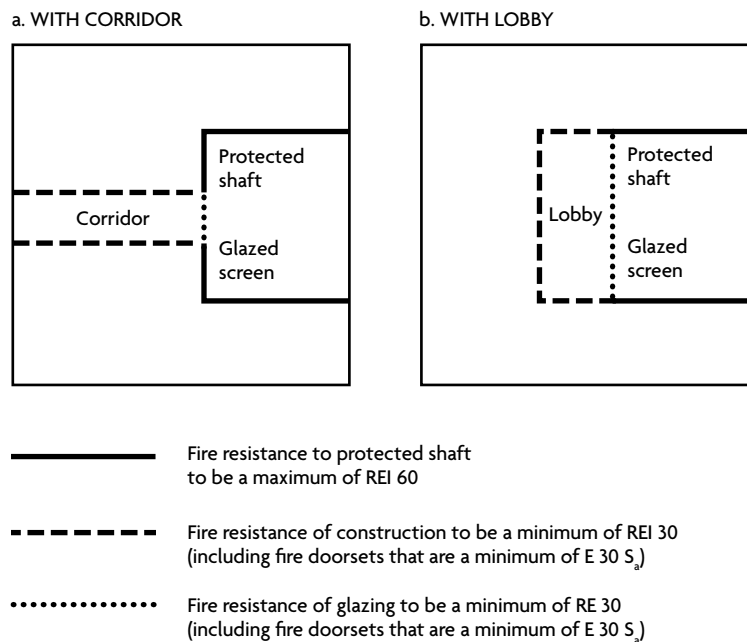


Diagram 8.4 Uninsulated glazed screen separating protected shaft from lobby or corridor

## Pipes for oil or gas and ventilation ducts in protected shafts

**8.36** A **protected shaft** containing a **protected stairway** and/or a lift *should not* also contain either of the following.

- A **pipe** that conveys oil, other than in the mechanism of a hydraulic lift.
- A ventilating duct. Two exceptions are as follows.
  - A duct provided for pressurising the **protected stairway** to keep it smoke free.
  - A duct provided only to ventilate the **protected stairway**.

A **pipe** that is completely separated from a **protected shaft** by **fire resisting** construction is not considered to be contained within that shaft.

**8.37** In a **protected shaft**, any **pipe** carrying natural gas or LPG should be both of the following.

- Of screwed steel or all-welded steel construction.
- Installed in accordance with both of the following.
  - The Pipelines Safety Regulations 1996.
  - The Gas Safety (Installation and Use) Regulations 1998.

## Ventilation of protected shafts conveying gas

**8.38** A **protected shaft** conveying piped flammable gas should be ventilated direct to the outside air, by ventilation openings at high and low level in the shaft.

Any extension of the **storey** floor into the **protected shaft** should not compromise the free movement of air throughout the entire length of the shaft.

Guidance on shafts conveying piped flammable gas, including the size of ventilation openings, is given in **BS 8313**.

## Openings into protected shafts

**8.39** The **external wall** of a **protected shaft** does not normally need to have **fire resistance**. Situations where there are provisions are given in paragraph 3.29 (**external walls** of **protected stairways**, which may also be **protected shafts**) and paragraph 17.2 (**firefighting shafts**).

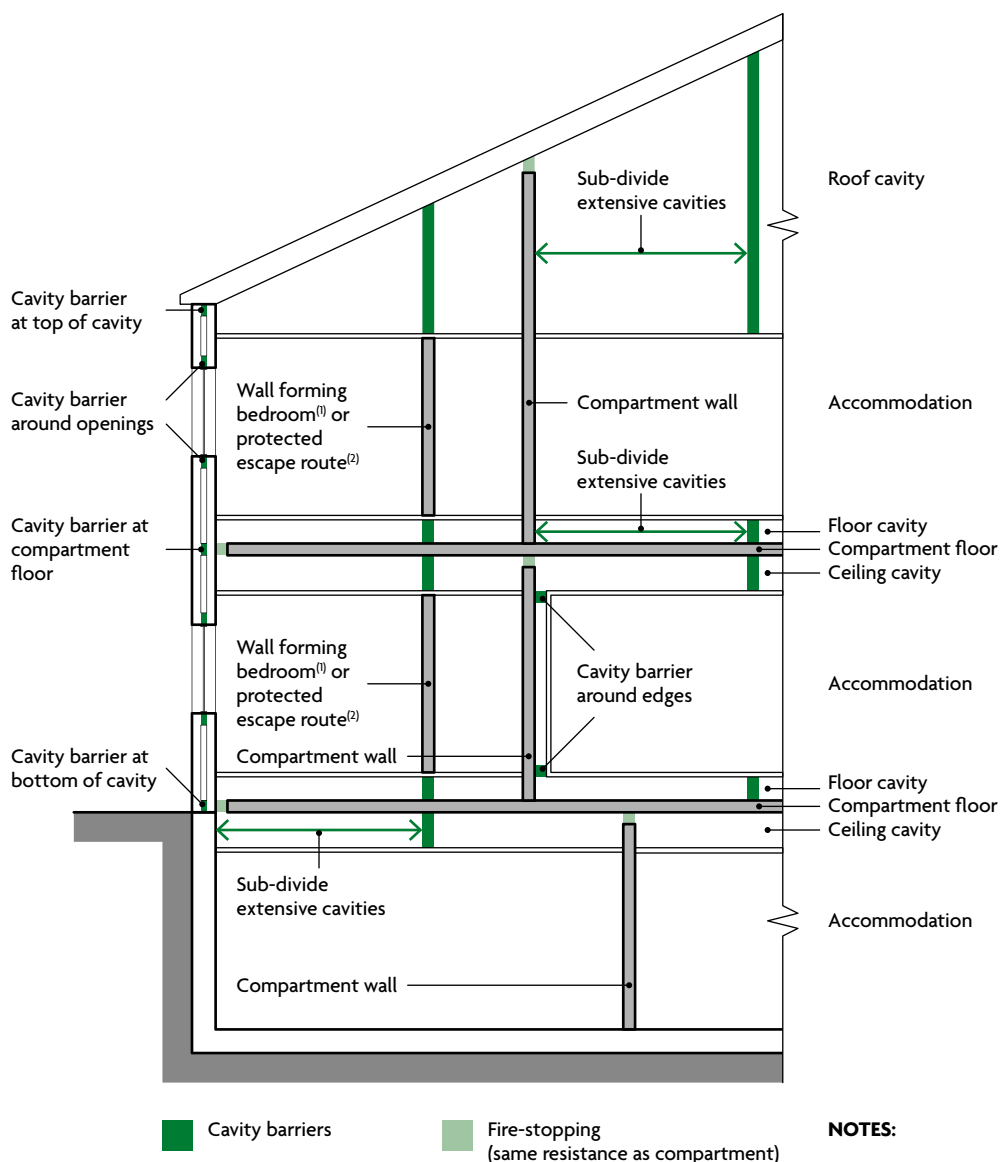
Openings in other parts of the enclosure to a **protected shaft** should be limited to the following.

- a. If a wall common to two or more **buildings** forms part of the enclosure, only the following openings should be made in that wall.
  - i. A **fire doorset** providing a **means of escape**, which has the same **fire resistance** as the wall and is fitted in accordance with the provisions in Appendix C.
  - ii. The passage of a **pipe** that meets the provisions in Section 10.
- b. Other parts of the enclosure (other than an **external wall**) should only have openings for any of the following.
  - i. **Fire doorsets** of the appropriate **fire resistance**, fitted in accordance with the provisions in Appendix C.
  - ii. The passage of **pipes** which meet the provisions in Section 10.
  - iii. Inlets to, outlets from and openings for a ventilation duct (if the shaft contains or serves as a ventilating duct), meeting the provisions in Section 10.
  - iv. The passage of lift cables into a lift machine **room** (if the shaft contains a lift). If the machine **room** is at the bottom of the shaft, the openings should be as small as practicable.

## Section 9: Cavities

- 9.1 Cavities in the construction of a building provide a ready route for the spread of smoke and flame, which can present a greater danger as any spread is concealed. For the purpose of this document, a cavity is considered to be any concealed space.

See para 9.2



### NOTES:

1. See paragraph 9.7.
2. See paragraph 9.5.

Diagram 9.1 Provisions for cavity barriers

## Provision of cavity barriers

- 9.2** To reduce the potential for fire spread, **cavity barriers** should be provided for both of the following.
- To divide **cavities**.
  - To close the edges of **cavities**.

See Diagram 9.1. **Cavity barriers** should not be confused with **fire-stopping** details (Section 10).

## Pathways around fire-separating elements

### Junctions and cavity closures

- 9.3** **Cavity barriers** should be provided at all of the following locations.
- At the edges of **cavities**, including around openings (such as windows, doors and exit/entry points for services).
  - At the junction between an external cavity wall and every **compartment floor** and **compartment wall**.
  - At the junction between an internal cavity wall and every **compartment floor**, **compartment wall** or other wall or door assembly forming a **fire resisting** barrier.

This does not apply where a wall meets the conditions of Diagram 9.2.

- 9.4** It is not appropriate to complete a line of **compartment walls** by fitting **cavity barriers** above them. The **compartment wall** should extend to the underside of the floor or roof above.

### Protected escape routes

- 9.5** If the **fire resisting** construction of a protected **escape route** is either of the following.
- Not carried to full **storey** height.
  - At the top **storey**, not carried to the underside of the roof covering.

Then the **cavity above or below** the **fire resisting** construction should be either of the following.

- Fitted with **cavity barriers** on the line of the enclosure.
- For **cavities** above the **fire resisting** construction, enclosed on the lower side by a **fire resisting ceiling** (minimum EI 30) that extends throughout the **building**, **compartment** or **separated part** (see Diagram 9.3).

### Cavities affecting alternative escape routes

- 9.6** In divided corridors, **cavity barriers** may be needed to prevent **alternative escape routes** being affected by fire and/or smoke (see paragraph 2.27 and Diagram 2.9).

### Separation of bedrooms in ‘residential (institutional)’ and ‘residential (other)’ buildings

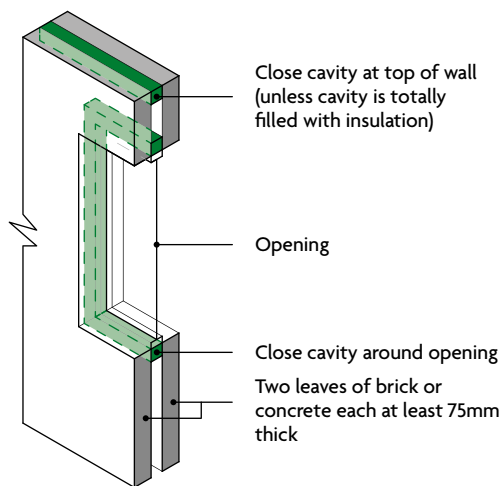
- 9.7** Where a **cavity** exists above or below a partition between bedrooms because the enclosure is not carried to full **storey** height or to the underside of the roof covering, the guidance in paragraph 9.5 should be followed.

## Double-skinned corrugated or profiled roof sheeting

**9.8** Cavity barriers are not required between double-skinned corrugated or profiled insulated roof sheeting if the sheeting complies with all of the following.

- The sheeting is rated class A2-s3, d2 or better.
- Both surfaces of the insulating layer are rated class C-s3, d2 or better.
- Both surfaces of the insulating layer make contact with the inner and outer skins of cladding (Diagram 9.4).

See para 9.3

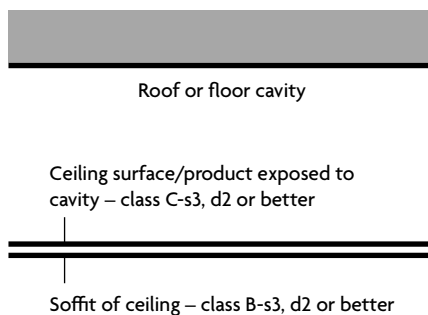


### NOTES:

- Materials used to close the cavity in this arrangement do not need to achieve a specific performance in relation to fire resistance.
- Domestic meter cupboards may be installed provided that the following conditions are met:
  - There are no more than two cupboards per dwelling
  - The openings in the outer wall leaf are not bigger than 800×500mm for each cupboard
  - The inner leaf is not penetrated except by a sleeve not more than 80×80mm, which is fire-stopped.
- Materials achieving class B-s3, d2 or worse may be placed within the cavity.

Diagram 9.2 Cavity walls excluded from provisions for cavity barriers

See para 9.5

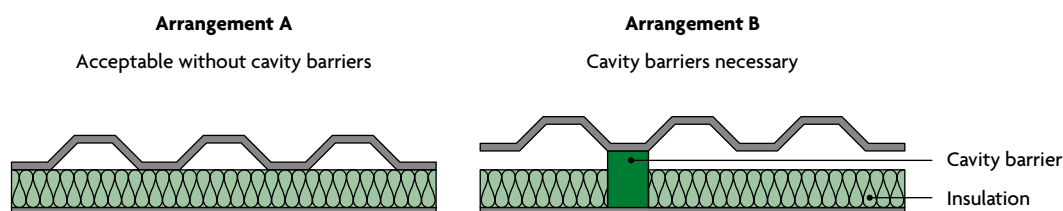


### NOTE:

- The ceiling should meet the following conditions.
- Provide a minimum fire resistance of EI 30.
  - Be imperforate, except for an opening described in paragraph 9.17.
  - Extend throughout the building or compartment.
  - Not be easily demountable.

Diagram 9.3 Fire resisting ceiling below cavity

See para 9.8



The insulation should make contact with both skins of sheeting. See also Diagram 8.2a regarding the need for fire-stopping where such roofs pass over the top of a compartment wall.

Diagram 9.4 Provisions for cavity barriers in double-skinned insulated roof sheeting

## Extensive cavities

### Maximum dimensions of cavities

**9.9** Cavity barriers should be used to divide any cavity (including roof spaces). Table 9.1 sets out maximum dimensions for undivided cavities.

**Table 9.1 Maximum dimensions of cavities in buildings other than dwellings (purpose groups 2 to 7)**

Location of cavity	Class of surface/product exposed in cavity (excluding the surface of any pipe, cable or conduit, or any insulation to any pipe)	Maximum dimension in any direction (m)
Between roof and a ceiling	Any	20
Any other cavity	Class C-s3, d2 or better	20
	Worse than Class C-s3, d2	10

**9.10** Table 9.1 does not apply to any of the following cavities.

- A cavity in a wall that is fire resisting only because it is loadbearing.
- A cavity in a wall that meets the conditions of Diagram 9.2.
- A floor or roof cavity above a fire resisting ceiling (Diagram 9.3) that extends throughout the building or compartment to a maximum of 30m.
- In a building not put to residential or institutional use, a cavity that does not contain materials achieving class B-s3, d2 or worse and is formed either:
  - behind the external skin of an external cladding system with a masonry or concrete inner leaf a minimum of 75mm thick
  - by overcladding an existing masonry (or concrete) external wall or an existing concrete roof.
- A cavity that meets the conditions of paragraph 9.8.
- A cavity below a floor next to the ground or next to oversite concrete, if either:

- i. the **cavity** is less than 1000mm in height
- ii. the **cavity** is not normally accessible by people, unless there are openings in the floor such that it is possible for materials to accumulate in the **cavity** (in which case **cavity barriers** should be provided and access should be provided to the **cavity** for cleaning).

**9.11** If a single **room** with a **ceiling cavity** or underfloor **cavity** exceeds the dimensions in Table 9.1, **cavity barriers** need only be provided on the line of the enclosing walls/partitions of that **room**, if both of the following apply.

- a. The **cavity barriers** are a maximum of 40m apart.
- b. The surface of the material/product exposed in the **cavity** is class C-s3, d2 or better.

**9.12** If the undivided area exceeds 40m in one or both directions, there is no limit to its size if all of the following conditions are met.

- a. Together, the **room** and **cavity** form a **compartment** separated from the rest of the **building**.
- b. Both of the following apply.
  - i. The **building** is fitted with an automatic fire detection and alarm system that conforms to **BS 5839-1**.
  - ii. Detectors are only required in the **cavity** to satisfy **BS 5839-1**.
- c. If the **cavity** is used as a plenum then the recommendations for recirculating air distribution systems in Section 32 of **BS 9999** are followed.
- d. Both of the following apply.
  - i. The exposed surface of the material/product used in the construction of the **cavity** is class B-s3, d2 or better.
  - ii. The supports and fixings in the **cavity** are class A1.
- e. Any **pipe** insulation system should achieve class C-s3, d2 rating or better.
- f. Any electrical wiring in the **cavity** is laid in metal trays or metal conduit.
- g. Other than those in (d)–(f), any materials are class A2-s3, d2 rated or better.

## Construction and fixings for cavity barriers

**9.13** **Cavity barriers**, tested from each side separately, should provide a minimum of both of the following:

- a. 30 minutes' integrity (E 30)
- b. 15 minutes' insulation (I 15).

They may be formed by a construction provided for another purpose if it achieves the same performance.

**9.14** **Cavity barriers** in a stud wall or partition, or provided around openings, may be formed of any of the following.

- a. Steel, a minimum of 0.5mm thick.
- b. Timber, a minimum of 38mm thick.
- c. Polythene-sleeved mineral wool, or mineral wool slab, under compression when installed in the **cavity**.

d. Calcium silicate, cement-based or gypsum-based boards, a minimum of 12mm thick.

These do not necessarily achieve the performance specified in paragraph 9.13.

**NOTE:** Cavity barriers provided around openings may be formed by the window or door frame if the frame is constructed of steel or timber of the minimum thickness in (a) or (b), as appropriate.

- 9.15** Cavity barriers should be tightly fitted to a rigid construction and mechanically fixed in position. If this is not possible (e.g. where a cavity barrier joins to slates, tiles, corrugated sheeting or similar materials) the junction should be fire-stopped.
- 9.16** Cavity barriers should be fixed so their performance is unlikely to be made ineffective by any of the following.
- Movement of the building due to subsidence, shrinkage or temperature change, and movement of the external envelope due to wind.
  - During a fire, collapse of services penetrating the cavity barriers, either by the failure of the supporting system or through degradation of the service itself (e.g. by melting or burning).
  - During a fire, failure of the cavity barrier fixings. (In roof spaces, where cavity barriers are fixed to roof members, there is no expectation of fire resistance from roof members provided for the purpose of support.)
  - During a fire, failure of any material or construction to which cavity barriers abut. (For example, a suspended ceiling that continues over a fire resisting wall or partition collapses, and the cavity barrier fails prematurely because the ceiling was not designed to provide a minimum fire resistance of EI 30.)

## Openings in cavity barriers

- 9.17** Openings should be limited to the following.
- Fire doorsets with a minimum rating of E 30, fitted in accordance with Appendix C.
  - The passage of pipes that follow the provisions in Section 10.
  - The passage of cables or conduits containing one or more cables.
  - Openings fitted with a suitably mounted and appropriate fire damper.
  - Ducts that are either of the following.
    - Fire resisting (minimum E 30).
    - Fitted with a suitably mounted and appropriate fire damper where they pass through the cavity barrier.
- 9.18** If a cavity barrier is provided above or below a partition between bedrooms in 'residential (institutional)' and 'residential (other)' (purpose groups 2(a) and 2(b)) buildings, and the partition is not a fire resisting partition, then paragraph 9.17 does not apply. However, both of the following apply.
- The number of openings in the barrier should be kept to a minimum.
  - Any penetrations should be sealed to restrict the passage of smoke with an appropriate fire-stopping material.

**NOTE:** For further guidance on openings in cavity barriers see Section 10.

## Section 10: Protection of openings and fire-stopping

### Introduction

**10.1** The performance of a **fire-separating element** should not be impaired. Every joint, imperfect fit and opening for services should be sealed. **Fire-stopping** delays the spread of fire and, generally, the spread of smoke as well.

### Openings for pipes

**10.2** Pipes passing through a **fire-separating element**, unless in a **protected shaft**, should comply with one of the alternatives A, B or C below.

#### Alternative A: Proprietary seals (any pipe diameter)

**10.3** Provide a proprietary, tested sealing system that will maintain the **fire resistance** of the wall, floor or **cavity barrier**.

#### Alternative B: Pipes with a restricted diameter

**10.4** Where a proprietary sealing system is not used, **fire-stop** around the **pipe**, keeping the opening for the **pipe** as small as possible. The nominal internal diameter of the **pipe** should not exceed the relevant dimension given in Table 10.1.

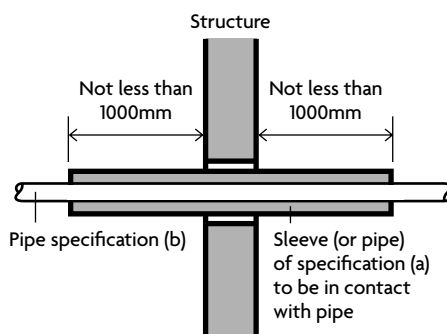
#### Alternative C: Sleeving

**10.5** A **pipe** with a maximum nominal internal diameter of 160mm may be used with a sleeve made out of a high melting point metal, as shown in Diagram 10.1, if the **pipe** is made of one of the following.

- a. Lead.
- b. Aluminium.
- c. Aluminium alloy.
- d. Fibre-cement.
- e. uPVC (**pipes** should also comply with either **BS 4514** or **BS 5255**).

A high melting point metal means any metal (such as cast iron, copper or steel) which, if exposed to a temperature of 800°C, will not soften or fracture to the extent that flame or hot gas will pass through the wall of the **pipe**.

See para 10.5



**NOTES:**

1. Make the opening in the structure as small as possible and provide fire-stopping between pipe and structure.
2. See Table 10.1 for materials specification.
3. The sleeve should be class A1 rated.

Diagram 10.1 Pipes penetrating structure

**Table 10.1 Maximum nominal internal diameter of pipes passing through a compartment wall/floor**

Situation	Pipe material and maximum nominal internal diameter (mm)		
	(a)	(b)	(c)
	High melting point metal <sup>(1)</sup>	Lead, aluminium, aluminium alloy, uPVC <sup>(2)</sup> , fibre-cement	Any other material
1. Structure (but not a wall separating buildings) enclosing a protected shaft that is not a stairway or a lift shaft	160	110	40
2. Any other situation	160	40	40

**NOTES:**

1. Any metal (such as cast iron, copper or steel) which, if exposed to a temperature of 800°C, will not soften or fracture to the extent that flame or hot gas will pass through the wall of the pipe.
2. uPVC pipes that comply with either **BS 4514** or **BS 5255**.

## Mechanical ventilation and air-conditioning systems

### General provisions

- 10.6** Ductwork should not help to transfer fire and smoke through the **building**. Terminals of exhaust points should be sited away from **final exits**, cladding or roofing materials achieving class B-s3, d2 or worse and openings into the **building**.
- 10.7** Ventilation ducts supplying or extracting air directly to or from a **protected stairway** should not also serve other areas. A separate ventilation system should be provided for each **protected stairway**.
- 10.8** A **fire and smoke damper** should be provided where ductwork enters or leaves each section of the protected **escape route** it serves. It should be operated by a smoke detector or suitable fire detection system. **Fire and smoke dampers** should close when smoke is detected. Alternatively, the methods set out in paragraphs 10.15 and 10.16 and Diagrams 10.2 and 10.3 may be followed.

**10.9** In a system that recirculates air, smoke detectors should be fitted in the extract ductwork before both of the following.

- a. The point where recirculated air is separated from air to be discharged to the outside.
- b. Any filters or other air cleaning equipment.

When smoke is detected, detectors should do one of the following.

- a. Cause the system to immediately shut down.
- b. Switch the ventilation system from recirculating mode to extraction to divert smoke outside the building.

**10.10** Non-domestic kitchens, car parks and plant rooms should have separate and independent extraction systems. Extracted air should not be recirculated.

**10.11** Under fire conditions, ventilation and air-conditioning systems should be compatible with smoke control systems and need to be considered in their respective design.

## Ventilation ducts and flues passing through fire-separating elements

### General provisions

**10.12** If air handling ducts pass through fire-separating elements, the load-bearing capacity, integrity and insulation of the elements should be maintained using one or more of the following four methods. In most ductwork systems, a combination of the four methods is best.

- a. Method 1 – thermally activated fire dampers.
- b. Method 2 – fire resisting enclosures.
- c. Method 3 – protection using fire resisting ductwork.
- d. Method 4 – automatically activated fire and smoke dampers triggered by smoke detectors.

**10.13** Further information on fire resisting ductwork is given in the ASFP Blue Book.

### Kitchen extract

**10.14** Methods 1 and 4 should not be used for extract ductwork serving kitchens. The likely build-up of grease within the duct can adversely affect dampers.

### Ducts passing through protected escape routes

**10.15** Method 1 should not be used for extract ductwork passing through the enclosures of protected escape routes (Diagrams 10.2 and 10.3), as large volumes of smoke can pass thermal devices without triggering them.

**10.16** An ES classified fire and smoke damper which is activated by a suitable fire detection system (method 4) may also be used for protected escape routes.

See para 10.15

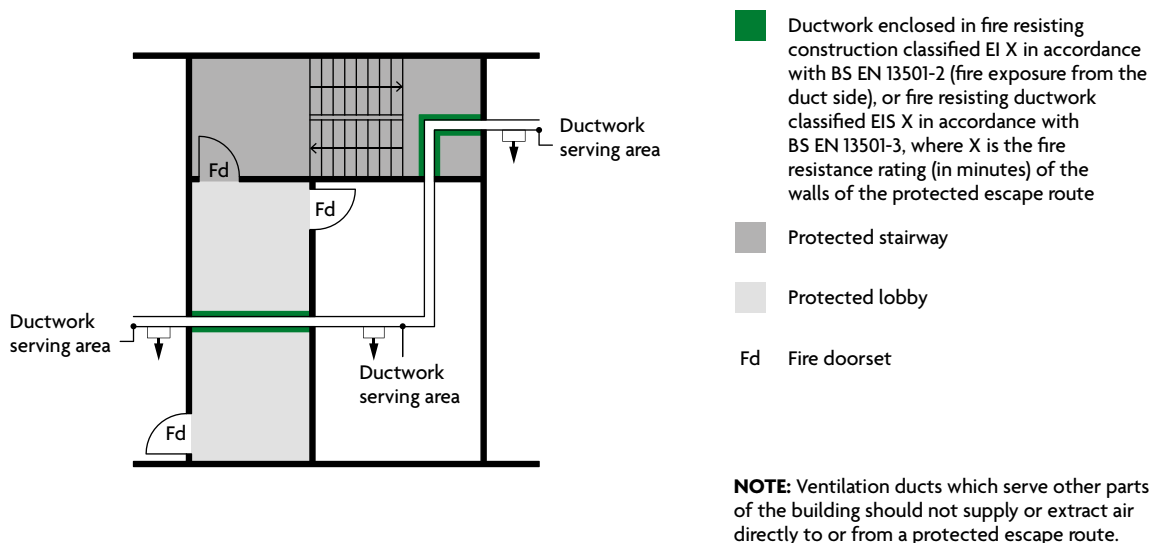


Diagram 10.2 Ductwork passing through protected escape routes – method 2 or method 3

See para 10.15

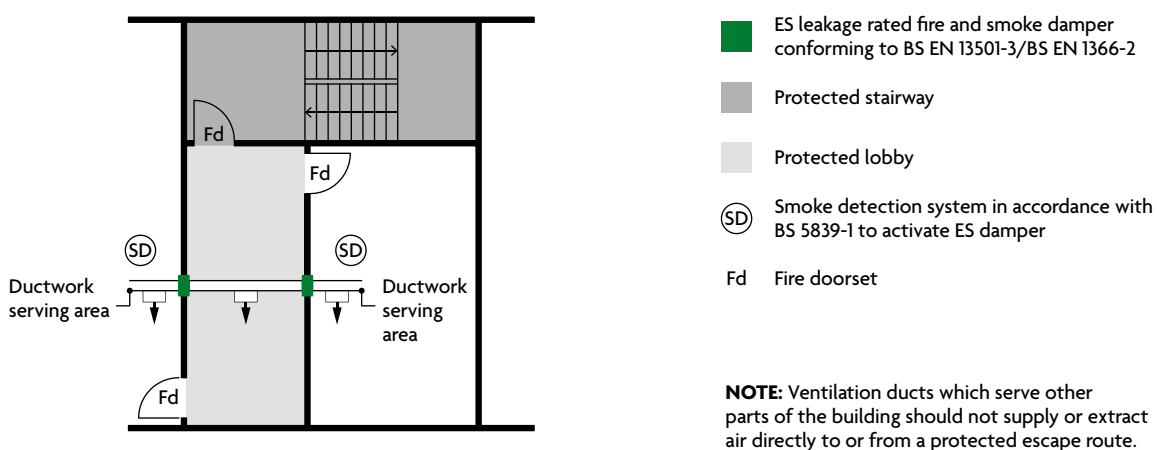


Diagram 10.3 Ductwork passing through protected escape routes – method 4

## Installation and specification of fire dampers

**10.17** Both **fire dampers** and **fire and smoke dampers** should be all of the following.

- Sited within the thickness of the **fire-separating elements**.
- Securely fixed.
- Sited such that, in a fire, expansion of the ductwork would not push the **fire damper** through the structure.

**10.18** Access to the **fire damper** and its actuating mechanism should be provided for inspection, testing and maintenance.

**10.19** **Fire dampers** should meet both of the following conditions.

- Conform to **BS EN 15650**.
- Have a minimum E classification of 60 minutes or to match the integrity rating of the **fire resisting** elements, whichever is higher.

**10.20** **Fire and smoke dampers** should meet both of the following conditions.

- Conform to **BS EN 15650**.
- Have a minimum ES classification of 60 minutes or to match the integrity rating of the **fire resisting** elements, whichever is higher.

**10.21** Smoke detectors should be sited so as to prevent the spread of smoke as early as practicable by activating the **fire and smoke dampers**. Smoke detectors and **automatic release mechanisms** used to activate **fire dampers** and/or **fire and smoke dampers** should conform to **BS EN 54-7** and **BS 5839-3** respectively.

Further information on **fire dampers** and/or **fire and smoke dampers** is given in the ASFP Grey Book.

## Sleeping risks

**10.22** Where the use of the **building** involves a sleeping risk, **fire dampers** or **fire and smoke dampers** should be actuated by both of the following.

- Smoke detector-controlled **automatic release mechanisms**.
- Thermally actuated devices.

However, in a situation where both of the following are true:

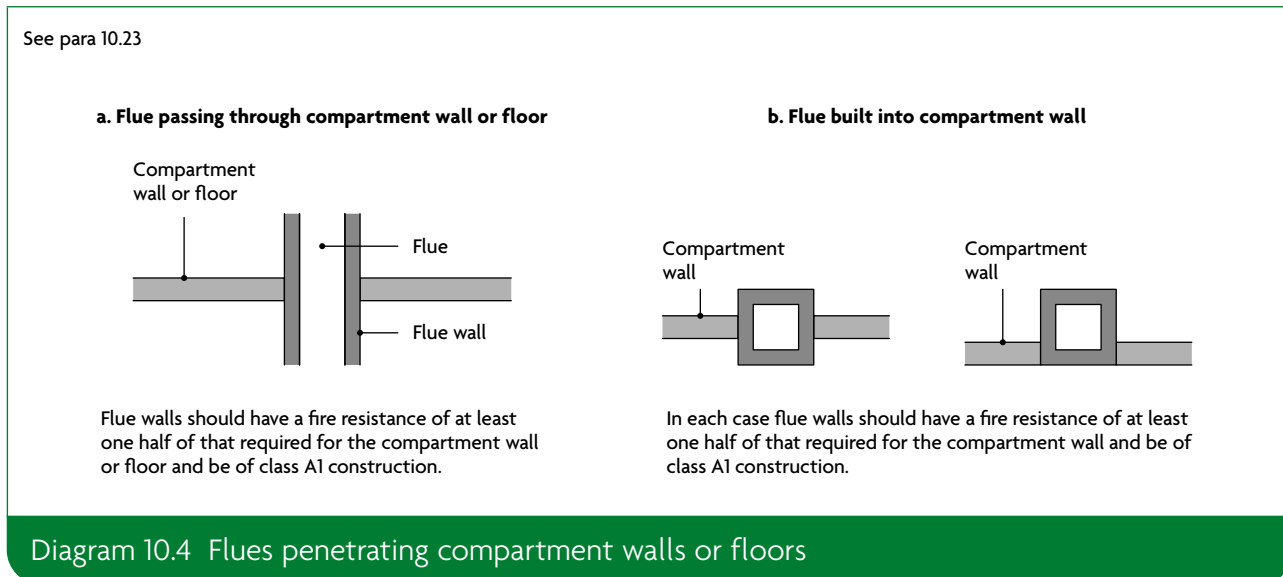
- all occupants of the **building** can be expected to make an unaided escape
- an L1 **fire detection and alarm system** is installed in accordance with **BS 5839-1**

then both of the following exceptions may be made.

- If, on the detection of smoke, the **fire alarm system** signals the immediate evacuation of all the occupants of the **building**, then **fire dampers** and/or **fire and smoke dampers** do not need to be actuated by smoke detectors.
- If the **building** is divided into fire **compartments** and the alarm system is arranged to signal the immediate evacuation of the occupants of the fire **compartment** in which the fire has been detected, then smoke detector-operated **fire dampers** or **fire and smoke dampers** need only be provided where ductwork enters or leaves the fire **compartment**.

## Flues, etc.

**10.23** The wall of a flue, duct containing flues or appliance ventilation duct(s) should have a fire resistance (REI) that is at least half of any compartment wall or compartment floor it passes through or is built into (Diagram 10.4).



## Fire-stopping

**10.24** In addition to any other provisions in this section, both of the following conditions should be met.

- a. Joints between fire-separating elements should be fire-stopped.
- b. Openings through a fire resisting element for pipes, ducts, conduits or cable should be all of the following.
  - i. As few as possible.
  - ii. As small as practicable.
  - iii. Fire-stopped (allowing thermal movement in the case of a pipe or duct).

**NOTE:** The fire-stopping around fire dampers, fire resisting ducts, fire and smoke dampers and smoke control ducts should be in accordance with the manufacturer or supplier's installation instructions.

**10.25** Materials used for fire-stopping should be reinforced with (or supported by) materials rated class A2-s3, d2 or better to prevent displacement in both of the following cases.

- a. Where the unsupported span is greater than 100mm.
- b. Where non-rigid materials are used (unless subjected to appropriate fire resistance testing to show their suitability).

**10.26** Proprietary, tested fire-stopping and sealing systems are available and may be used. Different materials suit different situations and not all are suitable in every situation.

**10.27** Other fire-stopping materials include the following.

- a. Cement mortar.
- b. Gypsum-based plaster.
- c. Cement-based or gypsum-based vermiculite/perlite mixes.
- d. Glass fibre, crushed rock, blast furnace slag or ceramic-based products (with or without resin binders).
- e. Intumescent mastics.

These may be used in situations appropriate to the particular material. Not all materials will be suitable in every situation.

**10.28** Guidance on the design, installation and maintenance of measures to contain fires or slow their spread is given in *Ensuring Best Practice for Passive Fire Protection in Buildings* produced by the Association for Specialist Fire Protection (ASFP).

**10.29** Further information on generic systems, their suitability for different applications and guidance on test methods is given in the ASFP Red Book.

## Section 11: Special provisions for car parks

- 11.1** Car parks call for different measures to restrict fire spread within **buildings** for the following reasons.
- The fire load is well defined.
  - The probability of fire spreading from one **storey** to another in a well ventilated car park is low. Guidance is therefore given for three ventilation scenarios.

### Open-sided car parks

#### Natural ventilation

- 11.2** For the purposes of assessing **fire resistance**, a **building**, **compartment** or **separated part** containing a car park may be regarded as open-sided when it complies with all of the following.
- There are no **basement storeys**.
  - Each **storey** is naturally ventilated by permanent openings at each car parking level. The aggregate vent area is a minimum of 1/20 of that level's floor area, at least half of which is provided equally by two opposite walls.
  - Where one **element of structure** supports, carries or stabilises another, the **fire resistance** of the supporting element at least matches the minimum period of **fire resistance** for the other element.
  - In mixed use **buildings**, the **fire resistance** of any element that supports, carries or stabilises an element in the other part of the **building** should at least match the minimum period of **fire resistance** for the other element.
  - All materials used in the construction should be class A1 rated, except for the following.
    - Any surface finish applied to a floor or roof of the car park (or within any **building**, **compartment** or **separated part** adjoining the structure enclosing it), if the finish meets requirements B2 and B4.
    - Any **fire doorset**.
    - Any attendant's kiosk not exceeding 15m<sup>2</sup> in area.
    - Any shop mobility facility.

### Car parks that are not open-sided

- 11.3** For car parks that do not have the ventilation set out in paragraph 11.2, the required **fire resistance** is given in Appendix B, Table B4. Ventilation should be either natural or mechanical. See Approved Document F for additional guidance on ventilation of car parks.

#### Natural ventilation

- 11.4** Each **storey** should be ventilated by permanent openings at each car parking level. The openings can be at **ceiling** level. The aggregate free vent area should be a minimum of 1/40 of that level's floor area, at least half of which should be provided equally by two opposite walls (1/160 on each side). The remaining free area can be distributed wherever possible.

### Mechanical ventilation

**11.5** If the minimum standard of natural ventilation is not possible, a system of mechanical ventilation should be provided that complies with all of the following.

- a. The system should be both of the following.
  - i. Independent of any other ventilating system (other than any system that provides day to day ventilation to the car park).
  - ii. Designed to operate at 10 air changes per hour during a fire.
- b. The system should run in two parts, each of which is:
  - i. capable of extracting 50% of the rates set out in item (a)
  - ii. able to operate alone or with the other part
  - iii. provided with an independent power supply capable of operating if the main supply fails.
- c. 50% of the outlets should be at high level and 50% at low level.
- d. The system should use E, I and S ductwork in accordance with **BS EN 1366-8**.

For further information on equipment for removing hot smoke, refer to **BS EN 12101-3**. An alternative method of providing smoke ventilation from enclosed car parks is given in **BS 7346-7**.

## Requirement B4: External fire spread

These sections deal with the following requirement from Part B of Schedule 1 to the Building Regulations 2010. Section 12 also refers to regulation 7(2) of the Building Regulations 2010. Guidance on regulation 7(1) can be found in Approved Document 7.

### 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.

### Regulation

#### **Regulation 7 – Materials and workmanship**

- (1) Building work shall be carried out—
- (a) with adequate and proper materials which—
    - (i) are appropriate for the circumstances in which they are used,
    - (ii) are adequately mixed or prepared, and
    - (iii) are applied, used or fixed so as adequately to perform the functions for which they are designed; and
  - (b) in a workmanlike manner.
- (2) Subject to paragraph (3), building work shall be carried out so that materials which become part of an external wall, or specified attachment, of a relevant building are of European Classification A2-s1, d0 or Class A1, classified in accordance with BS EN 13501-1:2007+A1:2009 entitled “Fire classification of construction products and building elements. Classification using test data from reaction to fire tests” (ISBN 978 0 580 59861 6) published by the British Standards Institution on 30th March 2007 and amended in November 2009.

**Regulation continued**

- (3) Paragraph (2) does not apply to—
- (a) cavity trays when used between two leaves of masonry;
  - (b) any part of a roof (other than any part of a roof which falls within paragraph (iv) of regulation 2(6)) if that part is connected to an external wall;
  - (c) door frames and doors;
  - (d) electrical installations;
  - (e) insulation and water proofing materials used below ground level;
  - (f) intumescent and fire stopping materials where the inclusion of the materials is necessary to meet the requirements of Part B of Schedule 1;
  - (g) membranes;
  - (h) seals, gaskets, fixings, sealants and backer rods;
  - (i) thermal break materials where the inclusion of the materials is necessary to meet the thermal bridging requirements of Part L of Schedule 1; or
  - (j) window frames and glass.
- (4) In this regulation—
- (a) a “relevant building” means a building with a storey (not including roof-top plant areas or any storey consisting exclusively of plant rooms) at least 18 metres above ground level and which—
    - (i) contains one or more dwellings;
    - (ii) contains an institution; or
    - (iii) contains a room for residential purposes (excluding any room in a hostel, hotel or boarding house); and
  - (b) “above ground level” in relation to a storey means above ground level when measured from the lowest ground level adjoining the outside of a building to the top of the floor surface of the storey.

## Intention

### Resisting fire spread over external walls

The external envelope of a **building** should not contribute to undue fire spread from one part of a **building** to another part. This intention can be met by constructing **external walls** so that both of the following are satisfied.

- a. The risk of ignition by an external source to the outside surface of the **building** and spread of fire over the outside surface is restricted.
- b. The materials used to construct **external walls**, and attachments to them, and how they are assembled do not contribute to the rate of fire spread up the outside of the **building**.

The extent to which this is necessary depends on the **height** and use of the **building**.

## Resisting fire spread from one building to another

The external envelope of a **building** should not provide a medium for undue fire spread to adjacent **buildings** or be readily ignited by fires in adjacent **buildings**. This intention can be met by constructing **external walls** so that all of the following are satisfied.

- a. The risk of ignition by an external source to the outside surface of the **building** is restricted.
- b. The amount of thermal radiation that falls on a neighbouring **building** from window openings and other **unprotected areas** in the **building** on fire is not enough to start a fire in the other **building**.
- c. Flame spread over the roof and/or fire penetration from external sources through the roof is restricted.

The extent to which this is necessary depends on the use of the **building** and its position in relation to adjacent **buildings** and therefore the **site boundary**.

## Section 12: Resisting fire spread over external walls

### Introduction

**12.1** The **external wall** of a **building** should not provide a medium for fire spread if that is likely to be a risk to health and safety. Combustible materials and **cavities** in **external walls** and attachments to them can present such a risk, particularly in tall **buildings**. The guidance in this section is designed to reduce the risk of vertical fire spread as well as the risk of ignition from flames coming from adjacent **buildings**.

### Fire resistance

**12.2** This section does not deal with **fire resistance** for **external walls**. An **external wall** may need **fire resistance** to meet the requirements of Section 5 (General provisions), Section 7 (Loadbearing elements of structures) or Section 13 (Resisting fire spread from one building to another).

### Combustibility of external walls

**12.3** The **external walls** of **buildings** other than those described in regulation 7(4) of the Building Regulations should achieve either of the following.

- a. Follow the provisions given in paragraphs 12.5 to 12.9, which provide guidance on all of the following.
  - i. External surfaces.
  - ii. Materials and products.
  - iii. **Cavities** and **cavity barriers**.
- b. Meet the performance criteria given in BRE report BR 135 for **external walls** using full-scale test data from **BS 8414-1** or **BS 8414-2**.

**12.4** In relation to **buildings** of any **height** or use, consideration should be given to the choice of materials (including their extent and arrangement) used for the **external wall**, or attachments to the wall, to reduce the risk of fire spread over the wall.

### External surfaces

**12.5** The external surfaces (i.e. outermost external material) of **external walls** should comply with the provisions in Table 12.1. The provisions in Table 12.1 apply to each wall individually in relation to its proximity to the **relevant boundary**.

**Table 12.1 Reaction to fire performance of external surface of walls**

Building type	Building height	Less than 1000mm from the relevant boundary	1000mm or more from the relevant boundary
'Relevant buildings' as defined in regulation 7(4) (see paragraph 12.11)		Class A2-s1, d0 <sup>(1)</sup> or better	Class A2-s1, d0 <sup>(1)</sup> or better
Assembly and recreation	More than 18m	Class B-s3, d2 <sup>(2)</sup> or better	From ground level to 18m: class C-s3, d2 <sup>(3)</sup> or better From 18m in height and above: class B-s3, d2 <sup>(2)</sup> or better
	18m or less	Class B-s3, d2 <sup>(2)</sup> or better	Up to 10m above ground level: class C-s3, d2 <sup>(3)</sup> or better Up to 10m above a roof or any part of the building to which the public have access: class C-s3, d2 <sup>(3)</sup> or better <sup>(4)</sup> From 10m in height and above: no minimum performance
Any other building	More than 18m	Class B-s3, d2 <sup>(2)</sup> or better	From ground level to 18m: class C-s3, d2 <sup>(3)</sup> or better From 18m in height and above: class B-s3, d2 <sup>(2)</sup> or better
	18m or less	Class B-s3, d2 <sup>(2)</sup> or better	No provisions

**NOTES:**

In addition to the requirements within this table, buildings with a top occupied storey above 18m should also meet the provisions of paragraph 12.6.

In all cases, the advice in paragraph 12.4 should be followed.

1. The restrictions for these buildings apply to all the materials used in the external wall and specified attachments (see paragraphs 12.10 to 12.13 for further guidance).
2. Profiled or flat steel sheet at least 0.5 mm thick with an organic coating of no more than 0.2mm thickness is also acceptable.
3. Timber cladding at least 9mm thick is also acceptable.
4. 10m is measured from the top surface of the roof.

## Materials and products

- 12.6** In a building with a storey 18m or more in height (see Diagram D6 in Appendix D) any insulation product, filler material (such as the core materials of metal composite panels, sandwich panels and window spandrel panels but not including gaskets, sealants and similar) etc. used in the construction of an external wall should be class A2-s3, d2 or better (see Appendix B). This restriction does not apply to masonry cavity wall construction which complies with Diagram 9.2 in Section 9. Where regulation 7(2) applies, that regulation prevails over all the provisions in this paragraph.
- 12.7** Best practice guidance for green walls (also called living walls) can be found in *Fire Performance of Green Roofs and Walls*, published by the Department for Communities and Local Government.

## Cavities and cavity barriers

**12.8** Cavity barriers should be provided in accordance with Section 9.

**12.9** In the case of an external wall construction of a building which, by virtue of paragraph 9.10d (external cladding system with a masonry or concrete inner leaf), is not subject to the provisions of Table 9.1, the surfaces which face into cavities should also meet the provisions of Table 12.1 and provisions in Section 9, but where regulation 7(2) applies, that regulation prevails over the guidance provided in Table 12.1 and Section 9.

## Regulation 7(2) and requirement B4

### Materials

**12.10** Regulation 7(1)(a) requires that materials used in building work are appropriate for the circumstances in which they are used. Regulation 7(2) sets requirements in respect of external walls and specified attachments in relevant buildings.

**NOTE:** Guidance on regulation 7(1) can be found in Approved Document 7.

**12.11** Regulation 7(2) applies to any building with a storey at least 18m above ground level (as measured in accordance with Diagram D6 in Appendix D) and which contains one or more dwellings; an institution; or a room for residential purposes (excluding any room in a hostel, hotel or a boarding house). It requires that all materials which become part of an external wall or specified attachment achieve class A2-s1, d0 or class A1, other than those exempted by regulation 7(3).

**NOTE:** The above includes student accommodation, care homes, sheltered housing, hospitals and dormitories in boarding schools. See regulation 7(4) for the definition of relevant buildings.

**NOTE:** The requirement in regulation 7(2) is limited to materials achieving class A2-s1, d0 or class A1.

**12.12** External walls and specified attachments are defined in regulation 2 and these definitions include any parts of the external wall as well as balconies, solar panels and sun shading.

**12.13** Regulation 7(3) provides an exemption for certain components found in external walls and specified attachments.

### Material change of use

**12.14** Regulations 5(k) and 6(3) provide that, where the use of a building is changed such that the building becomes a building described in regulation 7(4), the construction of the external walls, and specified attachments, must be investigated and, where necessary, work must be carried out to ensure they only contain materials achieving class A2-s1, d0 or class A1, other than those exempted by regulation 7(3).

### Additional considerations

**12.15** The provisions of regulation 7 apply in addition to requirement B4. Therefore, for buildings described in regulation 7(4), the potential impact of any products incorporated into or onto the external walls and specified attachments should be carefully considered with regard to their number, size, orientation and position.

**12.16** Particular attention is drawn to the following points.

- a. Membranes used as part of the **external wall** construction above ground level should achieve a minimum of class B-s3, d0.
- b. Internal linings should comply with the guidance provided in Section 6.
- c. Any part of a roof should achieve the minimum performance as detailed in Section 14.
- d. As per regulation 7(3), window frames and glass (including laminated glass) are exempted from regulation 7(2). Window spandrel panels and infill panels must comply with regulation 7(2).
- e. Thermal breaks are small elements used as part of the **external wall** construction to restrict thermal bridging. There is no minimum performance for these materials. However, they should not span two **compartments** and should be limited in size to the minimum required to restrict the thermal bridging (the principal insulation layer is not to be regarded as a thermal break).
- f. Regulation 7(2) only applies to **specified attachments**. Shop front signs and similar attachments are not covered by the requirements of regulation 7(2), although attention is drawn to paragraph 12.16g.
- g. While regulation 7(2) applies to materials which become part of an **external wall** or **specified attachment**, consideration should be given to other attachments to the wall which could impact on the risk of fire spread over the wall.

## Section 13: Resisting fire spread from one building to another

### Introduction

- 13.1** The following assumptions enable a reasonable standard of resistance to the spread of fire to be specified.
- a. The size of a fire depends on the compartmentation within the **building**. A fire may involve a complete **compartment**, but will not spread to other **compartments**.
  - b. The intensity of fire is related to the **building** use, but can be moderated by a sprinkler system.
  - c. Fires in 'residential' and 'assembly and recreation' **buildings** (**purposes groups** 1, 2 and 5) represent a greater risk to life.
  - d. A **building** on the far side of the **relevant boundary** meets both of the following conditions.
    - i. Has a similar elevation to the one in question.
    - ii. Is at the same distance from the common **boundary**.
  - e. The radiated heat passing through any part of the **fire resisting external wall** may be discounted.
- 13.2** Where regulation 7(2) applies, that regulation prevails over the provisions within this section.
- 13.3** If a reduced separation distance between **buildings**, or increased amount of **unprotected area**, is required, smaller **compartments** should be considered.

### Boundaries

- 13.4** The **fire resistance** of a wall depends on its distance from the **relevant boundary** (see Diagram 13.1). Separation distances are measured to boundaries to ensure that the location and design of **buildings** on adjoining **sites** have no influence on the **building** under consideration.
- 13.5** The **boundary** that a wall faces is the **relevant boundary** (Diagram 13.2). It may be one of the following.
- a. The site **boundary**.
  - b. The centre line of a space where further development is unlikely, such as a road, railway, canal or river.
  - c. An assumed **notional boundary** between two **buildings** on the same site (Diagram 13.3) where either of the following conditions is met.
    - i. One or both of the **buildings** are in the 'residential' or 'assembly and recreation' **purpose groups** (**purpose group** 1, 2 or 5).
    - ii. The buildings will be operated/managed by different organisations.

See para 13.4

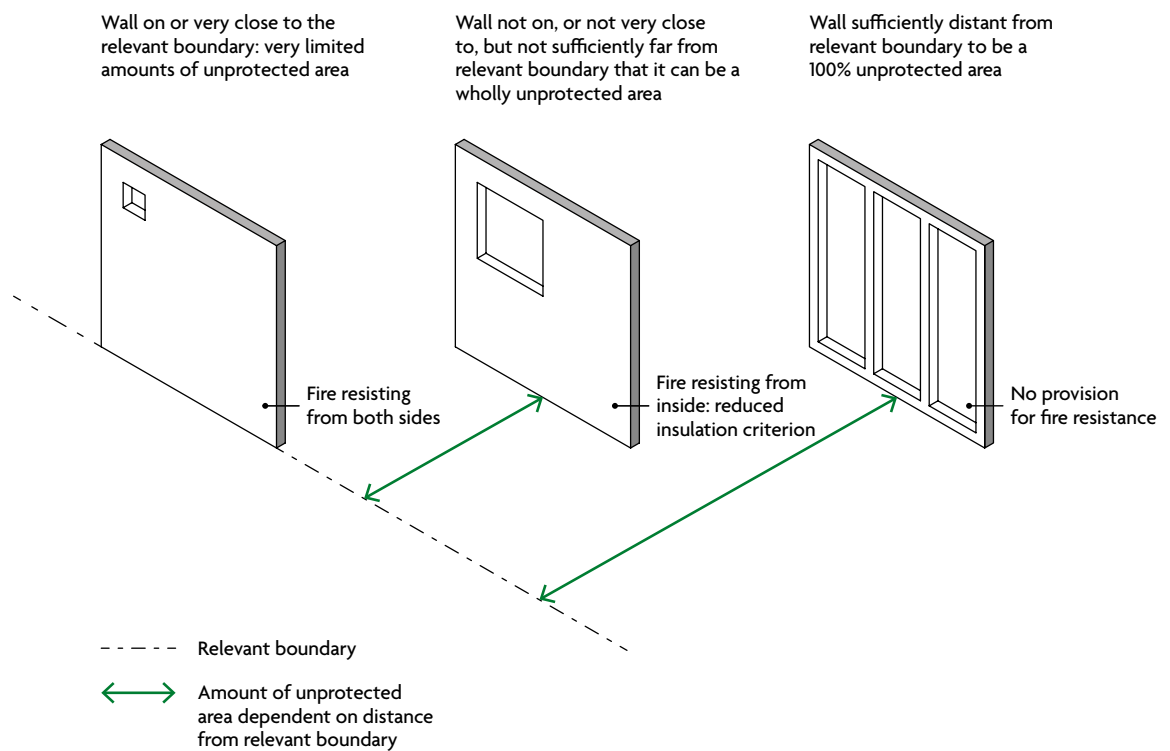
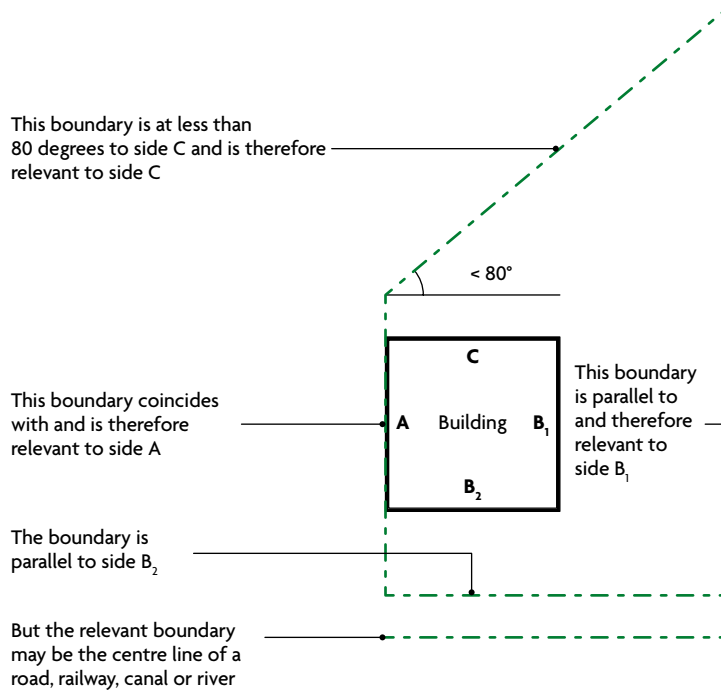


Diagram 13.1 Principles of space separation

See para 13.5



## NOTES:

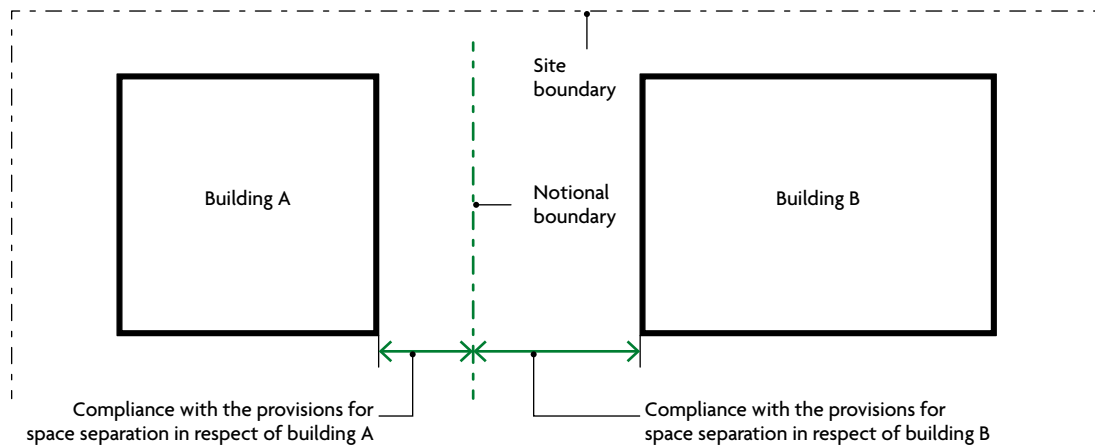
This diagram sets out the rules that apply in respect of a boundary for it to be considered as a relevant boundary.

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 13.2 Relevant boundary

See para 13.5



## NOTES:

The notional boundary should be set in the area between the two buildings using the following rules:

- The notional boundary is assumed to exist in the space between the buildings and is positioned so that one of the buildings would comply with the provisions for space separation having regard to the amount of its unprotected area. In practice, if one of the buildings is existing, the position of the boundary will be set by the space separation factors for that building.
- The siting of the new building, or the second building if both are new, can then be checked to see that it also complies, using the notional boundary as the relevant boundary for the second building.

Diagram 13.3 Notional boundary

## Unprotected areas and fire resistance

- 13.5** Parts of an **external wall** with less **fire resistance** than the appropriate amount given in Appendix B, Table B4, are called **unprotected areas**.
- 13.6** Where a **fire resisting external wall** has a surface material that is worse than class B-s3, d2 and is more than 1mm thick, that part of the wall should be classified as an **unprotected area** equating to half its area (Diagram 13.4).

### External walls on, and within 1000mm of, the relevant boundary

- 13.7** **Unprotected areas** should meet the conditions in Diagram 13.5 and the rest of the wall should be **fire resisting** from both sides.

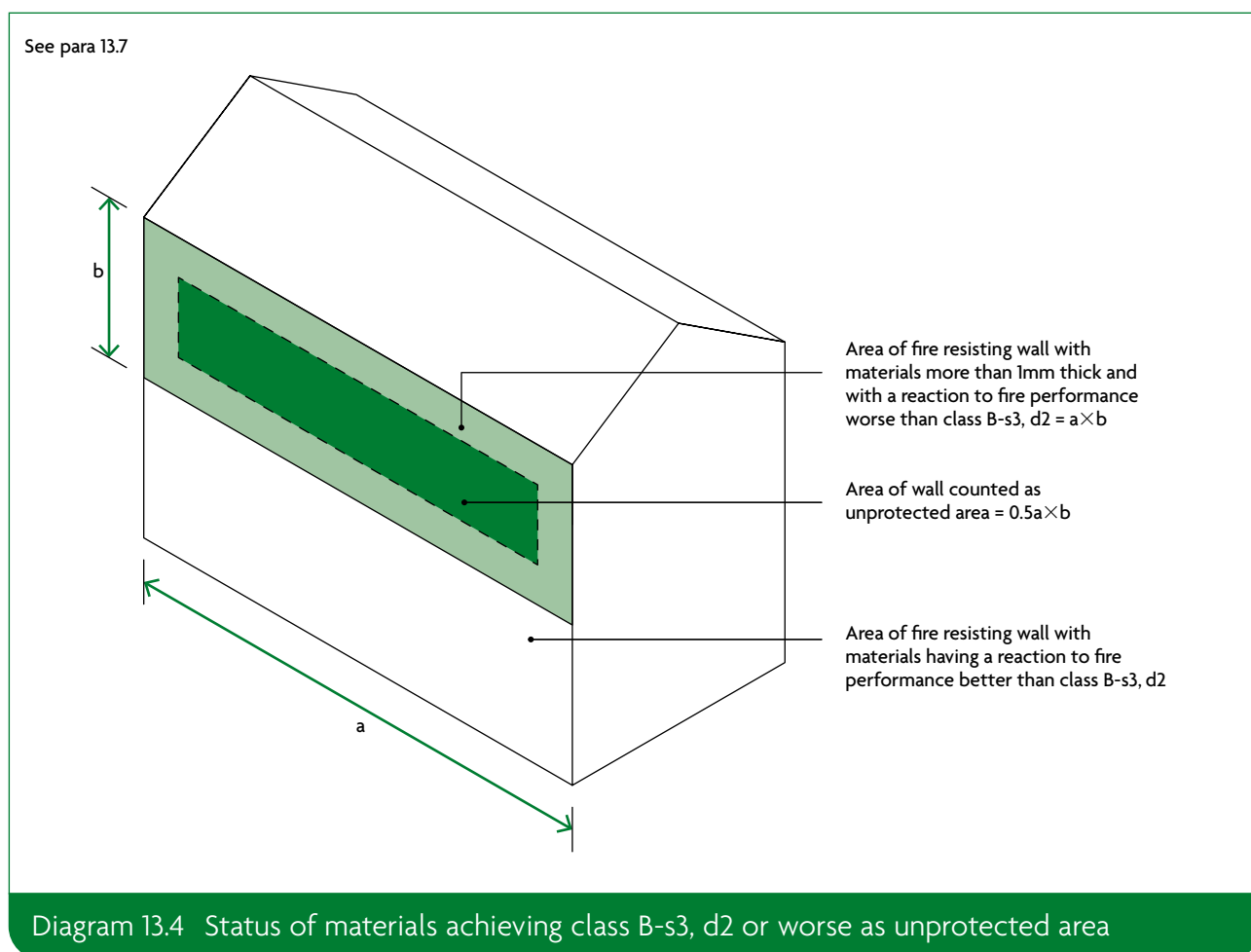
External surface materials facing the **boundary** should be class B-s3, d2 or better.

### External walls 1000mm or more from the relevant boundary

- 13.8** **Unprotected areas** should not exceed the result given by one of the methods in paragraph 13.17, and the rest of the wall (if any) should be **fire resisting** but only from the inside of the **building**.

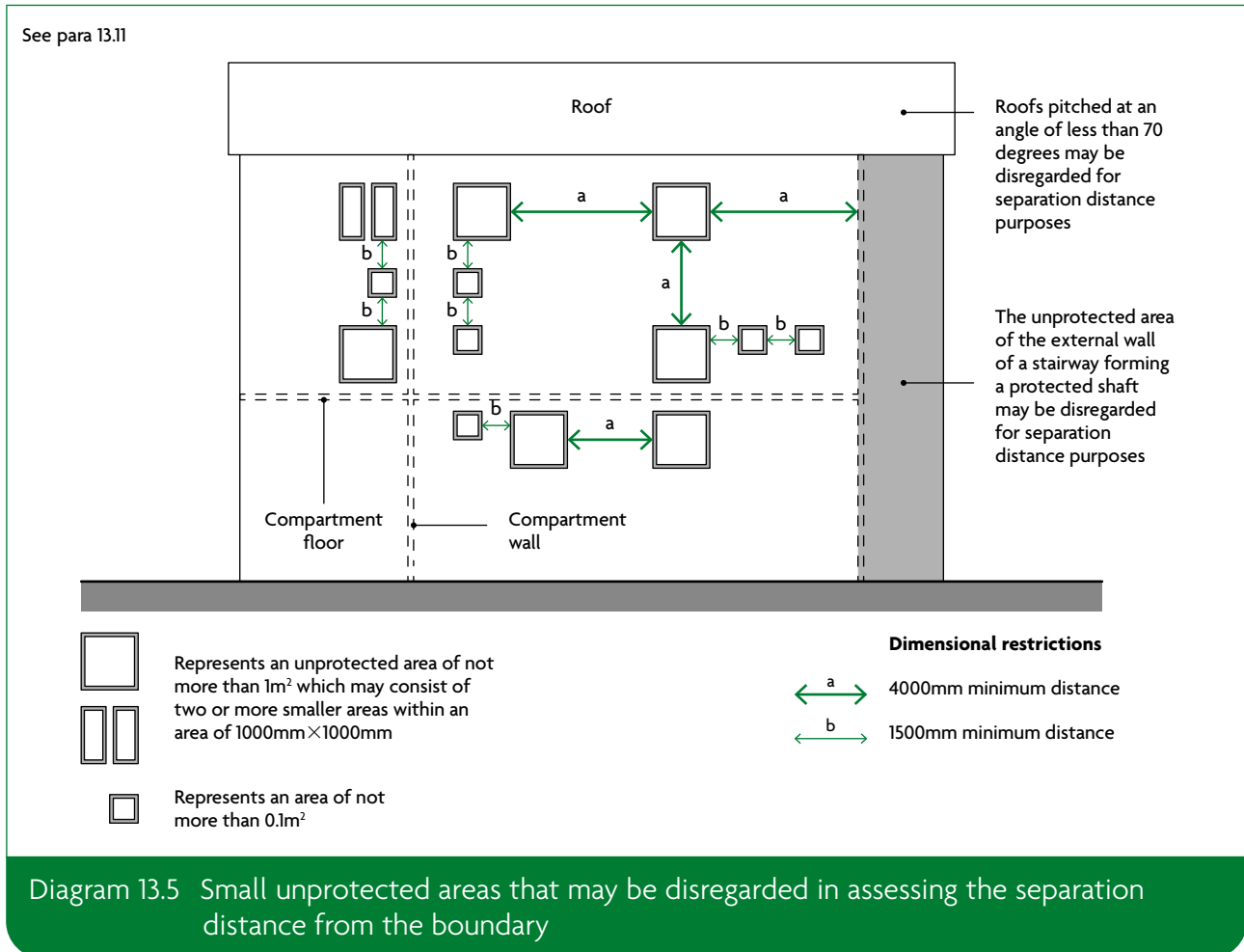
### External walls of protected stairways

- 13.9** Exclude **external walls** of **protected stairways** when assessing **unprotected areas** (see Diagram 3.3).



## Small unprotected areas

**13.10** In an otherwise protected wall, small **unprotected areas** may be ignored where they meet the conditions in Diagram 13.5.



## Large uncompartmented buildings

**13.11** For the purposes of assessing **unprotected area**, parts of walls of uncompartmented **buildings** that are more than 30m above mean ground level may be ignored.

## Canopies

**13.12** Where both of the following apply, separation distances may be determined from the wall rather than from the edge of the canopy (Diagram 13.6).

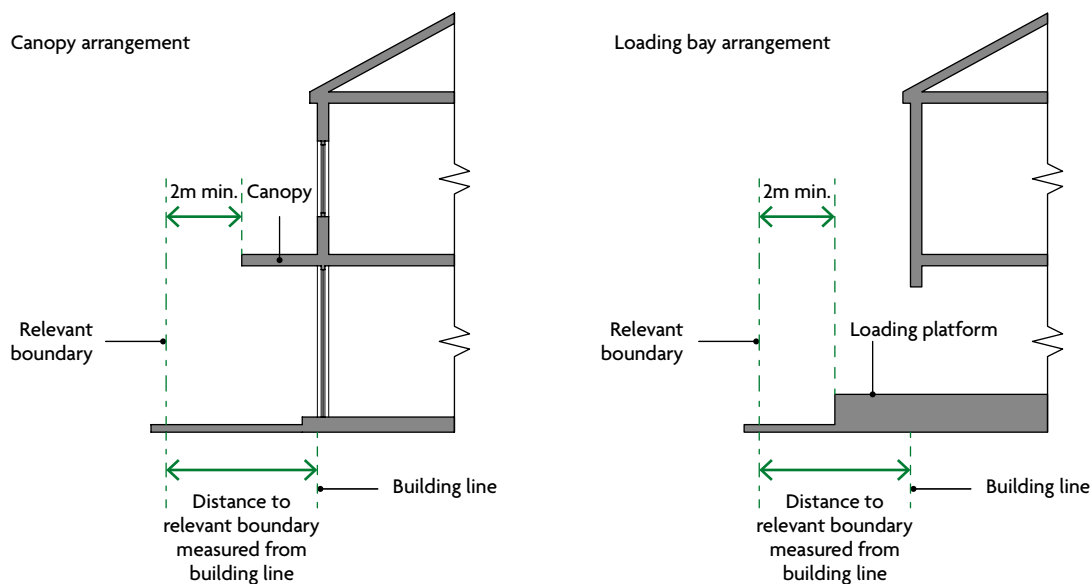
- The canopy is attached to the side of a **building**.
- The edges of the canopy are a minimum of 2m from the **relevant boundary**.

Canopies that fall within class 6 or class 7 of Schedule 2 to the regulations (Exempt Buildings and Work) are exempt from the Building Regulations.

**13.13** Space separation may be disregarded if a canopy is all of the following.

- Free-standing.
- Above a limited risk or controlled hazard, for example over petrol pumps.
- A minimum of 1000mm from the **relevant boundary**.

See para 13.13



**NOTE:** Projections from the building line, such as a canopy or a loading platform, can be ignored when assessing separation distance. This does not apply where the canopy is enclosed by side walls.

Diagram 13.6 The effect of a canopy on separation distance

## Roofs

**13.14** 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.

## Portal frames

**13.15** Portal frames are often used in single storey industrial and commercial buildings where there may be no need for fire resistance of the structure (requirement B3). However, where a portal framed building is near a relevant boundary, the external wall near the boundary may need fire resistance to restrict the spread of fire between buildings. It is generally accepted that a portal frame acts as a single structural element because of the moment-resisting connections used, especially at the column/rafter joints. Thus, in cases where the external wall of the building cannot be wholly unprotected, the rafter members of the frame, as well as the column members, may need to be fire protected. The design method for this is set out in SCI Publication P313.

**NOTE:** The recommendations in the SCI publication for designing the foundation to resist overturning do not need to be followed if the building is fitted with a sprinkler system in accordance with Appendix E.

**NOTE:** Normally, portal frames of reinforced concrete can support external walls requiring a similar degree of fire resistance without specific provision at the base to resist overturning.

**NOTE:** Existing buildings may have been designed to comply with all of the following guidance, which is also acceptable.

- The column members are fixed rigidly to a base of sufficient size and depth to resist overturning.
- There is brick, block or concrete protection to the columns up to a protected ring beam providing lateral support.
- There is some form of roof venting to give early heat release. (The roof venting could be, for example, PVC rooflights covering some 10% of the floor area and evenly spaced over the floor area.)

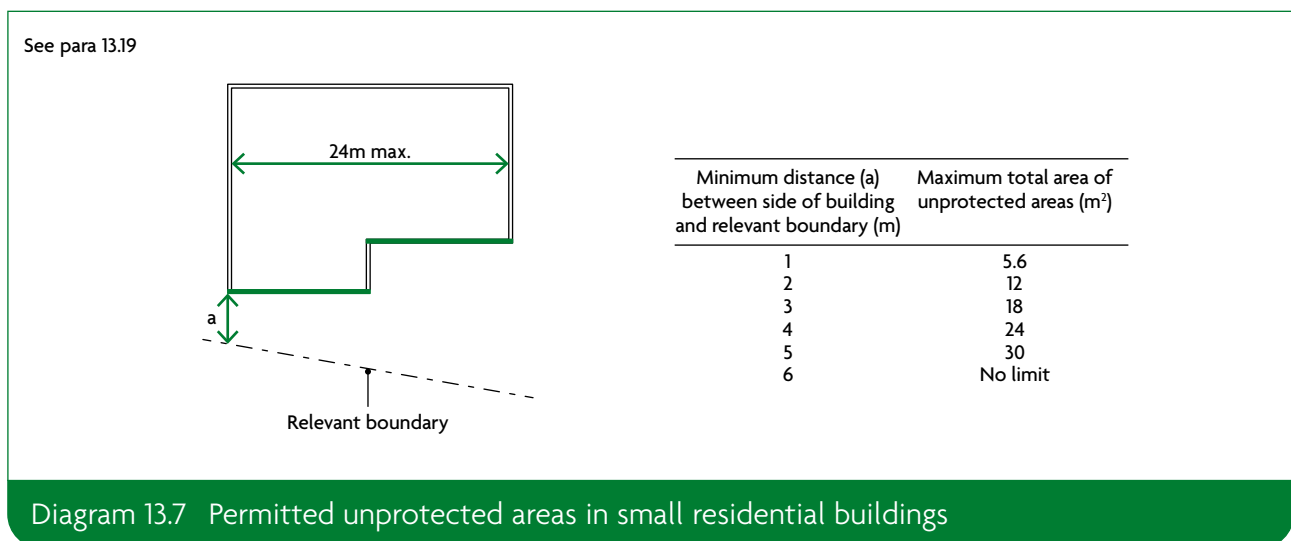
## Methods for calculating acceptable unprotected area

**13.16** Two simple methods are given for calculating the acceptable amount of unprotected area in an external wall that is a minimum of 1000mm from any point on the relevant boundary. More precise methods are described in BRE report BR 187 and may be used instead.

### Method 1

**13.17** This method applies to small buildings intended to be used for 'residential (other)' purposes.

**13.18** 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 13.7. Any small unprotected areas falling within the limits shown in Diagram 13.5 can be ignored.



### Method 2

**13.19** This method may be used for buildings or compartments intended for any use and for which method 1 is not appropriate.

**13.20** Except for an open-sided car park in purpose group 7(b) (see paragraph 11.2), the building should not exceed 10m in height. Each side of the building should meet the limits in Table 13.1. Areas falling within the limits in Diagram 13.5 can be ignored.

**Table 13.1 Permitted unprotected areas in small buildings or compartments**

Minimum distance between side of building and relevant boundary (m)		Maximum total percentage of unprotected area (%)
Purpose groups		
Residential, office, assembly and recreation (1)	Shop and commercial, industrial, storage and other non-residential (2)	(3)
Not applicable	1	4
1	2	8
2.5	5	20
5	10	40
7.5	15	60
10	20	80
12.5	25	100

**NOTES:**

- Intermediate values may be obtained by interpolation.
- For buildings fitted with an automatic sprinkler system, see paragraph 13.22.
- For open-sided car parks in purpose group 7(b), the distances set out in column (1) may be used instead of those in column (2).
- The total percentage of unprotected area is found by dividing the total unprotected area by the area of a rectangle that encloses all the unprotected areas, and multiplying the result by 100.

## Sprinkler systems

**13.21** If a **building** is fitted throughout with a sprinkler system in accordance with Appendix E, either of the following is permitted.

- The **boundary** distance can be halved, to a minimum distance of 1m.
- The amount of **unprotected area** can be doubled.

## Atrium buildings

**13.22** If a **building** contains one or more **atria**, the recommendations in clause B8 of **BS 9999** should be followed.

## Section 14: Resisting fire spread over roof coverings

### Introduction

- 14.1** 'Roof covering' describes one or more layers of material, but not the roof structure as a whole.
- 14.2** Provisions for the fire properties of roofs are given in other parts of this document.
- Requirement B1 – for roofs that are part of a **means of escape**.
  - Requirement B2 – for the internal surfaces of **rooflights** as part of internal linings.
  - Requirement B3 – for roofs that are used as a floor and for roofs passing over a **compartment wall**.
  - Section 13 – the circumstances in which a roof is subject to the provisions for space separation.

### Separation distances

- 14.3** Separation distance is the minimum distance from the roof, or part of the roof, to the **relevant boundary** (paragraph 13.5). Table 14.1 sets out separation distances by the type of roof covering and the size and use of the **building**.

In addition, roof covering products (and/or materials) defined in Commission Decision 2000/553/EC of 6 September 2000, implementing Council Directive 89/106/EEC, can be considered to fulfil all of the requirements for the performance characteristic 'external fire performance' without the need for testing, *provided that any national provisions on the design and execution of works are fulfilled*, and can be used without restriction.

- 14.4** The performance of **rooflights** is specified in a similar way to the performance of roof coverings. Plastic **rooflights** may also be used.

### Plastic rooflights

- 14.5** Table 14.2 and Diagram 14.1 set the limitations for using plastic **rooflights** whose lower surface has a minimum rating of class D-s3, d2.
- 14.6** Table 14.3 sets the limitations for using **thermoplastic materials** with a TP(a) rigid or TP(b) (see also Diagram 14.1) classification. The method of classifying **thermoplastic materials** is given in Appendix B.
- 14.7** Other than for the purposes of Diagram 6.2, polycarbonate or uPVC **rooflights** achieving a minimum rating of class C-s3, d2 can be regarded as having a  $B_{ROOF}(t4)$  classification.

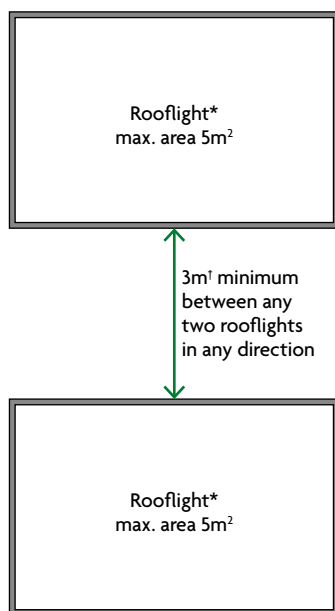
### Unwired glass in rooflights

- 14.8** When used in **rooflights**, unwired glass a minimum of 4mm thick can be regarded as having a  $B_{ROOF}(t4)$  classification.

### Thatch and wood shingles

- 14.9** If the performance of thatch or wood shingles cannot be established, they should be regarded as having an  $E_{ROOF}(t4)$  classification in Table 14.1.

See paras 14.5 and 14.6



- \* Or group of rooflights amounting to no more than 5m<sup>2</sup>  
 † Class D-s3, d2 rooflights to rooms in industrial and other non-residential purpose groups may be spaced 1800mm apart provided the rooflights are evenly distributed and do not exceed 20% of the area of the room

#### NOTES:

1. There are restrictions on the use of plastic rooflights in the guidance to requirement B2 in Section 6.
2. Surrounding roof covering to be class B-s3, d2 for at least 3m distance.
3. Where Diagram 8.2a or 8.2b applies, rooflights should be at least 1500mm from the compartment wall.

**Diagram 14.1** Limitations on spacing and size of plastic rooflights that have a class D-s3, d2 or TP(b) lower surface

**Table 14.1** Limitations on roof coverings

Designation <sup>(1)</sup> of covering of roof or part of roof	Distance from any point on relevant boundary			
	Less than 6m	At least 6m	At least 12m	At least 20m
B <sub>ROOF</sub> (t4)	●	●	●	●
C <sub>ROOF</sub> (t4)	○	●	●	●
D <sub>ROOF</sub> (t4)	○	● <sup>(2)(3)</sup>	● <sup>(2)</sup>	●
E <sub>ROOF</sub> (t4)	○	● <sup>(2)(3)</sup>	● <sup>(2)</sup>	● <sup>(2)</sup>
F <sub>ROOF</sub> (t4)	○	○	○	● <sup>(2)(3)</sup>

● Acceptable. ○ Not acceptable.

#### NOTES:

Separation distances do not apply to enclosed/covered walkways. However, see Diagram 8.2 if the roof passes over the top of a compartment wall.

Polycarbonate and uPVC rooflights that achieve a class C-s3, d2 rating by test may be regarded as having a B<sub>ROOF</sub>(t4) classification.

1. The designation of external roof surfaces is explained in Appendix B
2. Not acceptable on any of the following buildings.
  - a. Industrial, storage or other non-residential purpose group (purpose groups 6 and 7) buildings of any size.
  - b. Any other buildings with a cubic capacity of more than 1500m<sup>3</sup>.
3. Acceptable on buildings not listed in (1) if both of the following apply.
  - a. Part of the roof has a maximum area of 3m<sup>2</sup> and is a minimum of 1500mm from any similar part.
  - b. The roof between the parts is covered with a material rated class A2-s3, d2 or better.

**Table 14.2 Class D-s3, d2 plastic rooflights: limitations on use and boundary distance**

Minimum classification on lower surface <sup>(1)</sup>	Space that rooflight can serve	Minimum distance from any point on relevant boundary to rooflight with an external designation <sup>(2)</sup> of:	
		$E_{\text{ROOF}}(t4)$ or $D_{\text{ROOF}}(t4)$	$F_{\text{ROOF}}(t4)$
Class D-s3, d2	a. Balcony, verandah, carport, covered way or loading bay that has at least one longer side wholly or permanently open	6m	20m
	b. Detached swimming pool		
	c. Conservatory, garage or outbuilding, with a maximum floor area of 40m <sup>2</sup>		
	d. Circulation space <sup>(3)</sup> (except a protected stairway)	6m <sup>(4)</sup>	20m <sup>(4)</sup>
	e. Room <sup>(3)</sup>		

**NOTES:**

None of the above designations are suitable for protected stairways.

Polycarbonate and uPVC rooflights that achieve a class C-s3, d2 rating by test (see paragraph 14.7) may be regarded as having a  $B_{\text{ROOF}}(t4)$  classification.

Where Diagram 8.2a or 8.2b applies, rooflights should be a minimum of 1500mm from the compartment wall.

If double-skinned or laminate products have upper and lower surfaces of different materials, the greater distance applies.

1. See also the guidance to requirement B2 in Section 6.
2. The designation of external roof surfaces is explained in Appendix B.
3. Single-skinned rooflight only, in the case of non-thermoplastic material.
4. The rooflight should also meet the provisions of Diagram 14.1.

**Table 14.3 TP(a) and TP(b) thermoplastic rooflights: limitations on use and boundary distance**

Minimum classification on lower surface <sup>(1)</sup>	Space that rooflight can serve	Minimum distance from any point on relevant boundary to rooflight with an external surface classification <sup>(1)</sup> of:	
		TP(a)	TP(b)
1. TP(a) rigid	Any space except a protected stairway	6m <sup>(2)</sup>	Not applicable
2. TP(b)	a. Balcony, verandah, carport, covered way or loading bay, which has at least one longer side wholly or permanently open	Not applicable	6m
	b. Detached swimming pool		
	c. Conservatory, garage or outbuilding, with a maximum floor area of 40m <sup>2</sup>		
	d. Circulation space <sup>(3)</sup> (except a protected stairway)	Not applicable	6m <sup>(4)</sup>
	e. Room <sup>(3)</sup>		

**NOTES:**

None of the above designations are suitable for protected stairways.

Polycarbonate and uPVC rooflights that achieve a class C-s3, d2 rating by test may be regarded as having a  $B_{\text{ROOF}}(t4)$  designation.

Where Diagram 8.2a or 8.2b applies, rooflights should be at least 1500mm from the compartment wall.

If double-skinned or laminate products have upper and lower surfaces of different materials, the greater distance applies.

1. See also the guidance to requirement B2 in Section 6.
2. No limit in the case of any space described in 2(a), (b) and (c).
3. Single-skinned rooflight only, in the case of non-thermoplastic material.
4. The rooflight should also meet the provisions of Diagram 14.1.

# Requirement B5: Access and facilities for the fire service

These sections deal with the following requirement from Part B of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
<b>Access and facilities for the fire service</b>	
<b>B5.</b> (1) The building shall be designed and constructed so as to provide reasonable facilities to assist fire fighters in the protection of life.  (2) Reasonable provision shall be made within the site of the building to enable fire appliances to gain access to the building.	

## Intention

Provisions covering access and facilities for the fire service are to safeguard the health and safety of people in and around the **building**. Their extent depends on the size and use of the **building**. Most firefighting is carried out within the **building**. In the Secretary of State's view, requirement B5 is met by achieving all of the following.

- a. External access enabling fire appliances to be used near the **building**.
- b. Access into and within the **building** for firefighting personnel to both:
  - i. search for and rescue people
  - ii. fight fire.
- c. Provision for internal fire facilities for firefighters to complete their tasks.
- d. Ventilation of heat and smoke from a fire in a basement.

If an alternative approach is taken to providing the **means of escape**, outside the scope of this approved document, additional provisions for firefighting access may be required. Where deviating from the general guidance, it is advisable to seek advice from the fire and rescue service as early as possible (even if there is no statutory duty to consult).

## Section 15: Vehicle access

### Buildings not fitted with fire mains

- 15.1** For small buildings (up to 2000m<sup>2</sup>, with a top occupied storey that is a maximum of 11m above ground level), vehicle access for a pump appliance should be provided to whichever is the less onerous of the following.
- 15% of the perimeter.
  - Within 45m of every point of the footprint of the building (see Diagram 15.1).
- 15.2** For all other buildings, provide vehicle access in accordance with Table 15.1.
- 15.3** Every elevation to which vehicle access is provided should have a door, a minimum of 750mm wide, to give access into the building. The maximum distance between doors, or between a door and the end of the elevation, is 60m (e.g. a 150m elevation would need a minimum of two doors).

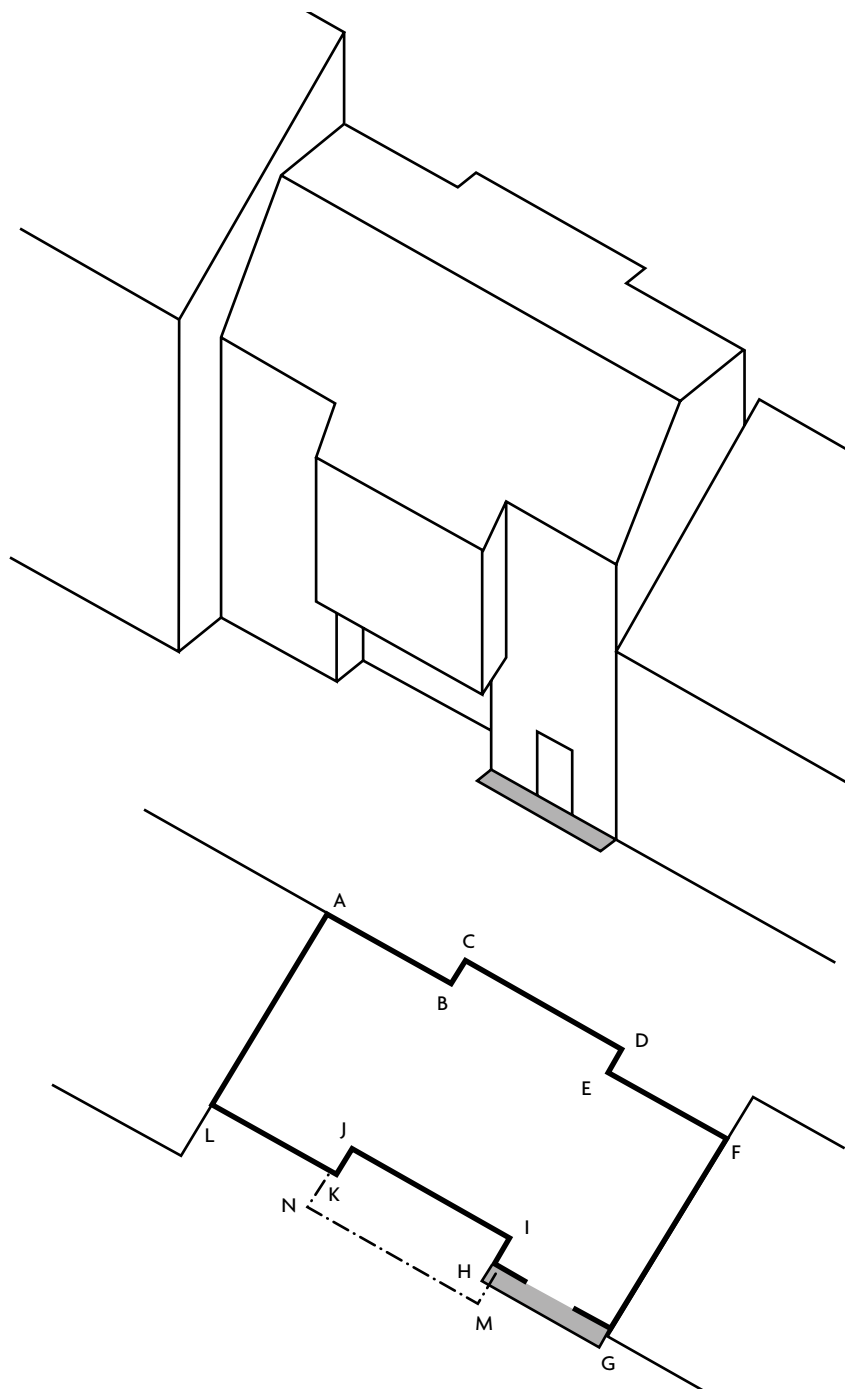
**Table 15.1 Fire and rescue service vehicle access to buildings not fitted with fire mains**

Total floor area <sup>(1)</sup> of building (m <sup>2</sup> )	Height of floor of top storey above ground (m) <sup>(2)</sup>	Provide vehicle access to:	Type of appliance
Up to 2000	Up to 11 Over 11	See paragraph 15.1 15% of perimeter	Pump High reach
2000–8000	Up to 11 Over 11	15% of perimeter 50% of perimeter	Pump High reach
8000–16,000	Up to 11 Over 11	50% of perimeter 50% of perimeter	Pump High reach
16,000–24,000	Up to 11 Over 11	75% of perimeter 75% of perimeter	Pump High reach
Over 24,000	Up to 11 Over 11	100% of perimeter 100% of perimeter	Pump High reach

**NOTES:**

- The sum of the area of all storeys in the building (excluding basements).
- For storage buildings (purpose group 7(a)), measure height to mean roof level (see Appendix D).

See para 15.1



Plan of building AFGL where AL and FG are walls in common with other buildings.

The footprint of the building is the maximum aggregate plan perimeter found by the vertical projection of any overhanging storey onto a ground storey (i.e. ABCDEFGHNMKL).

The perimeter of the building for the purposes of Table 15.1 is the sum of the lengths of the two external walls, taking account of the footprint i.e. (A to B to C to D to E to F) + (G to H to M to N to K to L).

If the dimensions of the building are such that Table 15.1 requires vehicle access, the shaded area illustrates one possible example of 15% of the perimeter. Note: There should be a door into the building in this length (see paragraph 15.3).

If the building does not have walls in common with other buildings, the lengths AL and FG would be included in the perimeter.

Diagram 15.1 Example of building footprint and perimeter

## Buildings fitted with fire mains

- 15.4** For buildings fitted with dry fire mains, both of the following apply.
- Access should be provided for a pumping appliance to within 18m of each fire main inlet connection point. Inlets should be on the face of the building.
  - The fire main inlet connection point should be visible from the parking position of the appliance, and satisfy paragraph 16.10.
- 15.5** For buildings fitted with wet fire mains, access for a pumping appliance should comply with both of the following.
- Within 18m, and within sight of, an entrance giving access to the fire main.
  - Within sight of the inlet to replenish the suction tank for the fire main in an emergency.
- 15.6** Where fire mains are provided in buildings for which Sections 16 and 17 make no provision, vehicle access may be as described in paragraphs 15.4 and 15.5, rather than Table 15.1.

## Design of access routes and hardstandings

- 15.7** Access routes and hardstandings should comply with the guidance in Table 15.2. Requirements can only apply to the site of the works.
- It may not be reasonable to upgrade the route across a site to a small building. The building control body, in consultation with the fire and rescue service, should consider options from doing no work to upgrading certain features, such as sharp bends.
- 15.8** Where access to an elevation is provided in accordance with Table 15.1, the following requirements should be met, depending on the building height.
- Buildings up to 11m, excluding small buildings (paragraph 15.1): pump appliance access should be provided adjacent to the building for the specified percentage of the total perimeter.
  - Buildings over 11m: access routes should comply with the guidance in Diagram 15.2.
- 15.9** Where access is provided for high reach appliances in accordance with Table 15.1, overhead obstructions (such as cables and branches) should be avoided in the zone shown in Diagram 15.2.
- 15.10** Dead-end access routes longer than 20m require turning facilities, as in Diagram 15.3. Turning facilities should comply with the guidance in Table 15.2.

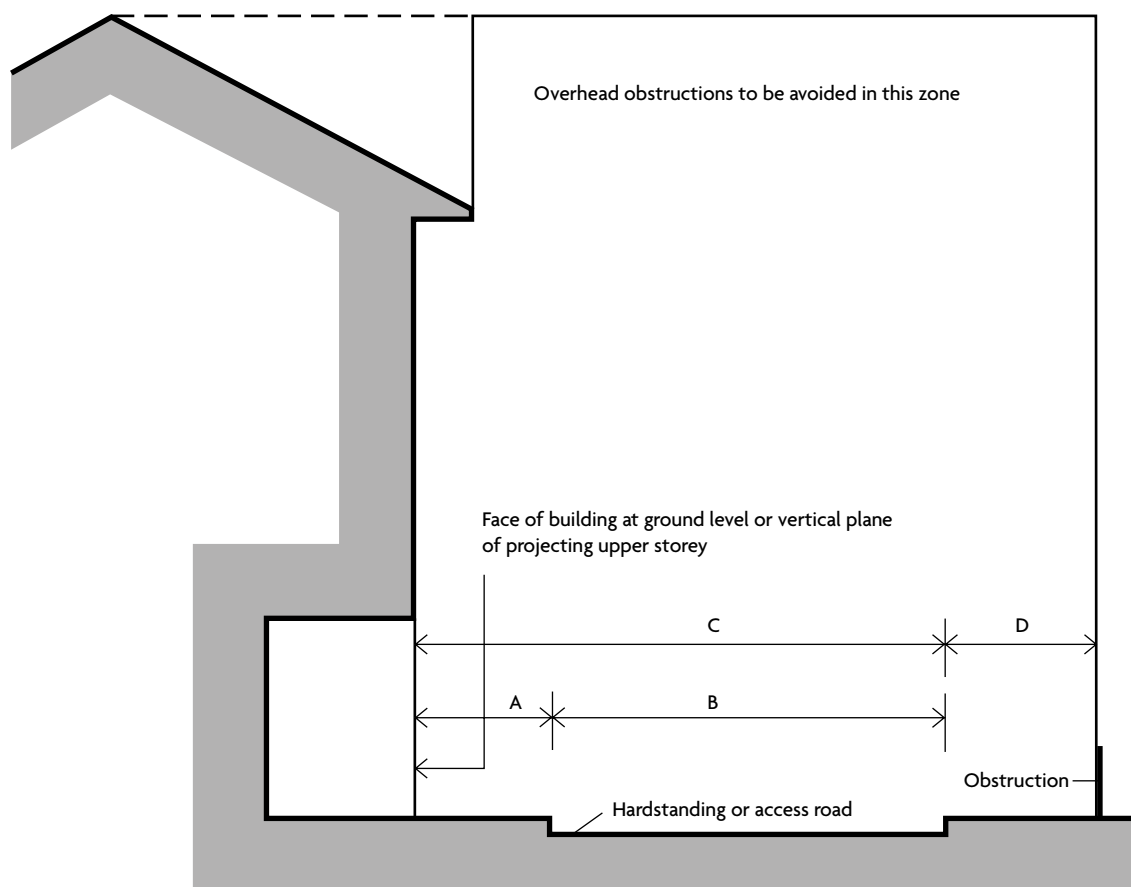
**Table 15.2 Typical fire and rescue service vehicle access route specification**

Appliance type	Minimum width of road between kerbs (m)	Minimum width of gateways (m)	Minimum turning circle between kerbs (m)	Minimum turning circle between walls (m)	Minimum clearance height (m)	Minimum carrying capacity (tonnes)
Pump	3.7	3.1	16.8	19.2	3.7	12.5
High reach	3.7	3.1	26.0	29.0	4.0	17.0

**NOTES:**

- Fire appliances are not standardised. The building control body may, in consultation with the local fire and rescue service, use other dimensions.
- The roadbase can be designed to 12.5 tonne capacity. Structures such as bridges should have the full 17-tonne capacity. The weight of high reach appliances is distributed over a number of axles, so infrequent use of a route designed to accommodate 12.5 tonnes should not cause damage.

See paras 15.8 and 15.9



	Type of appliance	
	Turntable ladder dimension (m)	Hydraulic platform dimension (m)
A. Maximum distance of near edge of hardstanding from building	4.9	2.0
B. Minimum width of hardstanding	5.0	5.5
C. Minimum distance of further edge of hardstanding from building	10.0	7.5
D. Minimum width of unobstructed space (for swing of appliance platform)	N/A	2.2

#### NOTES:

1. Hardstanding for high reach appliances should be as level as possible and should have a maximum gradient of 1 in 12.
2. Fire appliances are not standardised. Some fire services have appliances with a greater weight or different size. In consultation with the fire and rescue service, the building control body should adopt the relevant dimensions and ground loading capacity.

Diagram 15.2 Relationship between building and hardstanding/access roads for high reach fire appliances

See para 15.10

Fire and rescue service vehicles should not have to reverse more than 20m from the end of an access road.

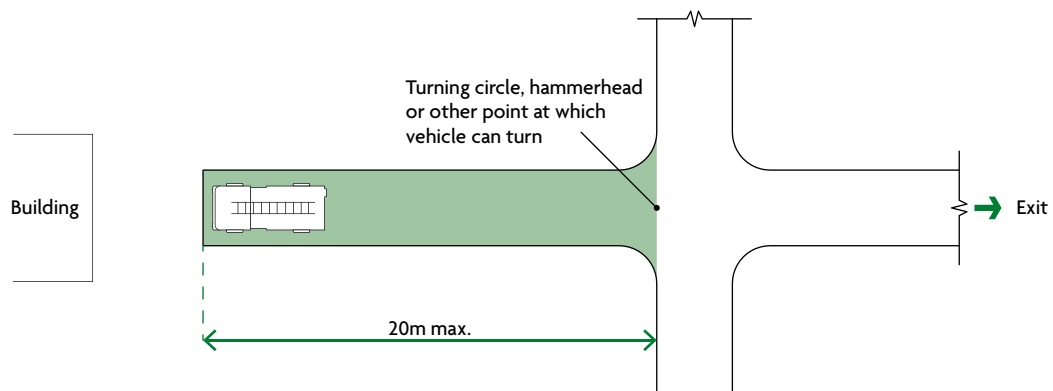


Diagram 15.3 Turning facilities

## Section 16: Fire mains and hydrants

### Introduction

**16.1** Fire mains are installed for the fire and rescue service to connect hoses for water. They may be either of the following.

- a. The 'dry' type, which are both of the following.
  - i. Normally kept empty.
  - ii. Supplied through a hose from a fire and rescue service pumping appliance.
- b. The 'wet' type, which are both of the following.
  - i. Kept full of water.
  - ii. Supplied by pumps from tanks in the building.

There should be a facility to replenish a wet system from a pumping appliance in an emergency.

### Provision of fire mains

**16.2** Buildings with firefighting shafts should have fire mains in both of the following.

- a. The firefighting shafts.
- b. Where necessary, in protected escape stairs.

The criteria for providing firefighting shafts and fire mains are given in Section 17.

**16.3** Buildings without firefighting shafts should be provided with fire mains where fire service vehicle access is not provided in accordance with Table 15.1. In these cases, outlets from fire mains should be located as described in paragraph 16.4, with a maximum hose distance of 45m from the fire main outlet to the furthest point, measured on a route suitable for laying a hose. Stairs do not need to be designed as firefighting shafts.

### Design and construction of fire mains

**16.4** If a firefighting shaft is provided, outlets from fire mains should be within the protected stairway or protected lobby (see Diagram 17.1).

**16.5** Guidance on the design and construction of fire mains is given in BS 9990.

**16.6** Buildings with a storey more than 50m above fire service vehicle access level should be provided with wet fire mains. In all other buildings where fire mains are provided, either wet or dry fire mains are suitable.

**16.7** Fire service vehicle access to fire mains should be provided as described in paragraphs 15.4 and 15.5.

## Provision of private hydrants

- 16.8** A **building** requires additional fire hydrants if both of the following apply.
- It has a **compartment** with an area more than 280m<sup>2</sup>.
  - It is being erected more than 100m from an existing fire hydrant.
- 16.9** If additional hydrants are required, these should be provided in accordance with the following.
- For **buildings** provided with fire mains – within 90m of dry fire main inlets.
  - For **buildings** not provided with fire mains – hydrants should be both of the following.
    - Within 90m of an entrance to the **building**.
    - A maximum of 90m apart.
- 16.10** Each fire hydrant should be clearly indicated by a plate, fixed nearby in a conspicuous position, in accordance with **BS 3251**.
- 16.11** Guidance on aspects of provision and siting of private fire hydrants is given in **BS 9990**.

## Alternative supply of water

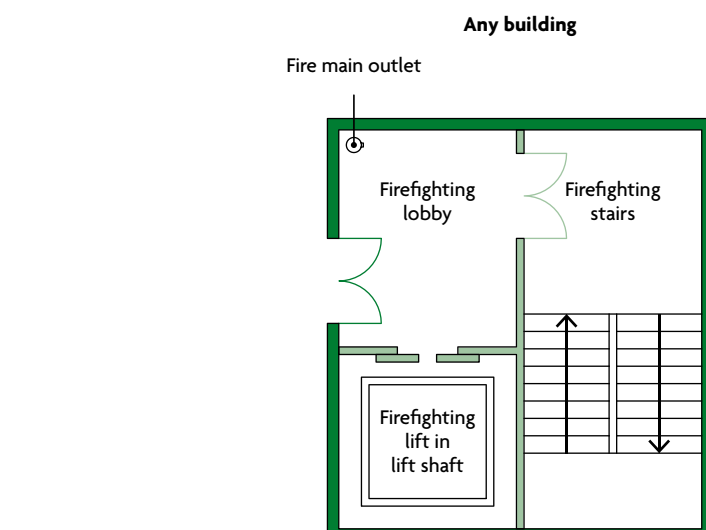
- 16.12** An alternative source of water supply should be provided where any of the following apply.
- No piped water supply is available.
  - Pressure and flow in the water main are insufficient.
  - An alternative source of supply is proposed.
- 16.13** The alternative source of water supply should be one of the following, subject to consultation with the local fire and rescue service.
- A charged static water tank with a minimum capacity of 45,000 litres.
  - A spring, river, canal or pond that is capable of fulfilling both of the following conditions.
    - Providing or storing a minimum of 45,000 litres of water at all times.
    - Providing access, space and a hardstanding for a pumping appliance.
  - Any other water supply that the local fire and rescue service considers appropriate.

# Section 17: Access to buildings for firefighting personnel

## Introduction

- 17.1** Facilities for fire and rescue, such as firefighting lifts, firefighting stairs and firefighting lobbies, are combined in protected firefighting shafts (Diagram 17.1). Section 8 gives guidance on the design and construction of protected shafts.

See para 17.1



- Minimum fire resistance REI 120 from accommodation side and REI 60 from inside the shaft with E 60 S<sub>a</sub> fire doors
- Minimum fire resistance REI 60 from both sides with E 30 S<sub>a</sub> fire doors

### NOTES:

1. Outlets from a fire main should be located in the firefighting lobby.
2. A firefighting lift is required if the building has a floor more than 18m above, or more than 10m below, fire service vehicle access level.
3. This diagram is only to illustrate the basic components and is not meant to represent the only acceptable layout. The firefighting shaft should be constructed generally in accordance with Section 6 of BS 9999.
4. For the minimum fire resistance of lift doors see Table C1.

Diagram 17.1 Components of a firefighting shaft

## Provision of firefighting shafts

- 17.2** A building with a storey more than 18m above the fire and rescue service vehicle access level should have one or more firefighting shafts containing a firefighting lift. The number and location of firefighting shafts should comply with paragraphs 17.4 to 17.7. Firefighting shafts are not required to serve a basement that is not large or deep enough to need one (see paragraph 17.3 and Diagram 17.2).
- 17.3** A building with basement storeys should have firefighting shafts in accordance with the following.
- There is a basement more than 10m below the fire and rescue service vehicle access level. The firefighting shafts should contain firefighting lifts.
  - There are two or more basement storeys, each with a minimum area of 900m<sup>2</sup>. The firefighting shafts do not need to include firefighting lifts.
- The building's height and size determine whether firefighting shafts also serve upper storeys.
- 17.4** Firefighting shafts should serve all storeys through which they pass.
- 17.5** A minimum of two firefighting shafts should be provided to buildings with a storey that has both of the following.
- A floor area of 900m<sup>2</sup> or more.
  - A floor level 18m or more above the fire and rescue service vehicle access level.
- 17.6** At least two firefighting shafts, which do not need to include firefighting lifts, should be provided if buildings meet all of the following.
- They are in the 'shop and commercial', 'assembly and recreation' or 'industrial' purpose group (purpose group 4, 5 or 6).
  - They have a storey area of 900m<sup>2</sup> or more.
  - They have a storey height of 7.5m or more above fire and rescue service vehicle access level.

See para 17.2

## Buildings in which firefighting shafts should be provided, showing which storeys need to be served

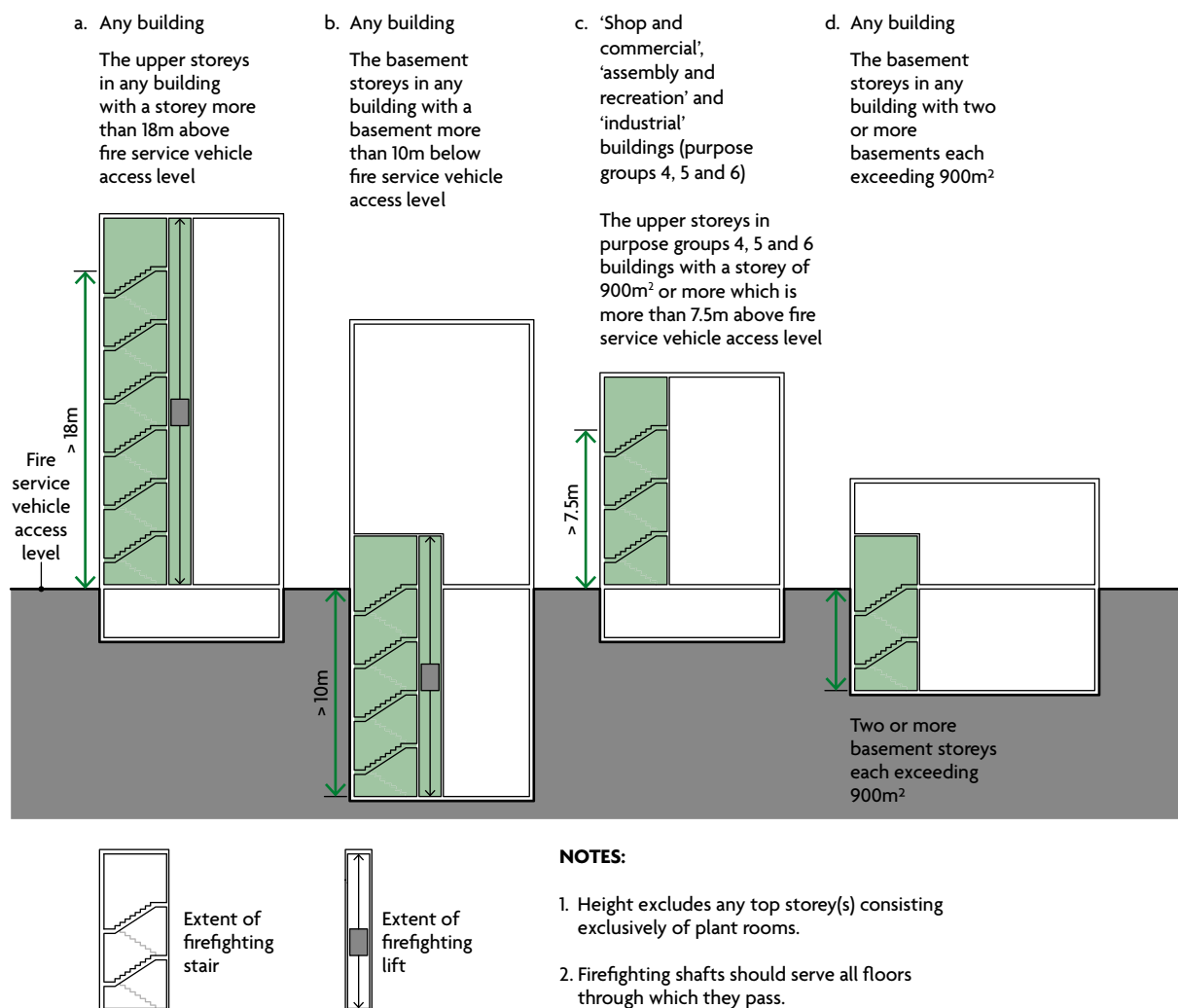


Diagram 17.2 Provision of firefighting shafts

## Location of firefighting shafts

**17.7** Firefighting shafts and protected stairways should be positioned such that every part of each storey more than 18m above the fire and rescue service vehicle access level complies with the maximum distances given in paragraph 17.8. Distances should be measured from the fire main outlet on a route suitable for laying a hose.

**NOTE:** If the internal layout is not known, the distance should be measured at two-thirds of the direct distance.

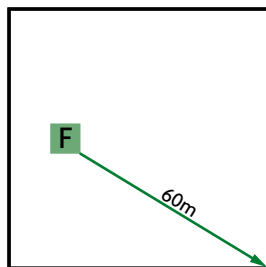
**17.8** In any building, the hose laying distance should meet all of the following conditions.

- a. A maximum of 60m from the fire main outlet in a firefighting shaft (see Diagram 17.3).
- b. Additionally, where sprinklers have not been provided in accordance with Appendix E, the hose laying distance should be a maximum of 45m from a fire main outlet in a protected shaft (although this does not imply that the protected shaft needs to be designed as a firefighting shaft (see Diagram 17.3).

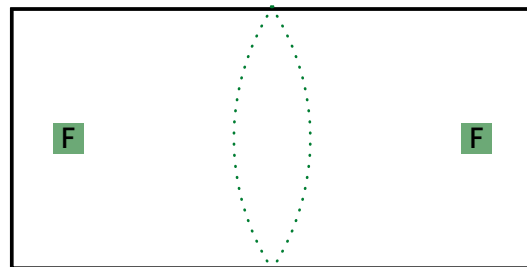
See para 17.8

## With sprinklers

a.

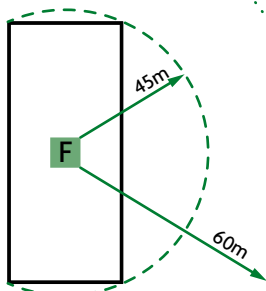


b.



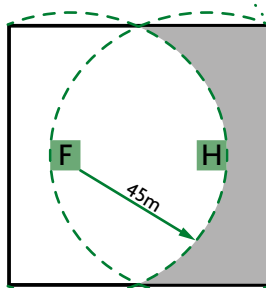
## Without sprinklers

c.

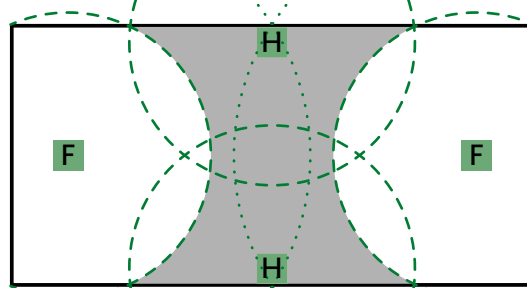


- ..... Floor plan within 60m hose laying distance of fire main outlet
- Floor plan within 45m hose laying distance of fire main outlet
- Hose reach
- F** Firefighting shaft
- H** Fire main outlet in a protected shaft
- Additional hose coverage required

d.



e.



### NOTES:

1. Hose laying distance should be measured from the fire main outlet along the route suitable for laying hose. If this route is not known, the distance should be taken at two-thirds of the direct distance.
2. The fire main outlet should be located according to paragraph 16.4.

Diagram 17.3 Location of firefighting shafts: hose laying distances

## Design and construction of firefighting shafts

**17.9** Every firefighting stair and firefighting lift should be approached from the accommodation through a firefighting lobby. Both the stair and lobby of the firefighting shaft should be provided with a means of venting smoke and heat (see clause 27.1 of **BS 9999**).

Only services associated with the firefighting shaft, such as ventilation systems and lighting for the firefighting shaft, should pass through or be contained within the firefighting shaft.

**17.10** All firefighting shafts should have fire mains with outlet connections and valves at every storey.

**17.11** A firefighting lift installation includes all of the following.

- a. Lift car.
- b. Lift well.
- c. Lift machinery space.
- d. Lift control system.
- e. Lift communications system.

The lift shaft should be constructed in accordance with Section 6 of **BS 9999**.

Firefighting lift installations should conform to **BS EN 81-72** and **BS EN 81-20**.

## Rolling shutters in compartment walls

**17.12** The fire and rescue service should be able to manually open and close rolling shutters without the use of a ladder.

## Section 18: Venting of heat and smoke from basements

### Provision of smoke outlets

- 18.1** Heat and smoke from basement fires vented via stairs can inhibit access for firefighting personnel. This may be reduced by providing smoke outlets, or smoke vents, which allow heat and smoke to escape from the basement levels to the open air. They can also be used by the fire and rescue service to let cooler air into the basements (Diagram 18.1).
- 18.2** Each basement space should have one or more smoke outlets.
- Where this is not practicable (for example, the plan area is deep and the amount of **external wall** is restricted by adjoining **buildings**), the perimeter basement spaces may be vented, with other spaces vented indirectly by opening connecting doors. This does not apply for **places of special fire hazard** (see paragraph 18.7).
- If a basement is compartmented, each **compartment** should have one or more smoke outlets, rather than indirect venting.
- A **basement storey** or **compartment** containing **rooms** with doors or windows does not need smoke outlets.
- 18.3** Smoke outlets connecting directly to the open air should be provided from every **basement storey**, except for any **basement storey** that has both of the following.
- A maximum floor area of 200m<sup>2</sup>.
  - A floor a maximum of 3m below the adjacent ground level.
- 18.4** Strong **rooms** do not need to be provided with smoke outlets.

### Natural smoke outlets

- 18.5** Smoke outlets should be both of the following.
- Sited at high level in either the **ceiling** or wall of the space they serve.
  - Evenly distributed around the **perimeter**, to discharge to the open air.
- 18.6** The combined clear cross-sectional area of all smoke outlets should be a minimum of 1/40 of the area of the floor of the **storey** they serve.
- 18.7** Separate outlets should be provided from **places of special fire hazard**.
- 18.8** If the smoke outlet terminates at a point that is not readily accessible, it should be kept unobstructed and covered only with a class A1 grille or louver.
- 18.9** If the smoke outlet terminates in a readily accessible position, it may be covered by a panel, stallboard or pavement light that can be broken out or opened. The position of covered smoke outlets should be suitably indicated.

**18.10** Outlets should not be placed where they prevent the use of **escape routes** from the **building**.

### Mechanical smoke extract

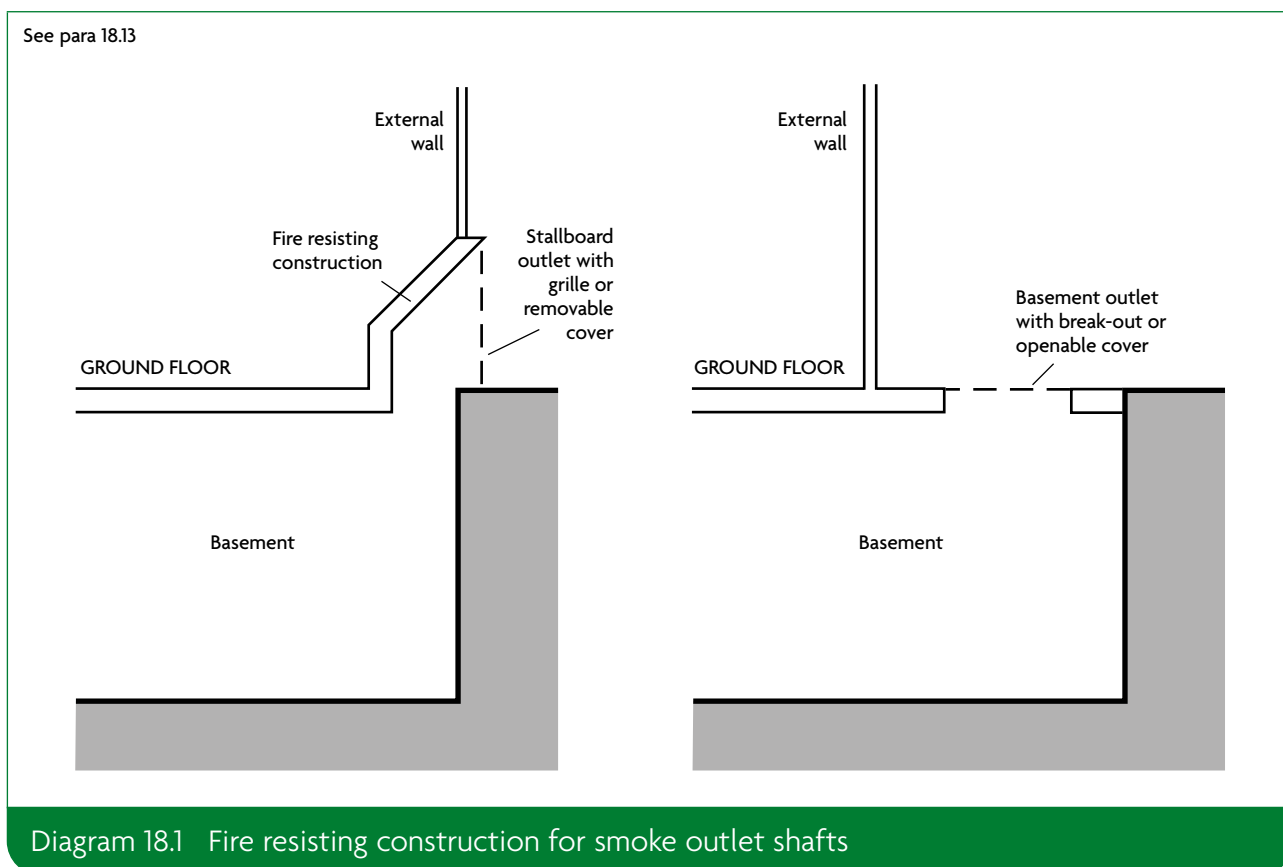
**18.11** If **basement storeys** are fitted with a sprinkler system in accordance with Appendix E, a mechanical smoke extraction system may be provided as an alternative to natural venting. Sprinklers do not need to be installed on the other **storeys** unless needed for other reasons.

Car parks are not normally expected to be fitted with sprinklers (see Section 11 for guidance on car parks).

**18.12** The air extraction system should comply with all of the following.

- a. It should give at least 10 air changes per hour.
- b. It should be capable of handling gas temperatures of 300°C for not less than one hour.
- c. It should do either of the following.
  - i. Be activated automatically if the sprinkler system activates.
  - ii. Be activated by an automatic fire detection system that conforms to **BS 5839-1** (minimum L3 standard).

Further information on equipment for removing hot smoke is given in **BS EN 12101-3**.



## Construction of outlet ducts or shafts

- 18.13** Outlet ducts or shafts, including any bulkheads over them (see Diagram 18.1), should be enclosed in construction of class A1 rating and **fire resistance** at least equal to that of the element through which they pass.
- 18.14** Natural smoke outlet shafts should be separated from each other using construction of class A1 rating and **fire resistance** at least equal to that of the **storeys** they serve, where the shafts are either of the following.
- From different **compartments** of the same **basement storey**.
  - From different **basement storeys**.

## Basement car parks

- 18.15** The provisions for ventilation of basement car parks in Section 11 satisfy the requirements for venting smoke from any basement used as a car park.

## Regulation 38: Fire safety information

This section deals with the following regulation of the Building Regulations 2010.

### Fire safety information

- 38.** (1) This regulation applies where building work—
- (a) consists of or includes the erection or extension of a relevant building; or
  - (b) is carried out in connection with a relevant change of use of a building,
- and Part B of Schedule 1 imposes a requirement in relation to the work.
- (2) The person carrying out the work shall give fire safety information to the responsible person not later than the date of completion of the work, or the date of occupation of the building or extension, whichever is the earlier.
- (3) In this regulation—
- (a) “fire safety information” means information relating to the design and construction of the building or extension, and the services, fittings and equipment provided in or in connection with the building or extension which will assist the responsible person to operate and maintain the building or extension with reasonable safety;
  - (b) a “relevant building” is a building to which the Regulatory Reform (Fire Safety) Order 2005 applies, or will apply after the completion of building work;
  - (c) a “relevant change of use” is a material change of use where, after the change of use takes place, the Regulatory Reform (Fire Safety) Order 2005 will apply, or continue to apply, to the building; and
  - (d) “responsible person” has the meaning given by article 3 of the Regulatory Reform (Fire Safety) Order 2005.

### Intention

The aim of this regulation is to ensure that the person responsible for the **building** has sufficient information relating to fire safety to enable them to manage the **building** effectively. The aim of regulation 38 will be achieved when the person responsible for the **building** has all the information to enable them to do all of the following.

- a. Understand and implement the fire safety strategy of the **building**.
- b. Maintain any fire safety system provided in the **building**.
- c. Carry out an effective fire risk assessment of the **building**.

## Section 19: Fire safety information

- 19.1** For building work involving the erection or extension of a relevant **building** (i.e. a **building** to which the Regulatory Reform (Fire Safety) Order 2005 applies or will apply), or the relevant change of use of a **building**, fire safety information should be given to the responsible person at one of the following times.
- When the project is complete.
  - When the **building** or extension is first occupied.
- 19.2** This section is a guide to the information that should be provided. Guidance is in terms of essential information and additional information for complex **buildings**; however, the level of detail required should be considered on a case-by-case basis.

### Essential information

- 19.3** Basic information on the location of fire protection measures may be sufficient. An as-built plan of the **building** should be provided showing all of the following.
- Escape routes** – this should include exit capacity (i.e. the maximum allowable number of people for each **storey** and for the **building**).
  - Location of **fire-separating elements** (including **cavity barriers** in walk-in spaces).
  - Fire doorsets**, **fire doorsets** fitted with a **self-closing device** and other doors equipped with relevant hardware.
  - Locations of fire and/or smoke detector heads, alarm call points, detection/alarm control boxes, alarm sounders, fire safety signage, **emergency lighting**, fire extinguishers, dry or wet fire mains and other firefighting equipment, and hydrants outside the **building**.
  - Any sprinkler systems, including isolating valves and control equipment.
  - Any smoke control systems, or ventilation systems with a smoke control function, including mode of operation and control systems.
  - Any high risk areas (e.g. heating machinery).
- 19.4** Details should be provided of all of the following.
- Specifications of any fire safety equipment provided, including routine maintenance schedules.
  - Any assumptions regarding the management of the **building** in the design of the fire safety arrangements.
  - Any provision enabling the evacuation of disabled people, which can be used when designing suitable personal emergency evacuation plans.

## Additional information for complex buildings

**19.5** A detailed record should be provided of both of the following.

- a. The fire safety strategy.
- b. Procedures for operating and maintaining any fire protection measures. This should include an outline cause and effect matrix/strategy for the building.

Further guidance is available in clause 9 and Annex H of **BS 9999**.

**19.6** The records should include details of all of the following.

- a. The fire safety strategy, including all assumptions in the design of the fire safety systems (such as fire load). Any risk assessments or risk analysis.
- b. All assumptions in the design of the fire safety arrangements for the management of the building.
- c. All of the following.
  - i. **Escape routes** (including occupant load and capacity of escape routes).
  - ii. Any provision to enable the evacuation of disabled people.
  - iii. Escape strategy (e.g. simultaneous or phased).
  - iv. Muster points.
- d. All passive fire safety measures, including all of the following.
  - i. Compartmentation (i.e. location of **fire-separating elements**).
  - ii. **Cavity barriers**.
  - iii. **Fire doorsets**, including **fire doorsets** fitted with a **self-closing device** and other doors equipped with relevant hardware (e.g. electronic security locks).
  - iv. Duct dampers.
  - v. Fire shutters.
- e. All of the following.
  - i. Fire detector heads.
  - ii. Smoke detector heads.
  - iii. Alarm call points.
  - iv. Detection/alarm control boxes.
  - v. Alarm sounders.
  - vi. Emergency communications systems
  - vii. CCTV.
  - viii. Fire safety signage.
  - ix. **Emergency lighting**.
  - x. Fire extinguishers.
  - xi. Dry or wet fire mains and other firefighting equipment.
  - xii. Other interior facilities for the fire and rescue service.

- xiii. Emergency control rooms.
- xiv. Location of hydrants outside the building.
- xv. Other exterior facilities for the fire and rescue service.
- f. All active fire safety measures, including both of the following.
  - i. Sprinkler system(s) design, including isolating valves and control equipment.
  - ii. Smoke control system(s) (or heating, ventilating and air conditioning system with a smoke control function) design, including mode of operation and control systems.
- g. Any high-risk areas (e.g. heating machinery) and particular hazards.
- h. Plans of the building as built, showing the locations of the above.
- i. Both of the following.
  - i. Specifications of any fire safety equipment provided, including all of the following.
    - Operational details.
    - Operators' manuals.
    - Software.
    - System zoning.
    - Routine inspection, testing and maintenance schedules.
  - ii. Records of any acceptance or commissioning tests.
- j. Any other details appropriate for the specific building.

## Appendix A: Key terms

**NOTE:** Except for the items marked \* (which are from the Building Regulations 2010), these definitions apply only to Approved Document B.

**NOTE:** The terms defined below are key terms used in this document only. Refer to **BS 4422** for further guidance on the definitions of common terms used in the fire safety industry which are not listed below.

**Access room** A room that the only escape route from an inner room passes through.

**Alternative escape routes** Escape routes that are sufficiently separated by direction and space or by fire resisting construction to ensure that one is still available if the other is affected by fire.

**NOTE:** A second stair, balcony or flat roof which enables a person to reach a place free from danger from fire is considered an alternative escape route for the purposes of a dwellinghouse.

**Alternative exit** One of two or more exits, each of which is separate from the other.

**Appliance ventilation duct** A duct to deliver combustion air to a gas appliance.

**Atrium** (plural **atria**) A continuous space that passes through one or more structural floors within a building, not necessarily vertically.

**NOTE:** Enclosed lift wells, enclosed escalator wells, building services ducts and stairs are not classified as atria.

**Automatic release mechanism** A device that normally holds a door open, but closes it automatically if any one of the following occurs.

- Smoke is detected by an automatic device of a suitable nature and quality in a suitable location.
- A hand-operated switch, fitted in a suitable position, is operated.
- The electricity supply to the device, apparatus or switch fails.
- The fire alarm system, if any, is operated.

**Basement storey** A storey with a floor that, at some point, is more than 1200mm below the highest level of ground beside the outside walls. (However, see Appendix B, paragraph B26c, for situations where the storey is considered to be a basement only because of a sloping site.)

**Boundary** The boundary of the land that belongs to a building, or, where the land abuts a road, railway, canal or river, the centre line of that road, railway, canal or river.

**\*Building** Any permanent or temporary building but not any other kind of structure or erection. A reference to a building includes a reference to part of a building.

**Building control body** A term that includes both local authority building control and approved inspectors.

**Cavity** A space enclosed by elements of a building (including a suspended ceiling) or contained within an element, but that *is not* a room, cupboard, circulation space, protected shaft, or space within a flue, chute, duct, pipe or conduit.

**Cavity barrier** A construction within a cavity, other than a smoke curtain, to perform either of the following functions.

- Close a cavity to stop smoke or flame entering.
- Restrict the movement of smoke or flame within a cavity.

**Ceiling** Part of a building that encloses a room, protected shaft or circulation space and is exposed overhead.

**NOTE:** The soffit of a rooflight, but not the frame, is included as part of the surface of the ceiling. An upstand below a rooflight is considered as a wall.

**Circulation space** A space (including a protected stairway) mainly used as a means of access between a room and an exit from the building or compartment.

**Common balcony** A walkway, open to the air on one or more sides, that forms part of the escape route from more than one flat.

**Common stair** An escape stair that serves more than one flat.

**Compartment (fire)** A building or part of a building, comprising one or more rooms, spaces or storeys, that is constructed to prevent the spread of fire to or from another part of the same building or an adjoining building.

**NOTE:** A roof space above the top storey of a compartment is included in that compartment. (See also 'Separated part'.)

**Compartment wall or floor** A fire resisting wall or floor to separate one fire compartment from another.

**NOTE:** Provisions relating to construction are given in Section 8.

**Corridor access** A design of a building containing flats, in which each flat is approached via a common horizontal internal access or circulation space, which may include a common entrance hall.

**Dead end** An area from which escape is possible in one direction only.

**Direct distance** The shortest distance from any point within the floor area to the nearest storey exit, measured within the external enclosures of the building, and ignoring walls, partitions and fittings other than the enclosing walls and partitions to protected stairways.

**\*Dwelling** Includes a dwellinghouse and a flat.

**NOTE:** A dwelling is a unit where one or more people live (whether or not as a sole or main residence) in either of the following situations.

- A single person or people living together as a family.
- A maximum of six people living together as a single household, including where care is provided for residents.

**\*Dwellinghouse** Does not include a flat or a building containing a flat.

**Element of structure** Any of the following.

- A member that forms part of the structural frame of a building, or any other beam or column.
- A loadbearing wall or loadbearing part of a wall.
- A floor.
- A gallery (but *not* a loading gallery, fly gallery, stage grid, lighting bridge, or any gallery provided for similar purposes or for maintenance and repair).
- An external wall.
- A compartment wall (including a wall that is common to two or more buildings).

**NOTE:** However, see the guidance to requirement B3, paragraph 7.3, for a list of structures that are *not* considered to be elements of structure.

**Emergency lighting** Lighting for use when the power supply to the normal lighting fails.

**Escape lighting** The part of the emergency lighting that is provided to ensure that the escape route is illuminated at all material times.

**Escape route** The route along which people can escape from any point in a building to a final exit.

**Evacuation lift** A lift that may be used to evacuate people in a fire.

**Exit passageway** A protected passageway that connects a protected stairway to a final exit.

**NOTE:** Exit passageways should be protected to the same standard as the stairway they serve.

**\*External wall** The external wall of a building includes all of the following.

- Anything located within any space forming part of the wall.
- Any decoration or other finish applied to any external (but not internal) surface forming part of the wall.
- Any windows and doors in the wall.

- Any part of a roof pitched at an angle of more than 70 degrees to the horizontal if that part of the roof adjoins a space within the building to which persons have access, but not access only for the purpose of carrying out repairs or maintenance.

**Final exit** The end of an escape route from a building that gives direct access to a street, passageway, walkway or open space, and is sited to ensure that people rapidly disperse away from the building so that they are no longer in danger from fire and/or smoke.

**NOTE:** Windows are not acceptable as final exits.

**Fire alarm system** Combination of components for giving an audible and/or other perceptible warning of fire.

**Fire damper** A mechanical or intumescent device within a duct or ventilation opening that operates automatically and is designed to resist the spread of fire.

**Fire and smoke damper** A fire damper which, in addition to the performance of the fire damper, resists the spread of smoke.

**Fire doorset** A door or shutter which, together with its frame and furniture as installed in a building, is intended (when closed) to resist the spread of fire and/or gaseous products of combustion and meets specified performance criteria to those ends.

**NOTE:** A fire doorset may have one or more leaves. The term includes a cover or other form of protection to an opening in a fire resisting wall or floor, or in a structure that surrounds a protected shaft. A fire doorset is a complete door assembly, assembled on site or delivered as a completed assembly, consisting of the door frame, leaf or leaves, essential hardware, edge seals and glazing, and any integral side panels or fanlight panels in an associated door screen.

**Firefighting lift** A lift with additional protection and with controls that enable it to be used by the fire and rescue service when fighting a fire. (See Section 17.)

**Firefighting lobby** A protected lobby that provides access from a firefighting stair to the accommodation area and to any associated firefighting lift.

**Firefighting shaft** A protected enclosure that contains a firefighting stair, firefighting lobbies and, if provided, a firefighting lift together with its machine room.

**Firefighting stair** A protected stairway that connects to the accommodation area through only a firefighting lobby.

**Fire resisting (Fire resistance)** The ability of a component or a building to satisfy, for a stated period of time, some or all of the appropriate criteria given in the relevant standard.

**Fire-separating element** A compartment wall, compartment floor, cavity barrier and construction that encloses a protected escape route and/or a place of special fire hazard.

**Fire-stop (Fire-stopping)** A seal provided to close an imperfection of fit or design tolerance between elements or components, to restrict the spread of fire and smoke.

**\*Flat** A flat is a separate and self-contained premises constructed or adapted for use for residential purposes and forming part of a building from some other part of which it is divided horizontally.

**Gallery** A floor or balcony that does not extend across the full extent of a building's footprint and is open to the floor below.

**Habitable room** A room used, or intended to be used, for people to live in (including, for the purposes of Approved Document B Volumes 1 and 2, a kitchen, but not a bathroom).

**Height** (of a building or storey for the purposes of Approved Document B Volumes 1 and 2)

- Height of a building is measured as shown in Appendix D, Diagram D4.
- Height of the floor of the top storey above ground level is measured as shown in Appendix D, Diagram D6.

**Inner room** Room from which escape is possible only by passing through another room (the access room).

**Live/work unit** A flat that is a workplace for people who live there, its occupants, and for people who do not live on the premises.

**Means of escape** Structural means that provide one or more safe routes for people to go, during a fire, from any point in the building to a place of safety.

#### Measurement

- Width of a doorway, cubic capacity, area, height of a building and number of storeys are measured as shown in Appendix D, Diagrams D1 to D6.
- Occupant number, travel distance, escape route and stairs are measured as described in Appendix D, paragraphs D1 to D4.

**Notional boundary** A boundary presumed to exist between two buildings on the same site.

**Open spatial planning** The internal arrangement of a building in which more than one storey or level is contained in one undivided volume, e.g. split-level floors. For the purposes of this document there is a distinction between open spatial planning and an atrium space.

**Perimeter** (of a building) The maximum aggregate plan perimeter, found by vertical projection onto a horizontal plane. (See Section 15.)

**Pipe** Includes pipe fittings and accessories. The definition of 'pipe' *excludes* a flue pipe and a pipe used for ventilating purposes, other than a ventilating pipe for an above-ground drainage system.

**Place of special fire hazard** A room such as any of the following.

- Oil-filled transformer room.
- Switch gear room.
- Boiler room.
- Storage space for fuel or other highly flammable substance(s).
- Room that houses a fixed internal combustion engine.

**Platform floor** (also called an access or raised floor) A floor that is supported by a structural floor, but with an intervening cavity to house services.

**Protected circuit** An electrical circuit that is protected against fire.

**Protected corridor/lobby** A corridor or lobby that is adequately protected from fire in adjoining areas by fire resisting construction.

**Protected entrance hall/landing** A circulation area, consisting of a hall or space in a flat, that is enclosed with fire resisting construction other than an external wall of a building.

**Protected shaft** A shaft that enables people, air or objects to pass from one compartment to another, and which is enclosed with fire resisting construction.

**Protected stairway** A stair that leads to a final exit to a place of safety and that is adequately enclosed with fire resisting construction. Included in the definition is any exit passageway between the foot of the stair and the final exit.

**Purpose group** A classification of a building according to the purpose to which it is intended to be put. (See Table 0.1.)

**Relevant boundary** The boundary or notional boundary that one side of the building faces and/or coincides with, and that is parallel or at an angle of a maximum of 80 degrees to that side of the building.

**Rooflight** A dome light, lantern light, skylight, ridge light, glazed barrel vault or other element to admit daylight through a roof.

**Room** An enclosed space within a building that is not used solely as a circulation space. The term includes not only conventional rooms, but also cupboards that are not fittings and large spaces such as warehouses and auditoria. The term *does not* include cavities such as ducts, ceiling cavities and roof spaces.

**School** A place of education for children between 2 and 19 years old. The term includes nursery schools, primary schools and secondary schools as defined in the Education Act 1996.

**Self-closing device** A device that closes a door, when open at any angle, against a door frame.

**NOTE:** If the door is in a cavity barrier, rising butt hinges (which are different from the self-closing device mentioned above) are acceptable.

**Separated part** (of a building) Part of a building that is separated from another part of the same building by a compartment wall. The wall runs the full height of the part and is in one vertical plane. (See Appendix D, Diagram D5.)

**Sheltered housing** Includes two or more dwellings in the same building or on adjacent sites, designed and constructed as residential accommodation for vulnerable or elderly people who receive, or will receive, a support service.

**Single storey building** A building that consists of a ground storey only. Basements are not counted as storeys in a building (see Appendix D). A separated part that consists of a ground storey only, with a roof to which access is only provided for repair or maintenance, may be treated as a single storey building.

**Site** (of a building) The land occupied by the building, up to the boundaries with land in other ownership.

**\*Specified attachment** Includes any of the following.

- A balcony attached to an external wall.
- A device for reducing heat gain within a building by deflecting sunlight which is attached to an external wall.
- A solar panel attached to an external wall.

**Storey** Includes any of the following.

- Any gallery in an assembly building (purpose group 5).
- Any gallery in any other type of building if its area is more than half that of the space into which it projects.
- A roof, unless it is accessible only for maintenance and repair.

**NOTE:** The building is regarded as a multi-storey building if both of the following apply.

- There is more than one gallery.

- The total aggregate area of all the galleries in one space is more than half the floor area of that space.

**Storey exit** A final exit, or a doorway that gives direct access into a protected stairway, firefighting lobby or external escape route.

**NOTE:** If an institutional building is planned to enable progressive horizontal evacuation, a door in a compartment wall is considered a storey exit for the purposes of requirement B1.

**Suspended ceiling** (fire-protecting) A ceiling suspended below a floor that adds to the fire resistance of the floor.

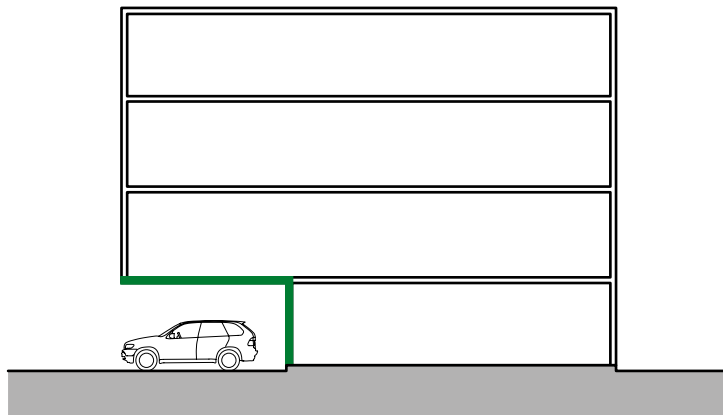
**Thermoplastic material** Any synthetic polymeric material that has a softening point below 200°C if tested to **BS EN ISO 306** Method A120. Specimens for this test may be fabricated from the original polymer where the thickness of material of the end product is less than 2.5mm.

**Travel distance** (unless otherwise specified, e.g. as in the case of flats) The distance that a person would travel from any point within the floor area to the nearest storey exit, determined by the layout of walls, partitions and fittings.

**Unprotected area** (in relation to a side or external wall of a building) All of the following are classed as unprotected areas.

- Any part of the external wall that has less than the relevant fire resistance set out in Section 13.
- Any part of the external wall constructed of material more than 1mm thick if that material does not have a class B-s3, d2 rating or better, which is attached or applied, whether for cladding or any other purpose.
- Windows, doors or other openings. This does not include windows that are designed and glazed to give the necessary level of fire resistance and that are not openable.

**NOTE:** Recessed car parking areas as shown in Diagram A1 should not be regarded as unprotected areas.

**NOTE:**

The parking area should be both of the following:

- a. Open fronted.
- b. Separated from the remainder of the building by a compartment wall(s) and floor(s) having not less than the period of fire resistance specified in Table B4 in Appendix B.

Diagram A1 Recessed car parking areas

# Appendix B: Performance of materials, products and structures

## Introduction

- B1** Much of the guidance in this document is given in terms of performance classifications in relation to British or European Standards. In such cases, it will be necessary to demonstrate that a system or product can meet the relevant performance classification. This will be achieved if the system or product complies with one of the following.
- They should be in accordance with a specification or design that has been shown by a specific test to be capable of meeting that performance classification.
  - They should have been designed by using relevant design standards in order to meet that performance classification.
  - They should have been assessed by applying relevant test evidence, in lieu of carrying out a specific test, as being capable of meeting that performance classification.

**NOTE:** Some products are subject to Classification Without Further Testing (CWFT). For the purposes of this approved document, such products can be considered to have been shown to be capable of meeting a performance specification as per paragraph B1a.

- B2** Any test evidence used to demonstrate the fire performance classification of a product or system should be carefully checked to ensure that it is applicable to the intended use. Small differences in detail, such as fixing method, joints, dimensions, the introduction of insulation materials and air gaps (ventilated or not), can significantly affect the performance.
- B3** Assessments should not be regarded as a way to avoid a test where one is necessary. Assessments should only be carried out where sufficient relevant test evidence is available. Relevant test evidence is unlikely to be provided by test standards which have different classification criteria.
- B4** Where it is proposed to assess the classification of a product or system in lieu of carrying out a specific test (as in paragraph B1b), this should be done in accordance with the relevant standard for extended application for the test in question and should include details of the test evidence that has been used to support the assessment.

For performance classifications where there is no specific standard for extended application, assessment reports should be produced in accordance with the principles of **BS EN 15725** and should include details of the test evidence that has been used to support the assessment. Further information on best practice is provided in the Passive Fire Protection Federation's *Guide to Undertaking Assessments in Lieu of Fire Tests*.

**NOTE:** Regulation 7(2) limits components used in or on the external walls of certain buildings to materials achieving class A2-s1, d0 or class A1 (see Section 12). Assessments cannot be used to demonstrate compliance with this requirement.

- B5** Tests and assessments should be carried out by organisations with the necessary expertise. For example, organisations listed as 'notified bodies' in accordance with the European Construction

Products Regulation or laboratories accredited by the United Kingdom Accreditation Service (UKAS) for the relevant test standard can be assumed to have the necessary expertise.

**NOTE:** Standard fire tests do not directly measure fire hazard. They measure or assess the response of a material or system to exposure to one or more aspects of fire conditions. Performance in fire tests is only one of a number of factors that should be taken into account.

## Reaction to fire

- B6** Reaction to fire relates to the degree to which a product will contribute, by its own decomposition, to a fire under specified conditions. Products, other than floorings, are classified as A1, A2, B, C, D, E or F (with class A1 being the highest performance and F being the lowest) in accordance with **BS EN 13501-1**. Class F is assigned when a product fails to attain class E. Untested products cannot be classified in accordance with **BS EN 13501-1**.

Materials covered by the Classification Without Further Testing (CWFT) process can be found by accessing the European Commission's website <https://eur-lex.europa.eu/>.

- B7** The classes of reaction to fire performance of A2, B, C, D and E are accompanied by additional classifications related to the production of smoke (s1, s2, s3), with s1 indicating the lowest production, and/or flaming droplets/particles (d0, d1, d2), with d0 indicating the lowest production.

**NOTE:** When a classification includes s3, d2 this means that there is no limit set for smoke production and/or flaming droplets/particles.

- B8** To reduce the testing burden on manufacturers, **BS EN 13238** defines a number of standard substrates that produce test results representative of different end use applications. The classification for reaction to fire achieved during testing is only valid when the product is used within this field of application, i.e. when the product is fixed to a substrate of that class in its end use. The standard substrate selected for testing should take account of the intended end use applications (field of application) of the product and represent end use substrates that have a density of a minimum of 75% of the standard substrate's nominal density.

- B9** Standard substrates include gypsum plasterboard (**BS EN 520**) with a density of  $700 \pm 100 \text{ kg/m}^3$ , calcium silicate board (**BS EN 14306**)  $870 \pm 50 \text{ kg/m}^3$  and fibre-cement board  $1800 \pm 200 \text{ kg/m}^3$ .

**NOTE:** Standard calcium silicate board is not representative of gypsum plasterboard end use (due to the paper layer), but would be representative of most gypsum plasters (with densities of more than  $650 \text{ kg/m}^3$ ).

**NOTE:** Classifications based on tests using a plasterboard substrate would also be acceptable for products bonded to a gypsum plaster end use substrate.

## National classifications for reaction to fire

- B10** This document uses the European classification system for reaction to fire set out in **BS EN 13501-1**; however, there may be some products lawfully on the market using the classification system set out in previous editions. Where this is the case, Table B1 can be used for the purposes of this document.

**Table B1 Reaction to fire classifications: transposition to national class**

<b>BS EN 13501-1 classification</b>	<b>Transposition</b>
A1	Material that, when tested to <b>BS 476-11</b> , does not either: a. flame b. cause a rise in temperature on either the thermocouple at the centre of the specimen or in the furnaces
A2-s1, d0	None
A2-s3, d2	Material that meets either of the following. a. Any material of density 300kg/m <sup>3</sup> or more, which, when tested to <b>BS 476-11</b> , complies with both of the following: i. does not flame ii. causes a rise in temperature on the furnace thermocouple not exceeding 20°C b. Any material of density less than 300kg/m <sup>3</sup> , which, when tested to <b>BS 476-11</b> , complies with both of the following: i. does not flame for more than 10 seconds ii. causes a rise in temperature on the thermocouple at the centre of the specimen or in the furnace that is a maximum of 35°C and on the furnace thermocouple that is a maximum of 25°C
B-s3, d2	Any material that meets both of the following criteria. a. Class 1 in accordance with <b>BS 476-7</b> . b. Has a fire propagation index (I) of a maximum of 12 and sub-index (i1) of a maximum of 6, determined by using the method given in <b>BS 476-6</b> . Index of performance (I) relates to the overall test performance, whereas sub-index (i1) is derived from the first three minutes of the test
C-s3, d2	Class 1 in accordance with <b>BS 476-7</b>
D-s3, d2	Class 3 in accordance with <b>BS 476-7</b>

**NOTE:** The national classifications do not automatically equate with the transposed classifications in the 'BS EN 13501-1 classification' column, therefore products cannot typically assume a European class unless they have been tested accordingly.

**NOTE:** A classification of s3, d2 indicates that no limit is set for production of smoke and/or flaming droplets/particles. If a performance for production of smoke and/or flaming droplets/particles is specified, then only the European classes can be used. For example, a national class may not be used as an alternative to a classification which includes s1, d0.

## Thermoplastic materials

- B11** Thermoplastic material is any synthetic polymeric material that has a softening point below 200°C if tested to **BS EN ISO 306** Method A120. Products formed from these materials cannot always be classified in the normal way. In those circumstances the following approach can be followed.
- B12** Thermoplastic materials used for window glazing, rooflights and lighting diffusers within suspended ceilings do not need to meet the criteria within paragraph B19 onwards, if the guidance to requirements B2 and B4 is followed.

**B13** For the purposes of requirements B2 and B4, **thermoplastic materials** should be classified as TP(a) rigid, TP(a) flexible or TP(b), as follows:

a. **TP(a) rigid**

- i. rigid solid uPVC sheet
- ii. solid (as distinct from double- or multi-skinned) polycarbonate sheet a minimum of 3mm thick
- iii. multi-skinned rigid sheet made from uPVC or polycarbonate that has a class 1 rating when tested to **BS 476-7**
- iv. any other rigid thermoplastic product, a specimen of which (at the thickness of the product as put on the market), when tested to **BS 2782-0** Method 508A, performs so that both:
  - the test flame extinguishes before the first mark
  - the duration of flaming or afterglow does not exceed 5 seconds following removal of the burner.

b. **TP(a) flexible**

Flexible products a maximum of 1mm thick that comply with the Type C requirements of **BS 5867-2** when tested to **BS 5438** Test 2 with the flame applied to the surface of the specimens for 5, 15, 20 and 30 seconds respectively, but excluding the cleansing procedure; and

c. **TP(b)**

- i. rigid solid polycarbonate sheet products a maximum of 3mm thick, or multi-skinned polycarbonate sheet products that do not qualify as TP(a) by test
- ii. other products which, when a specimen of the material between 1.5 and 3mm thick is tested in accordance with **BS 2782-0** Method 508A, have a maximum rate of burning of 50mm/minute.

**NOTE:** If it is not possible to cut or machine a 3mm thick specimen from the product, then a 3mm test specimen can be moulded from the same material as that used to manufacture the product.

**B14** A **thermoplastic material** alone when used as a lining to a wall or **ceiling** cannot be assumed to protect a substrate. The surface rating of both **thermoplastic material** and substrate must therefore meet the required classification.

If, however, the **thermoplastic material** is fully bonded to a non-thermoplastic substrate, then only the surface rating of the composite needs to meet the required classification.

## Roofs

**B15** Performance of the resistance of roofs to external fire exposure is measured in terms of penetration through the roof construction and the spread of flame over its surface.

**B16** Roof constructions are classified within the European system as  $B_{ROOF}(t4)$ ,  $C_{ROOF}(t4)$ ,  $D_{ROOF}(t4)$ ,  $E_{ROOF}(t4)$  or  $F_{ROOF}(t4)$  in accordance with **BS EN 13501-5**.  $B_{ROOF}(t4)$  indicates the highest performance and  $F_{ROOF}(t4)$  the lowest.

**B17** **BS EN 13501-5** refers to four separate roof tests. The suffix (t4) used in paragraph B16 indicates that Test 4 is to be used for the purposes of this approved document.

**B18** This document uses the European classification system for roof covering set out in **BS EN 13501-5**; however, there may be some products lawfully on the market using the classification system set out in previous editions. Where this is the case, Table B2 can be used for the purposes of this document.

**Table B2 Roof covering classifications: transposition to national class**

BS EN 13501-5 classification	Transposition to BS 476-3 classification
B <sub>ROOF</sub> (t4)	AA, AB or AC
C <sub>ROOF</sub> (t4)	BA, BB or BC
D <sub>ROOF</sub> (t4)	CA, CB or CC
E <sub>ROOF</sub> (t4)	AD, BD or CD
F <sub>ROOF</sub> (t4)	DA, DB, DC or DD

**NOTE:** The national classifications do not automatically equate with the transposed classifications in the European column, therefore products cannot typically assume a European class unless they have been tested accordingly.

## Fire resistance

- B19** Common to all of the provisions of Part B of the Building Regulations is the property of **fire resistance**. **Fire resistance** is a measure of one or more of the following.
- Resistance to collapse** (loadbearing capacity), which applies to loadbearing elements only, denoted R in the European classification of the resistance to fire performance.
  - Resistance to fire penetration** (integrity), denoted E in the European classification of the resistance to fire performance.
  - Resistance to the transfer of excessive heat** (insulation), denoted I in the European classification of the resistance to fire performance.
- B20** The standards of **fire resistance** necessary for a particular **building** are based on assumptions about the severity of fires and the consequences should an element fail. Fire severity is estimated in very broad terms from the use of the **building** (its **purpose group**), on the assumption that the building contents (which constitute the fire load) are similar for **buildings** with the same use.
- B21** Because the use of **buildings** may change, a precise estimate of fire severity based on the fire load due to a particular use may be misleading. Therefore if a fire engineering approach of this kind is adopted, the likelihood that the fire load may change in the future needs to be considered.
- B22** Performance in terms of the **fire resistance** to be achieved by elements of structure, doors and other forms of construction is classified in accordance with one of the following.
- BS EN 13501-2.**
  - BS EN 13501-3.**
  - BS EN 13501-4.**

**B23** Fire resistance is measured in minutes. This relates to time elapsed in a standard test and should not be confused with real time.

**B24** The fire resistance necessary for different circumstances is set out in the following tables.

- Table B3 gives the specific requirements for each element of structure.
- Table B4 sets out the minimum periods of fire resistance for elements of structure.
- Table B5 sets out limitations on the use of uninsulated fire resisting glazed elements.

**B25** This document uses the European classification system for fire resistance set out in **BS EN 13501-2** to 4; however, there may be some products lawfully on the market using the classification system set out in previous editions. In those situations the equivalent classifications given in Table B1 can be used.

**Table B3 Specific provisions of the test for fire resistance of elements of structure, etc.**

Part of building	Minimum provisions when tested to the relevant European standard (minutes) <sup>(1)</sup>	Alternative minimum provisions when tested to the relevant part of <b>BS 476</b> <sup>(2)</sup> (minutes)			Type of exposure
		Loadbearing capacity <sup>(3)</sup>	Integrity	Insulation	
1. <b>Structural</b> frame, beam or column.	R see Table B4	See Table B4	Not applicable	Not applicable	Exposed faces
2. <b>Loadbearing wall</b> (which is not also a wall described in any of the following items).	R see Table B4	See Table B4	Not applicable	Not applicable	Each side separately
3. <b>Floors</b> <sup>(4)</sup>					
a. between a shop and flat above	REI 60 or see Table B4 (whichever is greater)	60 min or see Table B4 (whichever is greater)	60 min or see Table B4 (whichever is greater)	60 min or see Table B4 (whichever is greater)	From underside <sup>(5)</sup>
b. in upper storey of two storey dwellinghouse (but not over garage or basement)	R 30 and REI 15	30 min	15 min	15 min	From underside <sup>(5)</sup>
c. any other floor – including compartment floors.	REI see Table B4	See Table B4	See Table B4	See Table B4	From underside <sup>(5)</sup>

Table B3 Continued

Part of building	Minimum provisions when tested to the relevant European standard (minutes) <sup>(1)</sup>	Alternative minimum provisions when tested to the relevant part of <b>BS 476</b> <sup>(2)</sup> (minutes)			Type of exposure
		Loadbearing capacity <sup>(3)</sup>	Integrity	Insulation	
<b>4. Roofs</b>					
a. any part forming an escape route	REI 30	30 min	30 min	30 min	From underside <sup>(5)</sup>
b. any roof that performs the function of a floor.	REI see Table B4	See Table B4	See Table B4	See Table B4	From underside <sup>(5)</sup>
<b>5. External walls</b>					
a. any part a maximum of 1000mm from any point on the relevant boundary <sup>(6)</sup>	REI see Table B4	See Table B4	See Table B4	See Table B4	Each side separately
b. any part a minimum of 1000mm from the relevant boundary <sup>(6)</sup>	RE see Table B4 and REI 15	See Table B4	See Table B4	15 min	From inside the building
c. any part beside an external escape route (Section 2 Diagram 2.7 of Approved Document B Volume 1 and Section 3, Diagram 3.4).	RE 30	30 min	30 min	No provision <sup>(7) (8)</sup>	From inside the building
<b>6. Compartment walls</b> Separating either:					
a. a flat from any other part of the building (see paragraph 7.1 of Approved Document B Volume 1)	REI 60 or see Table B4 (whichever is less)	60 min or see Table B4 (whichever is less)	60 min or see Table B4 (whichever is less)	60 min or see Table B4 (whichever is less)	Each side separately
b. occupancies.	REI 60 or see Table B4 (whichever is less)	60 min or see Table B4 (whichever is less)	60 min or see Table B4 (whichever is less)	60 min or see Table B4 (whichever is less)	Each side separately
<b>7. Compartment walls</b> (other than in item 6 or item 10).	REI see Table B4	See Table B4	See Table B4	See Table B4	Each side separately

Table B3 Continued

Part of building	Minimum provisions when tested to the relevant European standard (minutes) <sup>(1)</sup>	Alternative minimum provisions when tested to the relevant part of <b>BS 476</b> <sup>(2)</sup> (minutes)			Type of exposure
		Loadbearing capacity <sup>(3)</sup>	Integrity	Insulation	
<b>8. Protected shafts</b> Excluding any firefighting shaft:					
a. any glazing	E 30	Not applicable	30 min	No provision <sup>(8)</sup>	Each side separately
b. any other part between the shaft and a protected lobby/corridor	REI 30	30 min	30 min	30 min	Each side separately
c. any part not described in (a) or (b) above.	REI see Table B4	See Table B4	See Table B4	See Table B4	Each side separately
<b>9. Enclosure</b> (that does not form part of a compartment wall or a protected shaft) to a:					
a. protected stairway	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	Each side separately
b. lift shaft.	REI 30	30 min	30 min	30 min	Each side separately
<b>10. Wall or floor</b> separating an attached or integral garage from a dwellinghouse	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	From garage side
<b>11. Fire resisting construction in dwellinghouses</b> not described elsewhere	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	Each side separately
<b>12. Firefighting shafts</b>	REI 120	120 min	120 min	120 min	From side remote from shaft
a. construction that separates firefighting shaft from rest of building	REI 60	60 min	60 min	60 min	From shaft side
b. construction that separates firefighting stair, firefighting lift shaft and firefighting lobby.	REI 60	60 min	60 min	60 min	Each side separately

Table B3 Continued

Part of building	Minimum provisions when tested to the relevant European standard (minutes) <sup>(1)</sup>	Alternative minimum provisions when tested to the relevant part of <b>BS 476</b> <sup>(2)</sup> (minutes)			Type of exposure
		Loadbearing capacity <sup>(3)</sup>	Integrity	Insulation	
13. <b>Enclosure</b> (that is not a compartment wall or described in item 8) to a:					
a. protected lobby	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	Each side separately
b. protected corridor.	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	Each side separately
14. <b>Sub-division of a corridor</b>	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	Each side separately
15. <b>Fire resisting construction</b>					
a. construction that encloses places of special fire hazard	REI 30	30 min	30 min	30 min	Each side separately
b. construction between store rooms and sales area in shops	REI 30	30 min	30 min	30 min	Each side separately
c. fire resisting sub-division	REI 30	30 min	30 min	30 min	Each side separately
d. construction that encloses bedrooms and ancillary accommodation in care homes.	REI 30	30 min	30 min	30 min	Each side separately
16. <b>Enclosure</b> in a flat to a protected entrance hall, or to a protected landing.	REI 30 <sup>(8)</sup>	30 min	30 min	30 min <sup>(8)</sup>	Each side separately
17. <b>Cavity barrier</b>	E 30 and EI 15	Not applicable	30 min	15 min	Each side separately
18. <b>Ceiling</b> see paragraph 2.5, Diagram 2.3 of Approved Document B Volume 1 and paragraph 9.5 and Diagram 9.3.	EI 30	Not applicable	30 min	30 min	From underside
19. <b>Duct</b> described in paragraph 9.17e.	E 30	Not applicable	30 min	No provision	From outside
20. <b>Casing</b> around a drainage system described in Diagram 9.1 of Approved Document B Volume 1.	E 30	Not applicable	30 min	No provision	From outside

Table B3 Continued

Part of building	Minimum provisions when tested to the relevant European standard (minutes) <sup>(1)</sup>	Alternative minimum provisions when tested to the relevant part of <b>BS 476</b> <sup>(2)</sup> (minutes)			Type of exposure
		Loadbearing capacity <sup>(3)</sup>	Integrity	Insulation	
21. <b>Flue walls</b> described in Diagram 10.4.	EI half the period given in Table B4 for the compartment wall/floor	Not applicable	Half the period given in Table B4 for the compartment wall/floor	Half the period given in Table B4 for the compartment wall/floor	From outside
22. <b>Construction</b> described in note (a) to paragraph 12.9 of Approved Document B Volume 1.	EI 30	Not applicable	30 min	30 min	From underside
23. <b>Fire doorsets</b>	See Table C1	See Table C1			See Appendix C

**NOTES:**

- BS EN 13501-2** Classification using data from fire resistance tests, excluding ventilation services. **BS EN 13501-3** Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers. **BS EN 13501-4** Classification using data from fire resistance tests on components of smoke control systems.  
In the European classification:  
'R' is the resistance to fire in terms of loadbearing capacity.  
'E' is the resistance to fire in terms of integrity.  
'I' is the resistance to fire in terms of insulation.  
The national classifications do not automatically equate with the alternative classifications in the European column, therefore products cannot typically assume a European class unless they have been tested accordingly.
- BS 476-20** for general principles, **BS 476-21** for loadbearing elements, **BS 476-22** for non-loadbearing elements, **BS 476-23** for fire-protecting suspended ceilings and **BS 476-24** for ventilation ducts.
- Applies to loadbearing elements only (see paragraph B19).
- Guidance on increasing the fire resistance of existing timber floors is given in BRE Digest 208.
- Only if a suspended ceiling meets the appropriate provisions should it be relied on to add to the fire resistance of the floor.
- Such walls may contain areas that do not need to be fire resisting (unprotected areas). See Section 13.
- Unless needed as part of a wall in item 5a or 5b.
- Except for any limitations on uninsulated glazed elements given in Table B5.

**Table B4 Minimum periods of fire resistance**

Purpose group of building	Minimum periods of fire resistance <sup>(1)</sup> (minutes) in a:						
	Basement storey* including floor over		Ground or upper storey				
	Depth (m) of the lowest basement		Height (m) of top floor above ground, in a building or separated part of a building				
	More than 10	Up to 10	Up to 5	Up to 11	Up to 18	Up to 30	More than 30
1. Residential:							
a. Block of flats							
– without sprinkler system	90 min	60 min	30 min <sup>†</sup>	60 min <sup>±5</sup>	Not permitted <sup>(2)</sup>	Not permitted <sup>(2)</sup>	Not permitted <sup>(2)</sup>
– with sprinkler system <sup>(3)</sup>	90 min	60 min	30 min <sup>†</sup>	60 min <sup>±5</sup>	60 min <sup>±5</sup>	90 min <sup>±</sup>	120 min <sup>±</sup>
b. and c. Dwellinghouse	Not applicable <sup>(4)</sup>	30 min <sup>±†</sup>	30 min <sup>†</sup>	60 min <sup>(5)</sup>	60 min <sup>(5)</sup>	Not applicable <sup>(4)</sup>	Not applicable <sup>(4)</sup>
2. Residential							
a. Institutional	90 min	60 min	30 min <sup>†</sup>	60 min	60 min	90 min	120 min <sup>†</sup>
b. Other residential	90 min	60 min	30 min <sup>†</sup>	60 min	60 min	90 min	120 min <sup>†</sup>
3. Office:							
– without sprinkler system	90 min	60 min	30 min <sup>†</sup>	60 min	60 min	90 min	Not permitted <sup>(6)</sup>
– with sprinkler system <sup>(3)</sup>	60 min	60 min	30 min <sup>†</sup>	30 min <sup>†</sup>	30 min <sup>†</sup>	60 min	120 min <sup>†</sup>
4. Shop and commercial:							
– without sprinkler system	90 min	60 min	60 min	60 min	60 min	90 min	Not permitted <sup>(6)</sup>
– with sprinkler system <sup>(3)</sup>	60 min	60 min	30 min <sup>†</sup>	60 min	60 min	60 min	120 min <sup>†</sup>
5. Assembly and recreation:							
– without sprinkler system	90 min	60 min	60 min	60 min	60 min	90 min	Not permitted <sup>(6)</sup>
– with sprinkler system <sup>(3)</sup>	60 min	60 min	30 min <sup>†</sup>	60 min	60 min	60 min	120 min <sup>†</sup>
6. Industrial:							
– without sprinkler system	120 min	90 min	60 min	90 min	90 min	120 min	Not permitted <sup>(6)</sup>
– with sprinkler system <sup>(3)</sup>	90 min	60 min	30 min <sup>†</sup>	60 min	60 min	90 min	120 min <sup>†</sup>
7. Storage and other non-residential:							
a. any building or part not described elsewhere:							
– without sprinkler system	120 min	90 min	60 min	90 min	90 min	120 min	Not permitted <sup>(6)</sup>
– with sprinkler system <sup>(3)</sup>	90 min	60 min	30 min <sup>†</sup>	60 min	60 min	90 min	120 min <sup>†</sup>

**Table B4 Continued**

Purpose group of building	Minimum periods of fire resistance <sup>(1)</sup> (minutes) in a:						
	Basement storey* including floor over		Ground or upper storey				
	Depth (m) of the lowest basement		Height (m) of top floor above ground, in a building or separated part of a building				
	More than 10	Up to 10	Up to 5	Up to 11	Up to 18	Up to 30	More than 30
b. car park for light vehicles:							
i. open sided car park <sup>(7)</sup>	Not applicable	Not applicable	15 min <sup>†#</sup>	15 min <sup>†#(8)</sup>	15 min <sup>†#(8)</sup>	15 min <sup>†#(8)</sup>	60 min
ii. any other car park	90 min	60 min	30 min <sup>†</sup>	60 min	60 min	90 min	120 min <sup>†</sup>

**NOTES:**

For single storey buildings, the periods under the heading 'Up to 5' apply. If single storey buildings have basements, for the basement storeys the period appropriate to their depth applies.

\* For the floor over a basement or, if there is more than one basement, the floor over the topmost basement, the higher of the period for the basement storey and the period for the ground or upper storey applies.

† For compartment walls that separate buildings, the period is increased to a minimum of 60 minutes.

+ For any floor that does not contribute to the support of the building within a flat of more than one storey, the period is reduced to 30 minutes.

§ For flat conversions, refer to paragraphs 6.5 to 6.7 of Approved Document B Volume 1 regarding the acceptability of 30 minutes.

‡ For elements that do not form part of the structural frame, the period is reduced to 90 minutes.

# For elements that protect the means of escape, the period is increased to 30 minutes.

1. Refer to note 1, Table B3 for the specific provisions of test.

2. Blocks of flats with a top storey more than 11m above ground level (see Diagram D6) should be fitted with a sprinkler system in accordance with Appendix E.

**NOTE:** Sprinklers should be provided within the individual flats, they do not need to be provided in the common areas such as stairs, corridors or landings when these areas are fire sterile.

3. 'With sprinkler system' means that the building is fitted throughout with an automatic sprinkler system in accordance with Appendix E.

4. Very large (with a top storey more than 18m above ground level or with a 10m deep basement) or unusual dwellinghouses are outside the scope of the guidance provided with regard to dwellinghouses.

5. A minimum of 30 minutes in the case of three storey dwellinghouses, increased to 60 minutes minimum for compartment walls separating buildings.

6. Buildings within the 'office', 'shop and commercial', 'assembly and recreation', 'industrial' and 'storage and other non-residential' (except car parks for light vehicles) purpose groups (purpose groups 3 to 7(a)) require sprinklers where there is a top storey more than 30m above ground level.

7. The car park should comply with the relevant provisions in the guidance on requirement B3, Section 11.

8. For the purposes of meeting the Building Regulations, the following types of steel elements are deemed to have satisfied the minimum period of fire resistance of 15 minutes when tested to the European test method.

i. Beams supporting concrete floors, maximum  $H_p/A=230\text{m}^{-1}$  operating under full design load.

ii. Free-standing columns, maximum  $H_p/A=180\text{m}^{-1}$  operating under full design load.

iii. Wind bracing and struts, maximum  $H_p/A=210\text{m}^{-1}$  operating under full design load.

Guidance is also available in **BS EN 1993-1-2**.

## Application of the fire resistance standards in Table B4

**B26** The following guidance should be used when applying the fire resistance standards in Table B4.

- a. If one element of structure supports or carries or gives stability to another, the fire resistance of the supporting element should be no less than the minimum period of fire resistance for the other element (whether that other element is loadbearing or not). In some circumstances, it may be reasonable to vary this principle, for example:
  - i. if the supporting structure is in the open air and is not likely to be affected by the fire in the building
  - ii. if the supporting structure is in a different compartment, with a fire-separating element (that has the higher standard of fire resistance) between the supporting and the separated structure
  - iii. if a plant room on the roof needs greater fire resistance than the elements of structure that support it.
- b. If an element of structure forms part of more than one building or compartment, that element should be constructed to the standard of the higher of the relevant provisions.
- c. If, due to the slope of the ground, one side of a basement is open at ground level (allowing smoke to vent and providing access for firefighting) for elements of structure in that storey it may be appropriate to adopt the standard of fire resistance that applies to above-ground structures.
- d. Although most elements of structure in a single storey building may not need fire resistance, fire resistance is needed if one of the following applies to the element.
  - i. It is part of, or supports, an external wall, and there is provision in the guidance on requirement B4 to limit the extent of openings and other unprotected areas in the wall.
  - ii. It is part of, or supports, a compartment wall, including a wall that is common to two or more buildings.
  - iii. It supports a gallery.

**B27** For the purposes of this paragraph, the ground storey of a building that has one or more basement storeys and no upper storeys may be considered as a single storey building. The fire resistance of the basement storeys should be that specified for basements.

**Table B5 Limitations on the use of uninsulated glazed elements on escape routes. These limitations *do not* apply to glazed elements that satisfy the relevant insulation criterion, see Table B3**

Position of glazed element	Maximum total glazed area in parts of a building with access to:			
	A single stair		More than one stair	
	Walls	Door leaf	Walls	Door leaf
<b>Flats</b>				
1. Within the enclosures of a protected entrance hall or protected landing, or within fire resisting separation shown in Section 3, Diagram 3.4, of Approved Document B Volume 1.	Fixed fanlights only	Unlimited above 1100mm from floor	Fixed fanlights only	Unlimited above 1100mm from floor
<b>Dwellingshouses</b>				
2. Within either: a. the enclosures of a protected stairway b. fire resisting separation shown in Diagram 2.2 of Approved Document B Volume 1.	Unlimited above 1100mm from floor or pitch of the stair	Unlimited	Unlimited above 1100mm from floor or pitch of the stair	Unlimited
3. Within fire resisting separation either: a. shown in Diagram 2.4 of Approved Document B Volume 1 b. described in paragraph 2.16b of Approved Document B Volume 1.	Unlimited above 100mm from floor	Unlimited above 100mm from floor	Unlimited above 100mm from floor	Unlimited above 100mm from floor
4. Existing window between an attached/integral garage and the dwellinghouse.	Unlimited	Not applicable	Unlimited	Not applicable
5. Adjacent to an external escape stair (see paragraph 2.17 and Diagram 2.7 of Approved Document B Volume 1) or roof escape route (see paragraph 2.13 of Approved Document B Volume 1).	Unlimited	Unlimited	Unlimited	Unlimited
<b>General (except dwellingshouses)</b>				
6. Between residential/sleeping accommodation and a common escape route (corridor, lobby or stair).	Nil	Nil	Nil	Nil
7. Between a protected stairway <sup>(1)</sup> and either: a. the accommodation b. a corridor that <i>is not</i> a protected corridor <i>other than in item 6 above</i> .	Nil	25% of door area	Unlimited above 1100mm <sup>(2)</sup>	50% of door area
8. Between either: a. a protected stairway <sup>(1)</sup> and a protected lobby or protected corridor b. accommodation and a protected lobby <i>other than in item 6 above</i> .	Unlimited above 1100mm from floor	Unlimited above 100mm from floor	Unlimited above 100mm from floor	Unlimited above 100mm from floor

Table B5 Continued

Position of glazed element	Maximum total glazed area in parts of a building with access to:			
	A single stair		More than one stair	
	Walls	Door leaf	Walls	Door leaf
9. Between the accommodation and a protected corridor that forms a dead end, <i>other than in item 6 above.</i>	Unlimited above 1100mm from floor	Unlimited above 100mm from floor	Unlimited above 1100mm from floor	Unlimited above 100mm from floor
10. Between accommodation and any other corridor, or subdividing corridors, <i>other than in item 6 above.</i>	Not applicable	Not applicable	Unlimited above 100mm from floor	Unlimited above 100mm from floor
11. Beside an external escape route.	Unlimited above 1100mm from floor	Unlimited above 1100mm from floor	Unlimited above 1100mm from floor	Unlimited above 1100mm from floor
12. Beside an external escape stair (see paragraph 3.32 and Diagram 3.4) or roof escape route (see paragraph 2.32).	Unlimited	Unlimited	Unlimited	Unlimited

**NOTES:**

Items 1 and 8 apply also to single storey buildings.

Fire resisting glass should be marked with the name of the manufacturer and the name of the product.

Further guidance can be found in *A Guide to Best Practice in the Specification and Use of Fire-resistant Glazed Systems* published by the Glass and Glazing Federation.

1. If the protected stairway is also a protected shaft or a firefighting stair (see Section 17), there may be further restrictions on the use of glazed elements.
2. Measured vertically from the landing floor level or the stair pitch line.
3. The 100mm limit is intended to reduce the risk of fire spreading from a floor covering.

## Appendix C: Fire doorsets

- C1** All **fire doorsets** should have the performance shown in Table C1, based on one of the following.
- Fire resistance** in terms of integrity, for a period of minutes, when tested to **BS 476-22**, e.g. FD 30. A suffix (S) is added for doorsets where restricted smoke leakage at ambient temperatures is needed.
  - As determined with reference to Commission Decision 2000/367/EC regarding the classification of the resistance to fire performance of construction products, construction works and parts thereof. All **fire doorsets** should be classified in accordance with **BS EN 13501-2**, tested to the relevant European method from the following.
    - BS EN 1634-1.**
    - BS EN 1634-2.**
    - BS EN 1634-3.**
  - As determined with reference to European Parliament and Council Directive 95/16/EC (which applies to lifts that permanently serve **buildings** and constructions and specified safety components) on the approximation of laws of Member States relating to lifts ('Lifts Directive') implementing the Lifts Regulations 1997 (SI 1997/831) and calling upon the harmonised standard **BS EN 81-58**.
- C2** The performance requirement is in terms of integrity (E) for a period of minutes. An additional classification of S<sub>a</sub> is used for all doors where restricted smoke leakage at ambient temperatures is needed.
- C3** The requirement is for test exposure from each side of the doorset separately. The exception is lift doors, which are tested from the landing side only.
- C4** Any test evidence used to verify the **fire resistance** rating of a doorset or shutter should be checked to ensure both of the following.
- It adequately demonstrates compliance.
  - It is applicable to the **complete installed assembly**. Small differences in detail may significantly affect the rating.
- Until relevant harmonised product standards are published, for the purposes of meeting the Building Regulations, products tested in accordance with **BS EN 1634-1** (with or without pre-fire test mechanical conditioning) that achieve the minimum performance in Table C1 will be deemed to satisfy the provisions.
- C5** All **fire doorsets**, including to **flat** entrances and between a **dwellinghouse** and an integral garage, should be fitted with a **self-closing device**, except for all of the following.
- Fire doorsets** to cupboards.
  - Fire doorsets** to service ducts normally locked shut.
  - Fire doorsets** within **flats** and **dwellinghouses**.
- C6** If a **self-closing device** would be considered to interfere with the normal approved use of the **building**, self-closing fire doors may be held open by one of the following.

- a. A fusible link, but not if the doorset is in an opening provided as a **means of escape** unless it complies with paragraph C7.
- b. An **automatic release mechanism** activated by an automatic fire detection and alarm system.
- c. A door closer delay device.

**C7** Two **fire doorsets** may be fitted in the same opening if each door is capable of closing the opening, so the total **fire resistance** is the sum of their individual resistances. If the opening is provided as a **means of escape**, both **fire doorsets** should be self-closing.

If one **fire doorset** is capable of being easily opened by hand and has a minimum of 30 minutes' **fire resistance**, the other **fire doorset** should comply with both of the following.

- a. Be fitted with an automatic **self-closing device**.
- b. Be held open by a fusible link.

**C8** **Fire doorsets** often do not provide any significant insulation. Unless providing both integrity and insulation in accordance with Appendix B, Table B3, a maximum of 25% of the length of a **compartment wall** should consist of door openings.

Where it is practicable to maintain a clear space on both sides of the doorway, the above percentage may be greater.

**C9** Rolling shutters should be capable of manual opening and closing for firefighting purposes (see Section 17). Rolling shutters across a **means of escape** should only be released by a heat sensor, such as a fusible link or electric heat detector, in the immediate vicinity of the door.

Unless a shutter is also intended to partially descend as part of a **boundary** to a smoke reservoir, shutters across a **means of escape** should not be closed by smoke detectors or a **fire alarm system**.

**C10** Unless shown to be satisfactory when tested as part of a **fire doorset** assembly, the essential components of any hinge on which a fire door is hung should be made entirely from materials that have a minimum melting point of 800°C.

**C11** Except for doorsets listed in paragraph C12, all **fire doorsets** should be marked with one of the following fire safety signs, complying with **BS 5499-5**, as appropriate.

- a. To be kept closed when not in use – mark 'Fire door keep shut'.
- b. To be kept locked when not in use – mark 'Fire door keep locked shut'.
- c. Held open by an **automatic release mechanism** or free swing device – mark 'Automatic fire door keep clear'.

All **fire doorsets** should be marked on both sides, except **fire doorsets** to cupboards and service ducts, which should be marked on the outside.

**C12** The following **fire doorsets** are not required to comply with paragraph C11.

- a. Doors to and within **flats** and **dwellinghouses**.
- b. Bedroom doors in 'residential (other)' (**purpose group 2(b)**) premises.
- c. Lift entrance/landing doors.

**C13** The performance of some doorsets set out in Table C1 is linked to the minimum periods of **fire resistance** for **elements of structure** given in Tables B3 and B4. Limitations on the use of uninsulated glazing in **fire doorsets** are given in Table B5.

- C14** Recommendations for the specification, design, construction, installation and maintenance of **fire doorsets** constructed with non-metallic door leaves are given in **BS 8214**.

Guidance on timber **fire resisting doorsets**, in relation to the new European test standard, may be found in *Timber Fire Resisting Doorsets: Maintaining Performance Under the New European Test Standard* published by the Timber Research and Development Association (TRADA).

Guidance for metal doors is given in *Code of Practice for Fire Resisting Metal Doorsets* published by the Door and Shutter Manufacturers' Association (DSMA).

- C15** Hardware used on fire doors can significantly affect their performance in a fire. Notwithstanding the guidance in this approved document, guidance is available in *Hardware for Fire and Escape Doors* published by the Door and Hardware Federation (DHF) and Guild of Architectural Ironmongers (GAI).

**Table C1 Provisions for fire doorsets**

Position of door	Minimum fire resistance of door in terms of integrity (minutes) when tested to the relevant European standard <sup>(1)</sup>	Minimum fire resistance of door in terms of integrity (minutes) when tested to <b>BS 476-22</b>
1. <b>In a compartment wall separating buildings</b>	Same as for the wall in which the door is fitted, but a minimum of 60 minutes	Same as for the wall in which the door is fitted, but a minimum of 60 minutes
2. <b>In a compartment wall:</b>		
a. if it separates a flat from a space in common use	E 30 S <sub>a</sub> <sup>(2)</sup>	FD 30 S <sup>(2)</sup>
b. enclosing a protected shaft forming a stairway wholly or partly above the adjoining ground in a building used for flats, other residential, assembly and recreation, or office purposes	E 30 S <sub>a</sub> <sup>(2)</sup>	FD 30 S <sup>(2)</sup>
c. enclosing a protected shaft forming a stairway not described in (b) above	Half the period of fire resistance of the wall in which it is fitted, but 30 minutes minimum and with suffix S <sub>a</sub> <sup>(2)</sup>	Half the period of fire resistance of the wall in which it is fitted, but 30 minutes minimum and with suffix S <sup>(2)</sup>
d. enclosing a protected shaft forming a lift or service shaft	Half the period of fire resistance of the wall in which it is fitted, but 30 minutes minimum	Half the period of fire resistance of the wall in which it is fitted, but 30 minutes minimum
e. not described in (a), (b), (c) or (d) above.	Same as for the wall in which it is fitted, but add S <sub>a</sub> <sup>(2)</sup> if the door is used for progressive horizontal evacuation under the guidance to requirement B1	Same as for the wall in which it is fitted, but add S <sup>(2)</sup> if the door is used for progressive horizontal evacuation under the guidance to requirement B1
3. <b>In a compartment floor</b>	Same as for the floor in which it is fitted	Same as for the floor in which it is fitted

Table C1 Continued

Position of door	Minimum fire resistance of door in terms of integrity (minutes) when tested to the relevant European standard <sup>(1)</sup>	Minimum fire resistance of door in terms of integrity (minutes) when tested to BS 476-22
<b>4. Forming part of the enclosures of:</b>		
a. a protected stairway (except as described in item 9 or 11(b) below)	E 30 S <sub>a</sub> <sup>(2)</sup>	FD 30 S <sup>(2)</sup>
b. a lift shaft (see paragraph 5.34b) that does not form a protected shaft in 2(b), (c) or (d) above.	E 30	FD 30
<b>5. Forming part of the enclosure of:</b>		
a. a protected lobby approach (or protected corridor) to a stairway	E 30 S <sub>a</sub> <sup>(2)</sup>	FD 30 S <sup>(2)</sup>
b. any other protected corridor	E 20 S <sub>a</sub> <sup>(2)</sup>	FD 20 S <sup>(2)</sup>
c. a protected lobby approach to a lift shaft (see paragraph 5.37 to 5.39).	E 30 S <sub>a</sub> <sup>(2)</sup>	FD 30 S <sup>(2)</sup>
<b>6. Giving access to an external escape route</b>	E 30	FD 30
<b>7. Sub-dividing:</b>		
a. corridors connecting alternative exits	E 20 S <sub>a</sub> <sup>(2)</sup>	FD 20 S <sup>(2)</sup>
b. dead-end portions of corridors from the remainder of the corridor.	E 20 S <sub>a</sub> <sup>(2)</sup>	FD 20 S <sup>(2)</sup>
<b>8. Any door within a cavity barrier</b>	E 30	FD 30
<b>9. Any door that forms part of the enclosure to a protected entrance hall or protected landing in a flat</b>	E 20	FD 20
<b>10. Any door that forms part of the enclosure:</b>		
a. to a place of special fire hazard	E 30	FD 30
b. to ancillary accommodation in care homes (see paragraph 2.44).	E 30	FD 30
<b>11. In a dwellinghouse:</b>		
a. between a dwellinghouse and a garage	E 30 S <sub>a</sub> <sup>(2)</sup>	FD 30 S <sup>(2)</sup>
b. forming part of the enclosures to a protected stairway in a single family dwellinghouse	E 20	FD 20
c. within any fire resisting construction in a dwellinghouse not described elsewhere in this table.	E 20	FD 20

**NOTES:**

- Classified in accordance with **BS EN 13501-2**. National classifications do not necessarily equate with European classifications, therefore products cannot typically assume a European class unless they have been tested accordingly.
- Unless pressurisation techniques that comply with **BS EN 12101-6** are used, these doors should also comply with one of the following conditions.
  - Have a leakage rate not exceeding 3m<sup>3</sup>/m/hour (from head and jambs only) when tested at 25Pa under **BS 476-31.1**.
  - Meet the additional S<sub>a</sub> classification when tested to **BS EN 1634-3**.

## Appendix D: Methods of measurement

### Occupant number

- D1** The number of occupants of a room, storey, building or part of a building is either of the following.
- The maximum number of people it is designed to hold.
  - In buildings other than dwellings, the number of people calculated by dividing the area of a room or storey(s) (m<sup>2</sup>) by a floor space factor (m<sup>2</sup> per person) such as given in Table D1 for guidance.
- D2** Counters and display units should be included when measuring area. All of the following should be *excluded*.
- Stair enclosures.
  - Lifts.
  - Sanitary accommodation.
  - Any other fixed part of the building structure.

**Table D1 Floor space factors<sup>(1)</sup>**

Type of accommodation <sup>(2)(3)</sup>	Floor space factor (m <sup>2</sup> /person)
1. Standing spectator areas, bar areas (within 2m of serving point), similar refreshment areas	0.3
2. Amusement arcade, assembly hall (including a general purpose place of assembly), bingo hall, club, crush hall, dance floor or hall, venue for pop concerts and similar events and bar areas without fixed seating	0.5
3. Concourse or queuing area <sup>(4)</sup>	0.7
4. Committee room, common room, conference room, dining room, licensed betting office (public area), lounge or bar (other than in (1) above), meeting room, reading room, restaurant, staff room or waiting room <sup>(5)</sup>	1.0
5. Exhibition hall or studio (film, radio, television, recording)	1.5
6. Skating rink	2.0
7. Shop sales area <sup>(6)</sup>	2.0
8. Art gallery, dormitory, factory production area, museum or workshop	5.0
9. Office	6.0
10. Shop sales area <sup>(7)</sup>	7.0
11. Kitchen or library	7.0
12. Bedroom or study-bedroom	8.0
13. Bed-sitting room, billiards or snooker room or hall	10.0
14. Storage and warehousing	30.0
15. Car park	Two persons per parking space

**NOTES:**

1. As an alternative to using the values in the table, the floor space factor may be determined by reference to actual data taken from similar premises. Where appropriate, the data should reflect the average occupant density at a peak trading time of year.
2. Where accommodation is not directly covered by the descriptions given, a reasonable value based on a similar use may be selected.
3. Where any part of the building is to be used for more than one type of accommodation, the most onerous factor(s) should be applied. Where the building contains different types of accommodation, the occupancy of each different area should be calculated using the relevant space factor.
4. For detailed guidance on appropriate floor space factors for concourses in sports grounds refer to *Concourses* published by the Football Licensing Authority.
5. Alternatively the occupant number may be taken as the number of fixed seats provided, if the occupants will normally be seated.
6. Shops excluding those under item 10, but including: supermarkets and department stores (main sales areas), shops for personal services, such as hairdressing, and shops for the delivery or collection of goods for cleaning, repair or other treatment or for members of the public themselves carrying out such cleaning, repair or other treatment.
7. Shops (excluding those in covered shopping complexes but including department stores) trading predominantly in furniture, floor coverings, cycles, prams, large domestic appliances or other bulky goods, or trading on a wholesale self-selection basis (cash and carry).

## Travel distance

**D3** Travel distance is measured as the shortest route. Both of the following should be observed.

- If there is fixed seating or other fixed obstructions, the shortest route is along the centre line of the seatways and gangways.
- If the route includes a stair, the shortest route is along the pitch line on the centre line of travel.

## Width

**D4** Width is measured according to the following.

- For a **door (or doorway)**, the clear width when the door is open (Diagram D1).
- For an **escape route**, either of the following.
  - When the route is defined by walls: the width at 1500mm above finished floor level.
  - Elsewhere: the minimum width of passage available between any fixed obstructions.
- For a **stair**, the clear width between the walls or balustrades. On **escape routes** and stairs, handrails and strings intruding into the width by a maximum of 100mm on each side may be ignored. Rails used for guiding a stair-lift may be ignored, but it should be possible to park the lift's chair or carriage in a position that does not obstruct the stair or landing.

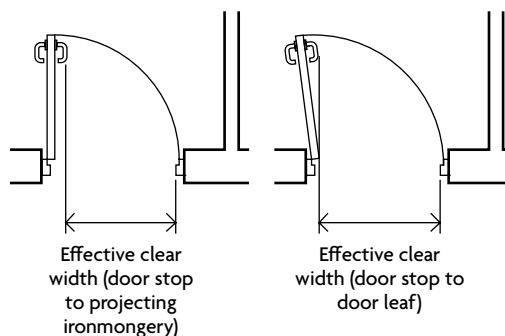
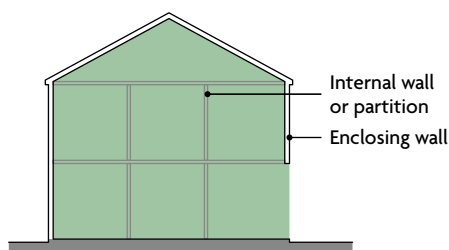
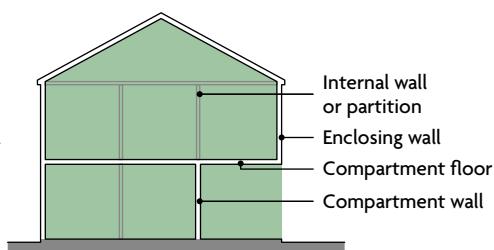


Diagram D1 Measurement of door width

## Building dimensions



a. Cubic capacity of a building



b. Cubic capacity of compartments or separated part of a building

In every case measure the volume contained by all of the following.

- Under surface of roof.
- Upper surface of lowest floor.
- Inner surface of enclosing walls. When there is not an outer enclosing wall, measure to the outermost edge of the floor slab.

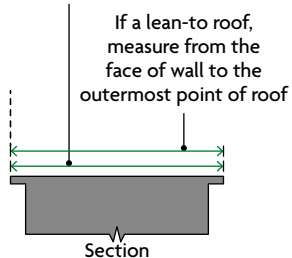
The measured volume should include internal walls and partitions.

Diagram D2 Cubic capacity

### a. Surface area: roofs and rooflights

In each case measure the visible area

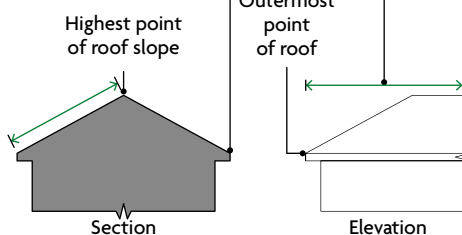
Measure from outermost point of roof at eaves or verge



i. Flat or monopitch roof

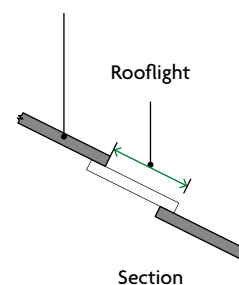
Lowest point of roof slope at eaves

If a hipped roof, measure to outermost point of roof at base area



ii. Double pitch roof

Roof sheeting



iii. Rooflight

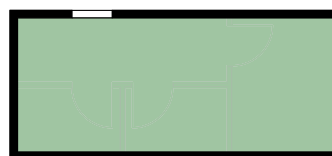
### b. Floor area:

Room, garage, conservatory or outbuilding, measure to inner surface of enclosing walls



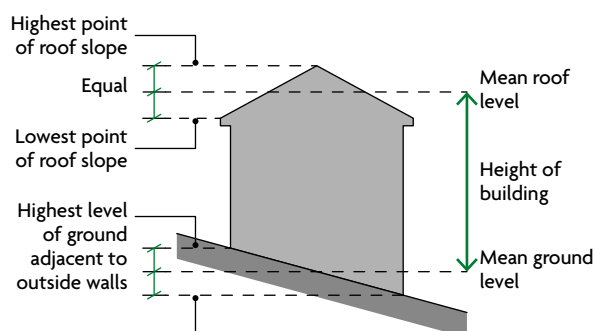
### c. Floor area:

Storey, part or compartment, measure to inner surface of enclosing walls and include internal walls and partitions

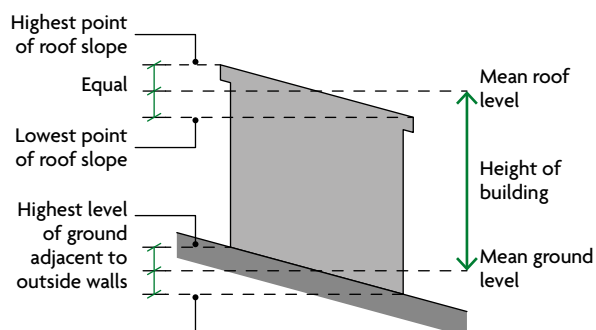


When there is not an outer enclosing wall, measure to the outermost edge of the floor slab

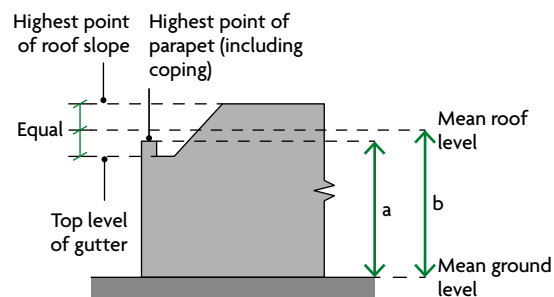
Diagram D3 Area



a. Double pitch roof



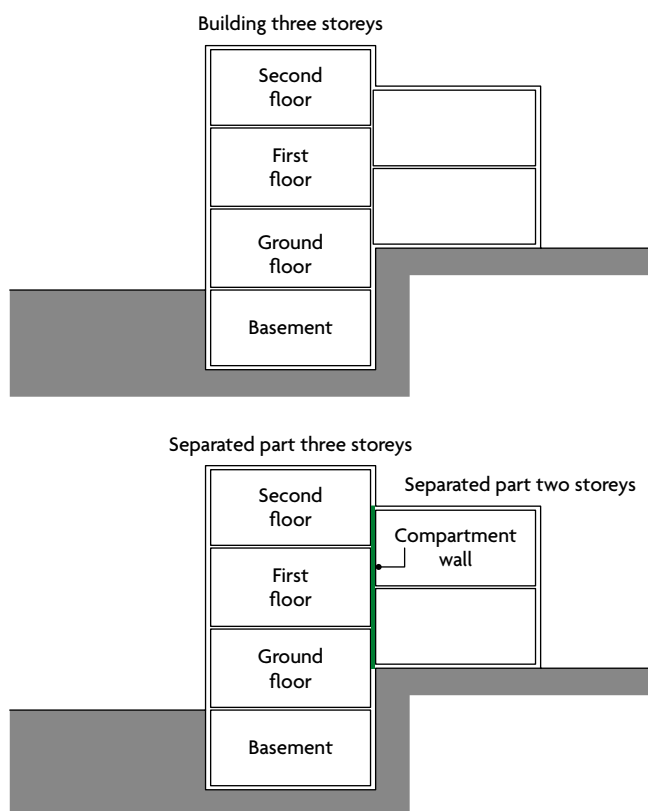
c. Flat or monopitch roof



Use height a or b, whichever is greater

b. Mansard type roof

Diagram D4 Height of building



To count the number of storeys in a building, or in a separated part of a building, count only at the position which gives the greatest number and exclude any basement storeys.

**NOTES:**

1. In assembly buildings (purpose group 5), a gallery is included as a storey, but not if it is a loading gallery, fly gallery, stage grid, lighting bridge, or any gallery provided for similar purposes, or for maintenance and repair.
2. In other purpose group buildings, galleries are not counted as a storey.
3. For the definition of basement, see Appendix A.

Diagram D5 Number of storeys

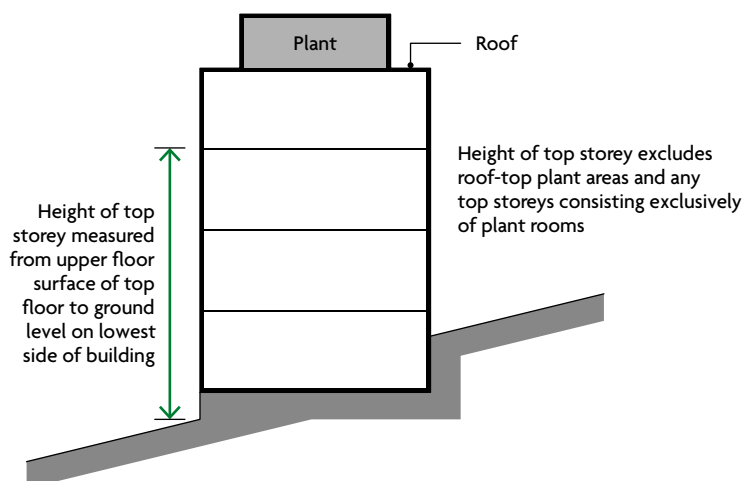
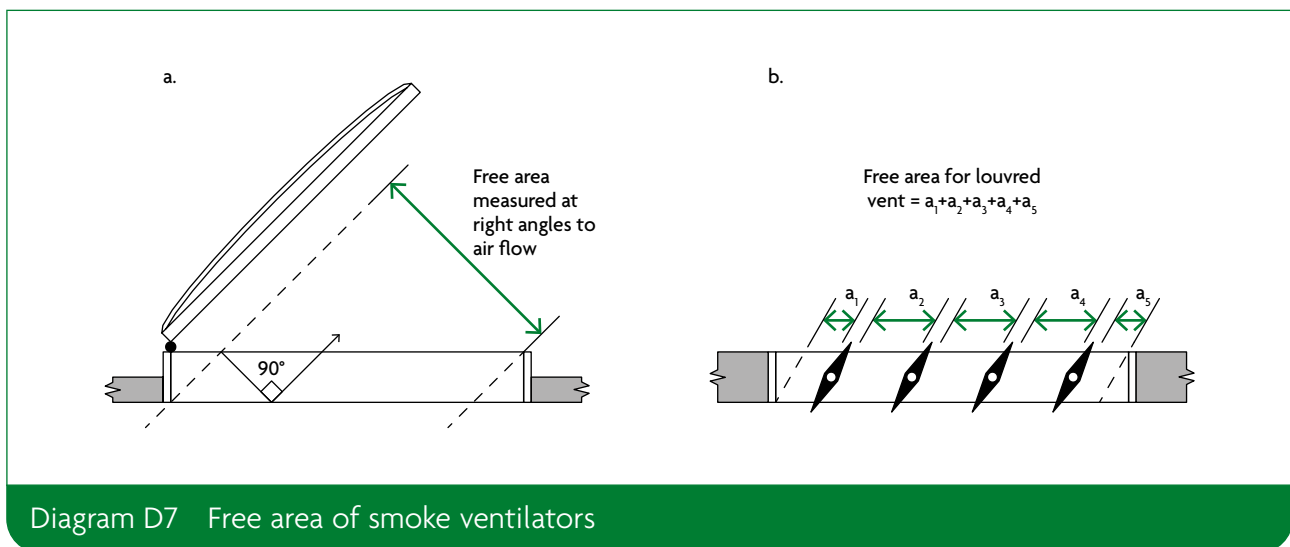


Diagram D6 Height of top storey in building

## Free area of smoke ventilators

**D5** The free area of a smoke ventilator should be measured by either of the following.

- The declared aerodynamic free area in accordance with **BS EN 12101-2**.
- The total unobstructed cross-sectional area (geometric free area), measured in the plane where the area is at a minimum and at right angles to the direction of air flow (Diagram D7).



# Appendix E: Sprinklers

## Sprinkler systems

- E1** Sprinkler systems installed in **buildings** can reduce the risk to life and significantly reduce the degree of damage caused by fire within a **building**.
- E2** Further recommendations for the provision of sprinklers are provided in the following sections:

### Volume 1 – Dwellings

Functional requirement	Paragraph	Title
B1	2.6	Dwellinghouses with two or more storeys more than 4.5m above ground level
B1	2.23	Loft conversions
B1	3.21	Internal planning of multi-storey flats
B3	Table B4	Minimum periods of fire resistance
B3	7.4	Sprinklers
B4	11.15	Unprotected areas and fire resistance – portal frames
B4	11.21	Methods for calculating acceptable unprotected area – sprinkler systems
B5	15.7	Provision of firefighting shafts

### Volume 2 – Buildings other than dwellings

Functional requirement	Paragraph	Title
B1	2.46	Residential care homes – sprinkler systems
B1	3.21	Width of escape stairs – phased evacuation
B1	5.46	Shop store rooms
B3	7.7	Raised storage areas
B3	Table 8.1	Maximum dimensions of building or compartment
B3	Table B4	Minimum periods of fire resistance
B3	8.14	Sprinklers
B4	13.16	Unprotected areas and fire resistance – portal frames
B4	13.22	Methods for calculating acceptable unprotected area – sprinkler systems
B5	17.8	Location of firefighting shafts
B5	18.11	Provision of smoke outlets – mechanical smoke extract

## Design of sprinkler systems

- E3** Where required, sprinkler systems should be provided throughout the **building** or **separated part**, unless acting as a compensatory feature to address a specific risk. They should be designed and installed in accordance with the following.
- For residential **buildings**, the requirements of **BS 9251**.
  - For non-residential **buildings**, or residential **buildings** outside the scope of **BS 9251**, the requirements of **BS EN 12845**, including the relevant hazard classification together with additional measures to improve system reliability and availability as described in Annex F of the standard.

**NOTE:** Any sprinkler system installed to satisfy the requirements of Part B of the Building Regulations should be provided with additional measures to improve system reliability and availability and is therefore to be regarded as a life safety system. However, there may be some circumstances in which additional measures to improve system reliability and availability specified in Annex F of **BS EN 12845** are inappropriate or unnecessary.

- E4** If the provisions in a building vary from those in this document, sprinkler protection can also sometimes be used as a compensatory feature.

**BS 9251** makes additional recommendations when sprinklers are proposed as compensatory features.

## Water supplies and pumps

- E5** For non-residential sprinkler systems designed and installed to **BS EN 12845**, water supplies should consist of either of the following.
- Two single water supplies complying with clause 9.6.1, independent of each other.
  - Two stored water supplies meeting all of the following conditions.
    - Gravity or suction tanks should satisfy all the requirements of clause 9.6.2(b), other than capacity.
    - Any pump arrangements should comply with clause 10.2.
    - In addition to meeting the requirements for inflow, either of the following should apply.
      - The capacity of each tank should be at least half the specified minimum water volume of a single full capacity tank, appropriate to the hazard.
      - One tank should be at least equivalent to half the specified water volume of a single full capacity tank, and the other shall not be less than the minimum volume of a reduced capacity tank (see clause 9.3.4) appropriate to the hazard.

The total capacity of the water supply in (iii), including any inflow for a reduced capacity tank, should be at least that of a single full holding capacity tank that complies with Table 9, Table 10 or clause 9.3.2.3, as appropriate to the hazard and pipework design.

- E6** For the systems described in paragraph E5, both of the following apply if pumps are used to draw water from two tanks.
- Each pump should be able to draw water from either tank.
  - Any one pump, or either tank, should be able to be isolated.

The sprinkler water supplies should not be used as connections for other services or other fixed firefighting systems.

# Appendix F: Standards referred to

## European Standards

**NOTE:** All the British and European Standards can be purchased at the following address: <https://shop.bsigroup.com/>. Alternatively access to the British and European Standards may be gained at public reference libraries.

### **BS EN 54** Fire detection and fire alarm systems

**BS EN 54-7** Smoke detectors. Point smoke detectors that operate using scattered light, transmitted light or ionization [2018]

**BS EN 54-11** Manual call points [2001]

### **BS EN 81** Safety rules for the construction and installation of lifts

**BS EN 81-20** Lifts for the transport of persons and goods. Passenger and goods passenger lifts [2014]

**BS EN 81-58** Examination and tests. Landing doors fire resistance test [2018]

**BS EN 81-72** Particular applications for passenger and goods passenger lifts. Firefighters lifts [2015]

### **BS EN ISO 306** Plastics. Thermoplastic materials. Determination of Vicat softening temperature (VST) [2013]

### **BS EN 520** Gypsum plasterboards. Definitions, requirements and test methods [2004 + A1 2009]

### **BS EN 1125** Building hardware. Panic exit devices operated by a horizontal bar, for use on escape routes. Requirements and test methods [2008]

### **BS EN 1155** Building hardware. Electrically powered hold-open devices for swing doors. Requirements and test methods [1997]

### **BS EN 1366** Fire resistance tests for service installations

**BS EN 1366-2** Fire dampers [2015]

**BS EN 1366-8** Smoke extraction ducts [2004]

### **BS EN 1634** Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware

**BS EN 1634-1** Fire resistance test for door and shutter assemblies and openable windows [2014 + A1 2018]

**BS EN 1634-2** Fire resistance characterisation test for elements of building hardware [2008]

**BS EN 1634-3** Smoke control test for door and shutter assemblies [2004]

### **BS EN 1993-1-2** Eurocode 3. Design of steel structures. General rules. Structural fire design [2005]

### **BS ISO 3864-1** Graphical symbols. Safety colours and safety signs. Design principles for safety signs and safety markings [2011]

### **BS EN 12101** Smoke and heat control systems

**BS EN 12101-2** Natural smoke and heat exhaust ventilators [2017]

**BS EN 12101-3** Specification for powered smoke and heat control ventilators (Fans) [2015]

**BS EN 12101-6** Specification for pressure differential systems. Kits [2005]

### **BS EN 12845** Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance [2015]

### **BS EN 13238** Reaction to fire tests for building products. Conditioning procedures and general rules for selection of substrates [2010]

### **BS EN 13501** Fire classification of construction products and building elements

**BS EN 13501-1** Classification using data from reaction to fire tests [2018]

**BS EN 13501-2** Classification using data from fire resistance tests, excluding ventilation services [2016]

**BS EN 13501-3** Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers [2005 + A1 2009]

**BS EN 13501-4** Classification using data from fire resistance tests on components of smoke control systems [2016]

**BS EN 13501-5** Classification using data from external fire exposure to roof tests [2016]

**BS EN 14306** Thermal insulation products for building equipment and industrial installations. Factory made calcium silicate (CS) products. Specification [2015]

**BS EN 14604** Smoke alarm devices [2005]

**BS EN 15102** Decorative wall coverings. Roll and panel form [2007 + A1 2011]

**BS EN 15650** Ventilation for buildings. Fire dampers [2010]

**BS EN 15725** Extended application reports on the fire performance of construction products and building elements [2010]

**BS EN 50200** Method of test for resistance to fire of unprotected small cables for use in emergency circuits [2015]

## British Standards

**BS 476** Fire tests on building materials and structures

**BS 476-3** Classification and method of test for external fire exposure to roofs [2004]

**BS 476-6** Method of test for fire propagation for products [1989 + A1 2009]

**BS 476-7** Method of test to determine the classification of the surface spread of flame of products [1997]

**BS 476-8** Test methods and criteria for the fire resistance of elements of building construction [1972]

**BS 476-11** Method for assessing the heat emission from building materials [1982]

**BS 476-20** Method for determination of the fire resistance of elements of construction (general principles) [1987]

**BS 476-21** Methods for determination of the fire resistance of loadbearing elements of construction [1987]

**BS 476-22** Methods for determination of the fire resistance of non-loadbearing elements of construction [1987]

**BS 476-23** Methods for determination of the contribution of components to the fire resistance of a structure [1987]

**BS 476-24** Method for determination of the fire resistance of ventilation ducts [1987]

**BS 476-31.1** Methods for measuring smoke penetration through doorsets and shutter assemblies. Method of measurement under ambient temperature conditions [1983]

**BS 2782-0** Methods of testing. Plastics. Introduction [2011]

**BS 3251** Specification. Indicator plates for fire hydrants and emergency water supplies [1976]

**BS 4422** Fire. Vocabulary [2005]

**BS 4514** Unplasticized PVC soil and ventilating pipes of 82.4mm minimum mean outside diameter, and fittings and accessories of 82.4mm and of other sizes. Specification [2001]

**BS 5255** Specification for thermoplastics waste pipe and fittings [1989]

**BS 5266-1** Emergency lighting. Code of practice for the emergency lighting of premises [2016]

**BS 5395-2** Stairs, ladders and walkways. Code of practice for the design of helical and spiral stairs [1984]

**BS 5438** Methods of test for flammability of textile fabrics when subjected to a small igniting flame applied to the face or bottom edge of vertically oriented specimens [1989]

**BS 5446-2** Fire detection and fire alarm devices for dwellings. Specification for heat alarms [2003]

**BS 5499** Graphical symbols and signs

**BS 5499-4** Safety signs. Code of practice for escape route signing [2013]

**BS 5499-5** Safety signs, including fire safety signs. Signs with specific safety meanings [2002]

**BS 5839** Fire detection and fire alarm systems for buildings

**BS 5839-1** Code of practice for system design, installation, commissioning and maintenance of systems in non-domestic premises [2017]

**BS 5839-2** Specification for manual call points [1983]

**BS 5839-3** Specification for automatic release mechanisms for certain fire protection equipment [1988]

**BS 5839-6** Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises [2019]

**BS 5839-8** Code of practice for the design, installation, commissioning and maintenance of voice alarm systems [2013]

**BS 5839-9** Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems [2011]

**BS 5867-2** Fabrics for curtains and drapes. Flammability requirements. Specification [2008]

**BS 5906** Waste management in buildings. Code of practice [2005]

**BS 7157** Method of test for ignitability of fabrics used in the construction of large tented structures [1989]

**BS 7273** Code of practice for the operation of fire protection measures

**BS 7273-4** Actuation of release mechanisms for doors [2015]

**BS 7346-7** Components for smoke and heat control systems. Code of practice on functional recommendations and calculation methods for smoke and heat control systems for covered car parks [2013]

**BS 7974** Application of fire safety engineering principles to the design of buildings. Code of practice [2019]

**BS 8214** Timber-based fire door assemblies. Code of practice [2016]

**BS 8313** Code of practice for accommodation of building services in ducts [1997]

**BS 8414** Fire performance of external cladding systems

**BS 8414-1** Test method for non-loadbearing external cladding systems applied to the masonry face of a building [2015 + A1 2017]

**BS 8414-2** Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame [2015 + A1 2017]

**BS 8519** Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications. Code of practice [2010]

**BS 9251** Fire sprinkler systems for domestic and residential occupancies. Code of practice [2014]

**BS 9252** Components for residential sprinkler systems. Specification and test methods for residential sprinklers [2011]

**BS 9990** Non automatic fire-fighting systems in buildings. Code of practice [2015]

**BS 9991** Fire safety in the design, management and use of residential buildings. Code of practice [2015]

**BS 9999** Fire safety in the design, management and use of buildings. Code of practice [2017]

# Appendix G: Documents referred to

## Legislation

(available via [www.legislation.gov.uk](http://www.legislation.gov.uk))

Education Act 1996

Gas Safety (Installation and Use) Regulations 1998 (SI 1998/2451)

Lifts Regulations 1997 (SI 1997/831)

Pipelines Safety Regulations 1996 (SI 1996/825)

Prison Act 1952

Safety of Sports Grounds Act 1975

Regulatory Reform (Fire Safety) Order 2005 (SI 2005/1541)

Commission Decision 2000/367/EC of 3 May 2000 implementing Council Directive 89/106/EEC

Commission Decision 2000/553/EC of 6 September 2000 implementing Council Directive 89/106/EEC

European Parliament and Council Directive 95/16/EC

## Other documents

### Publications

**Association for Specialist Fire Protection (ASFP)**  
([www.asfp.org.uk](http://www.asfp.org.uk))

ASFP Red Book – *Fire-Stopping: Linear Joint Seals, Penetration Seals and Cavity Barriers*, Fourth Edition

ASFP Grey Book – *Volume 1: Fire Dampers (European Standards)*, Second Edition

ASFP Blue Book British Standard version – *Fire Resisting Ductwork, Tested to BS 476 Part 24*, Third Edition

ASFP Blue Book European version – *Fire Resisting Ductwork, Classified to BS EN 13501 Parts 3 and 4*, First Edition

*Ensuring Best Practice for Passive Fire Protection in Buildings*, Second Edition [2014]

**Building Research Establishment Limited (BRE)**  
([www.bre.co.uk](http://www.bre.co.uk))

BRE report (BR 135) *Fire Performance of External Thermal Insulation for Walls of Multi-storey Buildings*, Third Edition [2013]

BRE report (BR 187) *External Fire Spread: Building Separation and Boundary Distances*, Second Edition [2014]

BRE Digest 208 *Increasing the Fire Resistance of Existing Timber Floors* [1988]

BRE report (BR 274) *Fire Safety of PTFE-based Materials Used in Buildings* [1994]

### Department for Communities and Local Government

([www.gov.uk/government/publications/fire-performance-of-green-roofs-and-walls](http://www.gov.uk/government/publications/fire-performance-of-green-roofs-and-walls))

*Fire Performance of Green Roofs and Walls* [2013]

### Department for Education

([www.dfes.gov.uk](http://www.dfes.gov.uk))

Building Bulletin (BB) 100: *Design for Fire Safety in Schools* [2007]

### Department of Health

([www.dh.gov.uk](http://www.dh.gov.uk))

Health Technical Memorandum (HTM) 05-02: *Firecode. Guidance in Support of Functional Provisions (Fire Safety in the Design of Healthcare Premises)* [2015]

HTM 88: *Guide to Fire Precautions in NHS Housing in the Community for Mentally Handicapped (or Mentally Ill) People*

### Door and Hardware Federation (DHF) and Guild of Architectural Ironmongers (GAI)

([www.firecode.org.uk](http://www.firecode.org.uk))

*Hardware for Fire and Escape Doors* [2012]

### Door and Shutter Manufacturers' Association (DSMA)

([www.dhfonline.org.uk](http://www.dhfonline.org.uk))

*Code of Practice for Fire Resisting Metal Doorsets* [2010]

### Fire Protection Association (FPA)

([www.thefpa.co.uk](http://www.thefpa.co.uk))

*RISCAuthority Design Guide for the Fire Protection of Buildings* [2005]

### Football Licensing Authority

([www.flaweb.org.uk/home.php](http://www.flaweb.org.uk/home.php))

*Concourses* [2006]

### Glass and Glazing Federation (GGF)

([www.ggf.org.uk](http://www.ggf.org.uk))

*A Guide to Best Practice in the Specification and Use of Fire-resistant Glazed Systems* [2011]

### Health and Safety Executive (HSE)

([www.hse.gov.uk](http://www.hse.gov.uk))

*Safety Signs and Signals: The Health and Safety Regulations 1996. Guidance on Regulations, L64* [2015]

### HM Prison and Probation Service (HMPPS)

([www.hmpps.intranet.org.uk/uploads/HMPPSFireSafetyDesignGuide.pdf](http://www.hmpps.intranet.org.uk/uploads/HMPPSFireSafetyDesignGuide.pdf))

*Custodial Premises Fire Safety Design Guide*

### Passive Fire Protection Federation (PFPF)

([http://pfpf.org/pdf/publications/guide\\_to\\_uailoft.pdf](http://pfpf.org/pdf/publications/guide_to_uailoft.pdf))

*Guide to Undertaking Assessments in Lieu of Fire Tests* [2000]

### Sports Grounds Safety Authority

(<https://sgsa.org.uk/>)

*Guide to Safety at Sports Grounds* [2007]

### Steel Construction Institute (SCI)

(<https://steel-sci.com>)

SCI Publication P288 *Fire Safe Design: A New Approach to Multi-storey Steel-framed Buildings*, Second Edition [2006]

SCI Publication P313 *Single Storey Steel Framed Buildings in Fire Boundary Conditions* [2002]

### Timber Research and Development Associations (TRADA)

([www.trada.co.uk](http://www.trada.co.uk))

*Timber Fire Resisting Doorsets: Maintaining Performance under the New European Test Standard* [2002]

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## **Approved Document A**

Structure

## **Approved Document B**

Fire safety

Volume 1: Dwellings

## **Approved Document B**

Fire safety

Volume 2: Buildings other than dwellings

## **Approved Document C**

Site preparation and resistance to contaminants and moisture

## **Approved Document D**

Toxic substances

## **Approved Document E**

Resistance to the passage of sound

## **Approved Document F**

Ventilation

## **Approved Document G**

Sanitation, hot water safety and water efficiency

## **Approved Document H**

Drainage and waste disposal

## **Approved Document J**

Combustion appliances and fuel storage systems

## **Approved Document K**

Protection from falling, collision and impact

## **Approved Document L1A**

Conservation of fuel and power in new dwellings

## **Approved Document L1B**

Conservation of fuel and power in existing dwellings

## **Approved Document L2A**

Conservation of fuel and power in new buildings other than dwellings

## **Approved Document L2B**

Conservation of fuel and power in existing buildings other than dwellings

## **Approved Document M**

Access to and use of buildings

Volume 1: Dwellings

## **Approved Document M**

Access to and use of buildings

Volume 2: Buildings other than dwellings

## **Approved Document P**

Electrical safety – Dwellings

## **Approved Document Q**

Security – Dwellings

## **Approved Document 7**

Materials and workmanship

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The Building Regulations 2010

# Site preparation and resistance to contaminants and moisture



## APPROVED DOCUMENT

**C1**      Site preparation and resistance to contaminants  
**C2**      Resistance to moisture

## MAIN CHANGES MADE BY THE 2013 AMENDMENTS

The main changes, which apply only to England\*, are to:

- Guidance on radon protective measures.
- References to British Standards design standards.
- Contaminated land guidance, including removal of Annex A.
- Materials and workmanship.

There have been no changes to Part A of Schedule 1 to the Building Regulations.

## MAIN CHANGES MADE BY THE 2010 AMENDMENTS

The 2010 amendments reflect the Building Regulations 2010 and Building (Approved Inspectors etc) Regulations 2010. The changes mainly reflect regulation number changes as a result of re-ordering. There have been no amendments to the substantive requirements in Part C of Schedule 1 to the Building Regulations.

## MAIN CHANGES IN THE 2004 EDITION

This edition replaced the 1992 (with 2000 amendments) edition. The main changes were:

- Site investigation recommended as the method for determining how much unsuitable material should be removed.
- Requirement C1(2) applied to material change of use as set out in Regulations 5 and 6.
- Remedial measures for dealing with land affected by contaminants expanded to include biological, chemical and physical treatment processes.
- The area of land around the building subject to measures to deal with contaminants.
- Guidance on protection from radon expanded to include buildings other than dwellings.
- Guidance included on sub-soil drainage and the risk of transportation of water-born contaminants.
- New guidance on condensation risks to floors, walls and roofs.
- Guidance provided on the use of moisture resistance boards for flooring.
- Updated guidance on assessing the suitability of cavity walls for filling.
- Former requirement F2; Condensation in roofs, transferred to Part C.

\* This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No. 2) Order 2009.

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# Use of guidance

## THE APPROVED DOCUMENTS

This document is one of a series that has been approved by the First Secretary of State for the purpose of providing practical guidance with respect to the requirements of Schedule 1 to and Regulation 7 of the Building Regulations 2010 (SI 2010/2214) for England and Wales.

**At the back of this document is a list of all the documents that have been approved and issued by the Secretary of State for this purpose.**

Approved Documents are intended to provide guidance for some of the more common building situations. However, there may well be alternative ways of achieving compliance with the requirements. **Thus there is no obligation to adopt any particular solution contained in an Approved Document if you prefer to meet the relevant requirement in some other way.**

### Other requirements

The guidance contained in an Approved Document relates only to the particular requirements of the Regulations which the document addresses. The building work will also have to comply with the Requirements of any other relevant paragraphs in Schedule 1 to the Regulations.

There are Approved Documents which give guidance on each of the Parts of Schedule 1 and on Regulation 7.

## LIMITATION ON REQUIREMENTS

In accordance with Regulation 8, the requirements in Part C of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings).

The requirements in Part C address health and safety, and do not seek to protect the building fabric for its own sake. Thus the degree of precautions needed to comply with Part C will be influenced by the intended use of the building. Part C may not apply where it can be demonstrated that it will not serve to increase the protection to the health and safety of any persons habitually employed in the building in question.

Paragraphs H2 and J7 are excluded from Regulation 8 because they deal directly with prevention of the contamination of water. Parts E and M (which deal, respectively, with resistance to the passage of sound, and access to and use of buildings) are excluded from Regulation 8 because they address the welfare and convenience of building users. Part L is excluded from Regulation 8 because it addresses the conservation of fuel and power. All these matters are amongst the purposes, other than health and safety, that may be addressed by Building Regulations.

## MATERIALS AND WORKMANSHIP

Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations shall be carried out in accordance with regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in Approved Document 7.

Building Regulations are made for specific purposes, primarily the health and safety, welfare and convenience of people and for energy conservation. Standards and other technical specifications may provide relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance or matters which, although they relate to health and safety etc., are not covered by the Building Regulations.

When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

### OTHER HEALTH AND SAFETY LEGISLATION

Health and safety regulations such as the Workplace (Health, Safety and Welfare) Regulations 1992 may impose requirements on employers and those in control of buildings used as workplaces in relation to certain physical characteristics of the workplace. There are also requirements in health and safety law which affect building design. In particular, Regulation 11 of the Construction (Design and Management) Regulations 2007 places duties on designers including the need to take account of the Workplace (Health, Safety and Welfare) Regulations 1992 which relate to the design of, and materials used in, any structure intended for use as a workplace.

Where such regulations apply there may be confusion as to whether the Building Regulations or health and safety requirements take precedence, as both will apply. Where an inspector for the purposes of the Health and Safety at Work etc. Act 1974 has identified a contravention of such health and safety regulations they may seek to serve an improvement notice to secure compliance. In such circumstances the inspector is prevented by virtue of Section 23(3) of the Health and Safety at Work etc. Act 1974 from requiring measures which are more onerous than necessary to comply with any requirements of the Building Regulations, unless the specific requirement of health and safety regulations are themselves more onerous.

## The Requirements

This Approved Document deals with the following Requirements which are contained in the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>Site preparation and resistance to contaminants and moisture</b>	
<b>Preparation of site and resistance to contaminants.</b>	
<p><b>C1.</b> (1) The ground to be covered by the building shall be reasonably free from any material that might damage the building or affect its stability, including vegetable matter, topsoil and pre-existing foundations.</p>	
<p>(2) Reasonable precautions shall be taken to avoid danger to health and safety caused by contaminants on or in the ground covered, or to be covered by the building and any land associated with the building.</p>	
<p>(3) Adequate sub-soil drainage shall be provided if it is needed to avoid:</p>	
<p>(a) the passage of ground moisture to the interior of the building;</p>	
<p>(b) damage to the building, including damage through the transport of water-borne contaminants to the foundations of the building.</p>	
<p>(4) For the purpose of this requirement, 'contaminant' means any substance which is or may become harmful to persons or buildings including substances which are corrosive, explosive, flammable, radioactive or toxic.</p>	
<b>Resistance to moisture</b>	
<p><b>C2.</b> The walls, floors and roof of the building shall adequately protect the building and people who use the building from harmful effects caused by:</p>	
<p>(a) ground moisture;</p>	
<p>(b) precipitation including wind-driven spray;</p>	
<p>(c) interstitial and surface condensation; and</p>	
<p>(d) spillage of water from or associated with sanitary fittings or fixed appliances.</p>	

## MATERIAL CHANGE OF USE

Requirement C1 (2), which addresses resistance to contaminants, is now added to the requirements in Regulation 6 of the Building Regulations 2010 which should be complied with when there are certain material changes of use of buildings. Regulation 6 sets out which parts of Schedule 1 should be complied with when there is a material change of use of the building as defined in Regulation 5. The absence of such a requirement would have meant that occupiers of buildings in areas at risk from contaminants may remain unprotected after the building work to effect the change of use is complete.

In particular, some contaminants can penetrate the floors of buildings such as landfill gas arising from the deposition of waste and vapours from spills of organic solvents and fuel. These contaminants can also migrate laterally from land outside the building. In order to deal with this Requirement C1 (2) now applies to all changes of use that have a residential purpose or provide sleeping accommodation including hotels, i.e. as defined by Regulation 5 (a) to 5 (g) with the exception of 5 (e) public buildings and 5 (j) shops. Other types of buildings are covered by Health and Safety legislation so do not need addressing through the Building Regulations, for example workplace assessment, including radon measurements.

**Attention is drawn to the following extracts from the Building Regulations 2010.**

### Interpretation (Regulation 2)

‘Room for residential purposes’ means a room, or suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep and includes a room in a hostel, a hotel, a boarding house, a hall of residence or a residential home, but does not include a room in a hospital, or other similar establishment, used for patient accommodation.

### Meaning of material change of use (Regulation 5)

For the purposes of paragraph 8 (1)(e) of Schedule 1 to the Act and for the purposes of these Regulations, there is a material change of use where there is a change in the purposes for which or the circumstances in which a building is used, so that after the change:

- a. the building is used as a dwelling, where previously it was not;
- b. the building contains a flat, where previously it did not;

- c. the building is used as a hotel or boarding house, where previously it was not;
- d. the building is used as an institution, where previously it was not;
- e. the building is used as a public building, where previously it was not;
- f. the building is not a building described in Classes 1 to 6 in Schedule 2, where previously it was;
- g. the building, which contains at least one dwelling, contains a greater or lesser number of dwellings than it did previously;
- h. the building contains a room for residential purposes, where previously it did not;
- i. the building, which contains at least one room for residential purposes, contains a greater or lesser number of such rooms than it did previously; or
- j. the building is used as a shop, where previously it was not.

### Requirements relating to material change of use (Regulation 6)

1. Where there is a material change of use of the whole of a building, such work, if any, shall be carried out as is necessary to ensure that the building complies with the applicable requirements of the following paragraphs of Schedule 1:

- a. in all cases,
  - B1 (means of warning and escape)
  - B2 (internal fire spread – linings)
  - B3 (internal fire spread – structure)
  - B4 (2) (external fire spread – roofs)
  - B5 (access and facilities for the fire service)
  - C2 (2) (interstitial and surface condensation)
  - F1 (ventilation)
  - G1 (cold water supply)
  - G3 (1) to (3) (hot water supply and systems)
  - G4 (sanitary conveniences)
  - G5 (bathrooms)
  - G6 (kitchens and good preparation areas)
  - H1 (foul water drainage)
  - H6 (solid waste storage)
  - J1 to J4 (combustion appliances)
  - L1 (conservation of fuel and power – dwellings);
  - P1 (electrical safety);
- b. in the case of a material change of use described in Regulations 5(c), (d), (e) or (f),
  - A1 to A3 (structure);

- c. in the case of a building exceeding fifteen metres in height, B4 (1) (external fire spread – walls);
  - d. in the case of a material change of use described in regulation 5(a), (b), (c), (d), (g), (h), (i) or, where the material change provides new residential accommodation, (f), C1 (2) (resistance to contaminants);
  - e. in the case of material change of use described in regulation 5(a), C2 (resistance to moisture);
  - f. in the case of a material change of use described in regulation 5(a), (b), (c), (g), (h) or (i), E1 to E3 (resistance to the passage of sound);
  - g. in the case of a material change of use described in regulation 5(e), where the public building consists or contains a school, E4 (acoustic conditions in schools);
  - h. in the case of a material change of use described in Regulation 5(a) or (b), G2 (water efficiency) and G3(4) (hot water supply and systems: hot water supply to fixed baths);
  - i. in the case of a material change of use described in regulation 5(c), (d), (e) or (j), M1 (access and use).
2. Where there is a material change of use of part only of a building, such work, if any, shall be carried out as is necessary to ensure that:
- a. that part complies in all cases with any applicable requirement referred to in paragraph (1) (a);
  - b. in a case to which sub-paragraphs (b), (e), (f), (g) or (h) of paragraph (1) apply, that part complies with the requirements referred to in the relevant sub-paragraph; and
  - c. in the case to which sub-paragraph (c) of paragraph (1) applies, the whole building complies with the requirement referred to in that sub-paragraph; and
  - d. in the case to which sub-paragraph (i) of paragraph (1) applies:
    - i. that part and any sanitary appliances provided in or in connection with that part comply with the requirements referred to in that sub-paragraph; and
    - ii. the building complies with requirement M1 (a) of Schedule 1 to the extent that reasonable provision is made to provide either suitable independent access to that part or suitable access through the building to that part.

## Historic buildings

Material change of use or alterations to existing buildings may include work on historic buildings. Historic buildings include:

- a. listed buildings;
- b. buildings situated in conservation areas;
- c. buildings which are of architectural and historical interest and which are referred to as a material consideration in a local authority's development plan;
- d. buildings of architectural and historical interest within national parks, areas of outstanding natural beauty and world heritage sites.

The need to conserve the special characteristics of such historic buildings needs to be recognised<sup>3</sup>. In such work, the aim should be to improve resistance to contaminants and moisture where it is practically possible, always provided that the work does not prejudice the character of the historic building, or increase the risk of long-term deterioration to the building fabric or fittings. In arriving at an appropriate balance between historic building conservation and improving resistance to contaminants and moisture it would be appropriate to take into account the advice of the local planning authority's conservation officer.

Particular issues relating to work in historic buildings that warrant sympathetic treatment and where advice from others could therefore be beneficial include the following:

- a. avoiding excessively intrusive gas protective measures;
- b. ensuring that moisture ingress to the roof structure is limited and the roof can breathe<sup>3,4</sup>. Where it is not possible to provide dedicated ventilation to pitched roofs it is important to seal existing service penetrations in the ceiling and to provide draught proofing to any loft hatches. Any new loft insulation should be kept sufficiently clear of the eaves so that any adventitious ventilation is not reduced.

<sup>3</sup> BS 7913:1998 Guide to the principles of the conservation of historic buildings. Provides guidance on the principles that should be applied when proposing work on historic buildings.

<sup>4</sup> SPAB Information Sheet 4 *The need for old buildings to 'breathe'*, 1986.

In most cases the rate at which gas seeps into buildings, mainly through floors, can be reduced by edge located sumps or sub-floor vents. These are less intrusive than internal sumps or ducts that may involve taking up floors. If flagged floors are taken up the stones should be indexed and their layout recorded to facilitate relaying when work is completed.

Radon can be dispersed by ventilation strategies such as positive pressurisation. These systems can often be accommodated in an unobtrusive manner.

If internal mechanical ventilation is used to disperse ground gases, it may affect the functioning of combustion appliances and may lead to the spillage of products of combustion into the building. Guidance on this can be found in BRE Report BR 211<sup>75</sup>.

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<sup>75</sup> BRE Report BR 211 *Radon: Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment)*, 2007.

# Section 0: General

## PERFORMANCE

### C1

**0.1** In the First Secretary of State's view the requirements of C1 will be met by making reasonable provisions to secure the health and safety of persons in and about the building, and by safeguarding them and buildings against adverse effects of:

- a. unsuitable material including vegetable matter, topsoil and pre-existing foundations;
- b. contaminants on or in the ground covered, or to be covered, by the building and any land associated with the building; and
- c. groundwater.

### C2

**0.2** In the First Secretary of State's view the requirements of C2 will be met if the floors, walls and roof are constructed to protect the building and secure the health and safety of persons in and about the building from harmful effects caused by:

- a. moisture emanating from the ground or from groundwater;
- b. precipitation and wind-driven spray;
- c. interstitial and surface condensation; and
- d. spillage of water from or associated with sanitary fittings and fixed appliances.

## INTRODUCTION TO PROVISIONS

**0.3** Sections 1, 2 and 3 of this document cover Requirement C1 and deal with site preparation and resistance to contaminants under the headings 'Clearance or treatment of unsuitable material', 'Resistance to contaminants' and 'Subsoil drainage'. Building Regulations are made for the purposes of securing the health, safety, welfare and convenience of persons in and about buildings. This means that action may need to be taken to mitigate the effects of contaminants within the land associated with the building as well as protecting the building and persons in and about the building. This includes action designed to prevent, i.e. inhibit, the ingress of radon gas into buildings to protect the health of occupants from exposure to indoor radon.

**0.4** Hazards associated with the ground may include the effects of vegetable matter including tree roots. They may include health hazards associated with chemical and biological contaminants, and gas generation from biodegradation of organic matter. Hazards to the built environment can be physical, chemical or biological. Items such as underground storage tanks or foundations may create hazards to both health and the building. Physical hazards also

include unstable fill or unsuitable hardcore containing sulphate.

**0.5** In addition, the naturally occurring radioactive gas radon and gases produced by some soils and minerals can be a hazard.

**0.6** Sections 4, 5 and 6 of this document cover Requirement C2 and deal with resistance to moisture under the headings 'Floors', 'Walls' and 'Roofs'. Moisture can rise from the ground to damage floors and the base of walls on any site, although much more severe problems can arise in sites that are liable to flooding. Driving rain or wind-driven spray from the sea or other water bodies adjacent to the building can penetrate walls or roofs directly, or through cracks or joints between elements, and damage the structure or internal fittings or equipment. Surface condensation from the water vapour generated within the building can cause moulds to grow which pose a health hazard to occupants. Interstitial condensation may cause damage to the structure. Spills and leaks of water, in rooms where sanitary fittings or fixed appliances that use water are installed (e.g. bathrooms and kitchens), may cause damage to floor decking or other parts of the structure.

**0.7** The diagrams in this Approved Document have been set out to show typical situations and relationships between adjacent elements of construction. Conventional notations and hatching have been used to identify different materials. **However, the diagrams cannot show specific situations. It remains the responsibility of the designer and builder to ensure that the building work meets all relevant aspects of the Building Regulations.**

## Flood risk

**0.8** Policies set out in the National Planning Policy Framework<sup>7</sup> aim to avoid inappropriate development in areas at risk of flooding, including requiring new development to be flood resilient and resistant, as and where appropriate. Flood resistance is not currently a requirement in Schedule 1 of the Building Regulations 2010 (and amendments). However, when local considerations necessitate building in flood prone areas the buildings can be constructed to mitigate some effects of flooding such as:

- a. elevated groundwater levels or flow of subsoil water across the site – this can be alleviated by the provision of adequate sub-soil drainage (see Section 3);
- b. sewer flooding due to backflow or surcharging of sewers or drains – this can be addressed through the use of non-return valves and anti-flooding devices (see Section 3, paragraph 3.6);

<sup>7</sup> National Planning Policy Framework, Communities and Local Government, March 2012.

- c. intrusion of groundwater through floors – this can be addressed through the use of water resistant construction (see Section 4, paragraphs 4.7 to 4.12);
- d. entry of water into floor voids – provision to inspect and clear out sub-floor voids can be considered (see Section 4, paragraph 4.20).

Further information on flood resistant and resilient construction can be found in the publication *Improving the flood performance of new buildings – Flood resilient construction*<sup>8</sup>.

## Land affected by contaminants

**0.9** The guidance given on resistance to contaminants in Section 2 is for the purposes of the Building Regulations and their associated requirements. Users of this document should be aware that there may be further provisions for dealing with contaminants contained in planning guidance or legislation made under the regime set out in Part IIA of the Environmental Protection Act 1990 which may be supplementary to the requirements of the Building Regulations. The Contaminated Land (England) Regulations 2006 (as amended 2012) make detailed provisions of a procedural nature to help give full effect to the Part IIA regime, and the statutory guidance<sup>161</sup> provides a basis for enforcing authorities to apply the regime. Where contaminants are removed, treated or contained as part of the construction works, waste management law may apply. If waste is removed for off-site disposal, the 'Duty of Care' and/or special waste requirements<sup>11</sup> will apply.

**0.10** Redevelopment is often the most effective means of remediating land affected by contaminants. This process is subject to controls under the Town and Country Planning Acts, and local planning authorities follow the guidance in the National Planning Policy Framework<sup>7</sup>. Although environmental protection, planning and Building Regulations have different purposes their aims are similar. Consequently the processes for assessing the effects of pollutants and contaminants are similar. An investigation or assessment to determine the characteristics of a site can be further developed for Building Regulations purposes when the form and construction of the buildings are known. If appropriate data are gathered at the early stages it should not be necessary to completely re-evaluate a site for Building Regulations purposes.

## Authorities that should be notified about contamination

**0.11** Other regulatory authorities may have an interest in land affected by contamination. It may be necessary at any stage of the site investigation, risk assessment or remediation process to notify any unexpected events or change in outcomes to these regulatory authorities. The most likely situations are:

- The Environmental Health department of the district council should be informed if contaminants are found on a site where the presence of contamination has not been formally recognised through the planning process, if it is found that contaminants from the site are affecting other land or if contaminants are reaching the site from neighbouring land. Additional discussions may also be required if the contamination identified differs from that which has been previously discussed and agreed with the local planning authority (LPA) or Environmental Health department.
- As redevelopment is the most favoured means of dealing with land affected by contaminants, all land quality issues should be set out in documents in support of planning approval sent to the local planning authority. As designs are refined it may be necessary to inform the LPA of any impacts the design changes may have on the risk assessment and remediation strategy.
- The Environment Agency has a number of relevant duties at sites where contamination may be an issue; in particular these include specific duties relating to waste management and the protection of water quality and resources. Sites may be of concern to the Environment Agency where there is a significant potential impact on controlled waters, if the site is designated as a Special Site under Part IIA of the Environmental Protection Act 1990, where an authorisation may be required or specific hazards are found. The local Environment Agency office should be contacted to identify if there are any relevant issues.
- Some remedial measures may themselves require prior authorisation from the Environment Agency including abstraction licensing for groundwater treatment and waste management licensing for a number of activities involving contaminated soils.

<sup>7</sup> National Planning Policy Framework, Communities and Local Government, March 2012.

<sup>8</sup> *Improving the flood performance of new buildings – Flood resilient construction*, Communities and Local Government, Defra and the Environment Agency, May 2007.

<sup>11</sup> Environmental Protection (Duty of Care (England)) Regulations 1991, as amended (SI 1991/2839 and SI 2003/63).

<sup>161</sup> Environmental Protection Act 1990: Part 2A: Contaminated Land Statutory Guidance, Defra, 2012 ([www.defra.gov.uk](http://www.defra.gov.uk)).

- Working on contaminated land can be hazardous. The risks should be assessed and the working procedures should be in accordance with the requirements of the Construction (Design and Management) Regulations 2007. It may be necessary to give notice to the Health and Safety Executive prior to work starting.

## Definitions

**0.12** The following meanings apply to terms throughout this Approved Document:

**Building and land associated with the building.**

The building and all the land forming the site subject to building operations which includes land under the building and the land around it which may have an effect on the building or its users (see also paragraph 2.11).

**Contaminant.** Any substance<sup>13</sup> which is or may become harmful to persons or buildings, including substances which are corrosive, explosive, flammable, radioactive or toxic.

**Floor.** Lower horizontal surface of any space in a building including finishes that are laid as part of the permanent construction.

**Groundwater.** Water in liquid form, either as a static water table or flowing through the ground.

**Interstitial condensation.** Deposition of liquid water from a vapour, occurring within or between the layers of the building envelope.

**Moisture.** Water in liquid, solid or gaseous form.

**Precipitation.** Moisture in any form falling from the atmosphere, usually as rain, sleet, snow or hail.

**Roof.** Any part of the external envelope of a building that is at an angle of less than 70° to the horizontal.

**Spray.** Water droplets driven by the wind from the surface of the sea or other bodies of water adjacent to buildings. Sea spray can be especially hazardous to materials because of its salt content.

**Surface condensation.** Deposition of liquid water from a vapour, occurring on visible surfaces within the building.

**Vapour control layer.** Material of construction, usually a membrane, that substantially reduces the water vapour transfer through any building in which it is incorporated.

**Wall.** Any opaque part of the external envelope of a building that is at an angle of 70° or more to the horizontal.

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<sup>13</sup> Part IIA of the Environmental Protection Act 1990 defines substance as '...any natural or artificial substance, whether in solid or liquid form or in the form of gas or vapour.'

# Section 1: Clearance or treatment of unsuitable material

## SITE INVESTIGATION

**1.1** The preparation of the site will depend on the findings of the site investigation. The site investigation is relevant to Sections 1, 2 and 3 of this Approved Document and also to the requirements of Approved Document A with respect to foundations. The site investigation should consist of a number of well-defined stages:

- a. **Planning stage.** Clear objectives should be set for the investigation, including the scope and requirements, which enable the investigation to be planned and carried out efficiently and provide the required information;
- b. **Desk study.** A review of the historical, geological and environmental information about the site is essential;
- c. **Site reconnaissance or walkover survey.** This stage of the investigation facilitates the identification of actual and potential physical hazards and the design of the main investigation;
- d. **Main investigation and reporting.** This will usually include intrusive and non-intrusive sampling and testing to provide soil parameters for design and construction. The main investigation should be preceded by (b) and (c) above.

**1.2** The extent and level of investigation need to be tailored to the type of development and the previous use of land. Typically the site investigation should include susceptibility to groundwater levels and flow, underlying geology, and ground and hydro-geological properties. A geotechnical site investigation should identify physical hazards for site development, determine an appropriate design and provide soil parameters for design and construction. BS EN 1997-2:2007: Eurocode 7: Geotechnical design with its UK National Annex<sup>14</sup> supported by BS 5930:1999+A2:2010<sup>36</sup> provide comprehensive guidance on site investigation. Guidance on site investigation for low-rise buildings is given in six BRE Digests covering procurement<sup>15</sup>, desk studies<sup>16</sup>, the walk-over survey<sup>17</sup>, trial pits<sup>18</sup>, soil description<sup>19</sup> and direct investigation<sup>20</sup>. Reference should also be made to BS 8103-1:2011<sup>21</sup>.

**1.3** Where the site is potentially affected by contaminants, a combined geotechnical and geo-environmental investigation should be considered. Guidance on assessing and remediating sites affected by contaminants is given in Section 2: Resistance to contaminants.

## UNSUITABLE MATERIAL

**1.4** Vegetable matter such as turf and roots should be removed from the ground to be covered by the building at least to a depth to prevent later growth. The effects of roots close to the building also need to be assessed. Consideration should be given to whether this provision need apply to a building used wholly for:

- a. storing goods, provided that any persons who are habitually employed in the building are engaged only in taking in, caring for or taking out the goods; or
- b. a purpose such that the provision would not serve to increase protection to the health or safety of any persons habitually employed in the building.

**1.5** Where mature trees are present on sites with shrinkable clays (see Diagram 1 and Table 1), the potential damage arising from ground heave to services and floor slabs and oversite concrete should be assessed. Reference should be made to BRE Digest 298<sup>22</sup>. Where soils and vegetation type would require significant quantities of soil to be removed, reference should be made to BRE Digests 240<sup>23</sup> and 241<sup>24</sup>, and to the FBE (Foundation for the Built Environment) report<sup>25</sup>. The effects of remaining trees on services and building movements close to the building need to be assessed using guidance in NHBC (National House Building Council) Standards Chapter 4.2<sup>26</sup>.

<sup>14</sup> BS EN 1997-2:2007: Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing; with UK National Annex to BS EN 1997-2:2007.

<sup>15</sup> BRE Digest 322 Site investigation for low-rise building: procurement, 1987.

<sup>16</sup> BRE Digest 318 Site investigation for low-rise building: desk studies, 1987.

<sup>17</sup> BRE Digest 348 Site investigation for low-rise building: the walk-over survey, 1989.

<sup>18</sup> BRE Digest 381 Site investigation for low-rise building: trial pits, 1993.

<sup>19</sup> BRE Digest 383 Site investigation for low-rise building: soil description, 1993.

<sup>20</sup> BRE Digest 411 Site investigation for low-rise building: direct investigations, 1995.

<sup>21</sup> BS 8103-1:2011 Structural design of low-rise buildings – Part 1: Code of practice for stability, site investigation, precast concrete floors and ground floor slabs for housing.

<sup>22</sup> BRE Digest 298 Low-rise building foundations: the influence of trees in clay soils, 1999.

<sup>23</sup> BRE Digest 240 Low-rise buildings on shrinkable clay soils: Part 1, 1993.

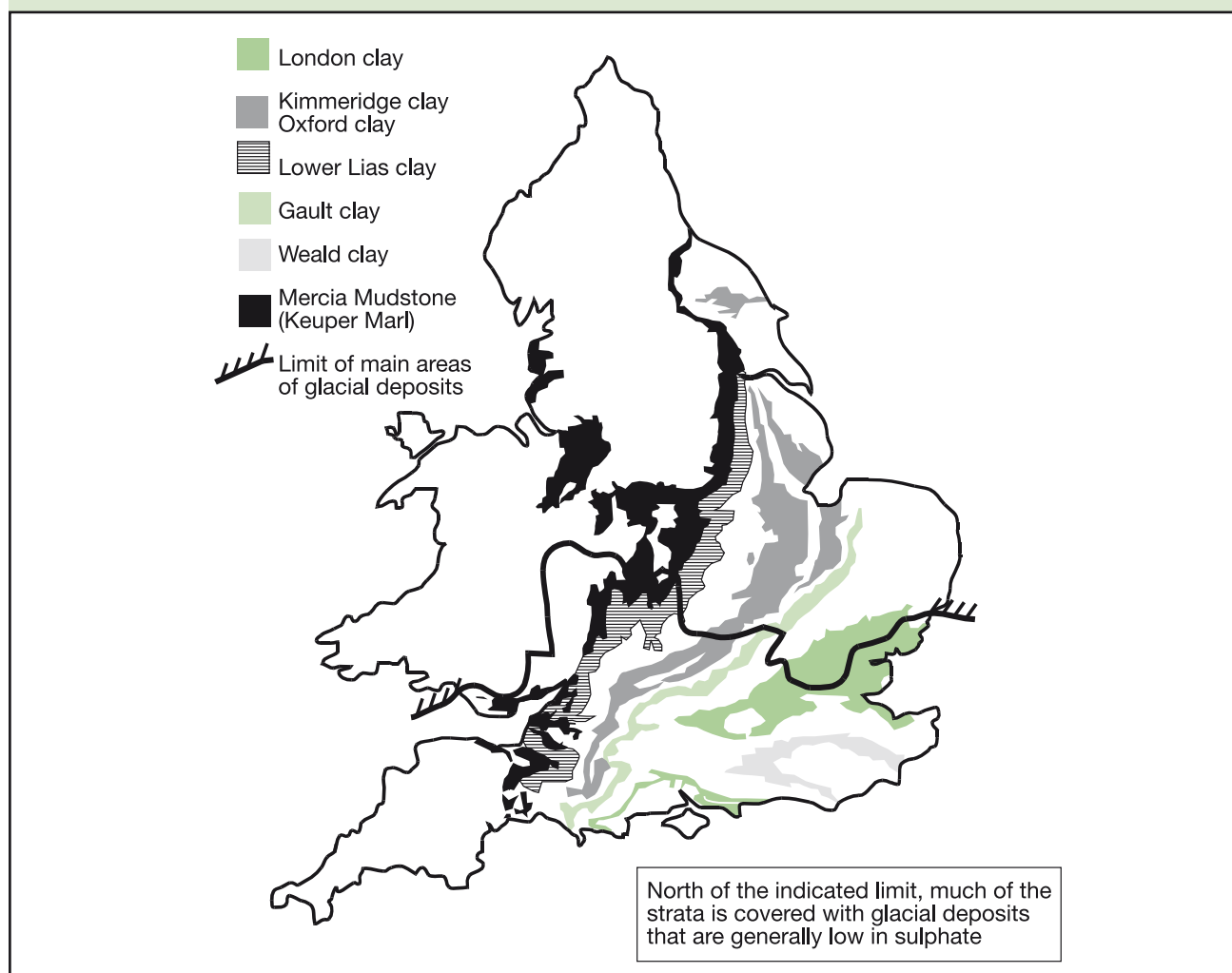
<sup>24</sup> BRE Digest 241 Low-rise buildings on shrinkable clay soils: Part 2, 1993.

<sup>25</sup> Subsidence damage to domestic buildings: lessons learned and questions remaining, FBE, 2000.

<sup>26</sup> NHBC Standards Chapter 4.2 Building near trees, 2003.

<sup>36</sup> BS 5930:1999+A2:2010. Code of practice for site investigations.

Diagram 1 **Distribution of shrinkable clays and principal sulphate/sulphide bearing strata in England and Wales**



**1.6** Building services such as below ground drainage should be sufficiently robust or flexible to accommodate the presence of any tree roots. Joints should be made so that roots will not penetrate them. Where roots could pose a hazard to building services, consideration should be given to their removal.

**1.7** On sites previously used for buildings, consideration should be given to the presence of existing foundations, services, buried tanks and any other infrastructure that could endanger persons in and about the building and any land associated with the building.

**1.8** Where the site contains fill or made ground, consideration should be given to its compressibility and its potential for collapse on wetting, and to appropriate remedial measures to prevent damaging differential settlement. Guidance is given in BRE Digest 427<sup>27</sup> and BRE Report BR 424<sup>28</sup>.

Table 1 **Volume change potential for some common clays**

Clay type	Volume change potential
Glacial till	Low
London	High to very high
Oxford and Kimmeridge	High
Lower Lias	Medium
Gault	High to very high
Weald	High
Mercia Mudstone	Low to medium

<sup>27</sup> BRE Digest 427 *Low-rise buildings on fill*.

<sup>28</sup> BRE Report BR 424 *Building on fill: Geotechnical aspects*, 2001.

## Section 2: Resistance to contaminants

### INTRODUCTION

**2.1** A wide range of solid, liquid and gaseous contaminants can arise on sites, especially those that have had a previous industrial use (see paragraph 0.12 for the definition of a contaminant). In particular, the burial of biodegradable waste in landfills can give rise to landfill gas (see paragraph 2.25). Sites with a generally rural use such as agriculture or forestry may be contaminated by pesticides, fertiliser, fuel and oils and decaying matter of biological origin.

**2.2** Table 2 lists examples of sites that are likely to contain contaminants. It is derived from the 'Industry Profile' guides produced by the former Department of the Environment (DoE), each of which deals with a different industry with the potential to cause contamination<sup>29</sup>. Each profile identifies contaminants which may be associated with the industry, areas on the site in which they may be found and possible routes for migration.

**2.3** In addition, there can be problems of natural contaminants in certain parts of the country as a result of the underlying geology. In this instance the contaminants can be naturally occurring heavy metals (e.g. cadmium and arsenic) originating in mining areas, and gases (e.g. methane and carbon dioxide) originating in coal mining areas and from organic rich soils and sediments such as peat and river silts. The Environment Agency has produced two guidance documents<sup>31,32</sup> on this subject which discuss the geographical extent of these contaminants, the associated hazards, methods of site investigation and protective measures.

**2.4** Natural contaminants also include the radioactive gas radon, although the specific approach for assessing and managing the risks it poses is different from other contaminants (see paragraphs 2.39 and 2.40).

**2.5** Sulphate attack affecting concrete floor slabs and oversite concrete associated with particular strata also needs to be considered. Principal areas of sulphate bearing strata in England and Wales are shown in Diagram 1 and Table 1. BRE Special Digest SD1<sup>33</sup> provides guidance on investigation, concrete specification and design to mitigate the effects of sulphate attack.

**Table 2 Examples of sites likely to contain contaminants**

Animal and animal products processing works
Asbestos works
Ceramics, cement and asphalt manufacturing works
Chemical works
Dockyards and dockland
Engineering works (including aircraft manufacturing, railway engineering works, shipyards, electrical and electronic equipment manufacturing works)
Gas works, coal carbonisation plants and ancillary by-product works
Industries making or using wood preservatives
Landfill and other waste disposal sites
Metal mines, smelters, foundries, steel works and metal finishing works
Munitions production and testing sites
Oil storage and distribution sites
Paper and printing works
Power stations
Railway land, especially larger sidings and depots
Road vehicle fuelling, service and repair: garages and filling stations
Scrap yards
Sewage works, sewage farms and sludge disposal sites
Tanneries
Textile works and dye works

**Note:** the above list is not exhaustive

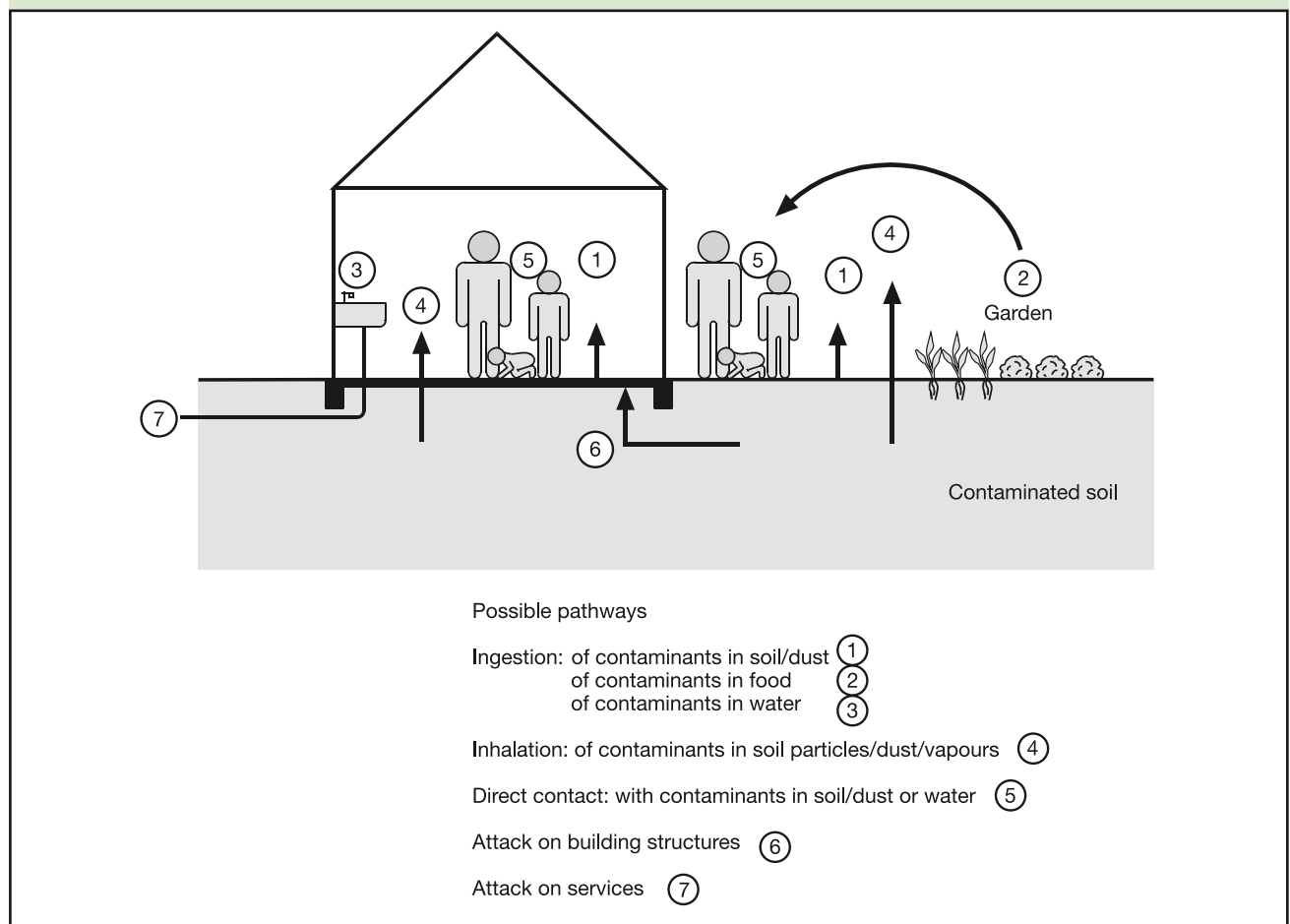
<sup>29</sup> Department of the Environment Industry Profiles, 1996.

<sup>31</sup> Environment Agency R & D Technical Report P291 *Information on land quality in England: Sources of information (including background contaminants)*.

<sup>32</sup> Environment Agency R & D Technical Report P292 *Information on land quality in Wales: Sources of information (including background contaminants)*.

<sup>33</sup> BRE Special Digest SD1 *Concrete in aggressive ground*, 2003.

Diagram 2 **Example of a conceptual model for a site showing source–pathway–receptor**



## SOLID AND LIQUID CONTAMINANTS

### Risk assessment

#### General concepts

**2.6** To ensure safe development of land affected by contaminants the principles of risk assessment (as set out in paragraph 2.8 below) should be followed. The general approach is founded on the concept of the ‘source–pathway–receptor’ relationship, or pollutant linkage, where source refers to contaminants in or on the ground. This is illustrated by the conceptual model<sup>34</sup> in Diagram 2.

**2.7** When land affected by contaminants is developed, receptors (i.e. buildings, building materials and building services, as well as people) are introduced onto the site and so it is necessary to break the pollutant linkages or condition them so that they do not pose a significant risk. This can be achieved by:

- a. treating the contaminant (e.g. use of physical, chemical or biological processes to eliminate or reduce the contaminant’s toxicity or harmful properties);

- b. blocking or removing the pathway (e.g. isolating the contaminant beneath protective layers or installing barriers to prevent migration);
- c. protecting or removing the receptor (e.g. changing the form or layout of the development, using appropriately designed building materials, etc.);
- d. removing the contaminant (e.g. excavating contaminated material).

<sup>34</sup> The conceptual model is a textual or schematic hypothesis of the nature and sources of contamination, the pollution migration pathways and potential receptors, developed on the basis of the information from a preliminary assessment, and is refined during subsequent phases of investigation.

## Stages of risk assessment

**2.8** In assessing the risks for land contamination a tiered approach is adopted with an increasing level of detail required in progressing through the tiers. The three tiers are: preliminary risk assessment, generic quantitative risk assessment (GQRA) and detailed quantitative risk assessment (DQRA). Once the need for a risk assessment has been identified, it will always be necessary to undertake a preliminary risk assessment but, depending on the situation and the outcome, it may not be appropriate to do a more detailed risk assessment. Alternatively, it may be necessary to do only one or both of the more detailed risk assessments. For each tier, the model procedures for the management of land contamination (CLR 11<sup>43</sup>) describes the stages of risk assessment that should be followed for identifying risks and making judgements about the consequences of land affected by contamination when developing a site. These are outlined below:

- a. **Hazard identification – developing the conceptual model by establishing contaminant sources, pathways and receptors.** This is the preliminary site assessment which consists of a desk study and a site walk-over in order to obtain sufficient information to obtain an initial understanding of the potential risks. An initial conceptual model for the site can be based on this information.
- b. **Hazard assessment – identifying what pollutant linkages may be present and analysing the potential for unacceptable risks.** Collect further information and undertake exploratory site investigation to refine understanding of risks and the likelihood of pollutant linkages. The results may be interpreted using generic criteria and assumptions.
- c. **Risk estimation – establishing the scale of the possible consequences by considering the degree of harm that may result and to which receptors.** Undertake detailed ground investigation to collect sufficient data to estimate the risks the contaminants may pose to defined receptors under defined conditions of exposure.
- d. **Risk evaluation – deciding whether the risks are acceptable or unacceptable.** Review all site data to decide whether estimated risks are unacceptable, taking into account the nature and scale of any uncertainties associated with the risk estimation process.

**2.9** Guidance on the investigation of sites potentially affected by contaminants is provided in:

- a. the Association of Geotechnical and Geoenvironmental Specialists (AGS) document<sup>35</sup>;

- b. BS 5930:1999+A2:2010. Code of practice for site investigations<sup>36</sup>;
- c. BS 10175:2011 Code of practice for investigation of potentially contaminated sites<sup>37</sup>;
- d. the Environment Agency documents<sup>38,41,42,43,44,45</sup>.

They recommend a risk based approach to identify and quantify the hazards that may be present and the nature of the risk they may pose. They describe the design and execution of field investigations, including suitable sample distribution strategies, sampling and testing.

## Hazard identification and assessment

**2.10** A preliminary site assessment is required to provide information on the past and present uses of the site and surrounding area that may give rise to contamination (see Table 2). During the site walk-over there may be signs of possible contaminants (see Table 3). The information collated from the desk study and site walk-over can assist and will dictate the design of the exploratory and detailed ground investigation.

<sup>35</sup> *Guidelines for combined geoenvironmental and geotechnical investigations*, Association of Geotechnical and Geoenvironmental Specialists.

<sup>36</sup> BS 5930:1999+A2:2010. Code of practice for site investigations.

<sup>37</sup> BS 10175:2011 Code of practice for investigation of potentially contaminated sites.

<sup>38</sup> National Groundwater & Contaminated Land Centre report NC/99/38/2 *Guide to good practice for the development of conceptual models and the selection and application of mathematical models of contaminant transport processes in the subsurface*.

<sup>41</sup> *Human health toxicological assessment of contaminants in soil* (Science report – final SC050021/SR2), Environment Agency. [http://www.environment-agency.gov.uk/static/documents/Research/TOX\\_guidance\\_report\\_-\\_final.pdf](http://www.environment-agency.gov.uk/static/documents/Research/TOX_guidance_report_-_final.pdf)

<sup>42</sup> *Updated technical background to the CLEA model* (Science Report: SC050021/SR3), Environment Agency. [http://www.environment-agency.gov.uk/static/documents/Research/CLEA\\_report\\_-\\_final.pdf](http://www.environment-agency.gov.uk/static/documents/Research/CLEA_report_-_final.pdf)

<sup>43</sup> CLR 11. *Model Procedures for the Management of Land Contamination*. Defra/Environment Agency, 2004. [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk).

<sup>44</sup> Environment Agency R & D Technical Report P5-065 *Technical aspects of site investigation*, 2000.

<sup>45</sup> Environment Agency R & D Technical Report P5-066 *Secondary model procedure for the development of appropriate soil sampling strategies for land contamination*.

**2.11** The site assessment and risk evaluation should pay particular attention to the area of the site subject to building operations. Those parts of the land associated with the building that include the building itself, gardens and other places on the site that are accessible to users of the building and those in and about the building should be remediated to the requirements of the Building Regulations.

There may be a case for a lower level of remediation if part of, or the remainder of, the land associated with the building, or adjacent to such land, is accessible to a lesser extent to the user or those in and about the building than the main parts of the buildings and their respective gardens. This incremental approach may also apply when very large sites are subject to redevelopment in stages; it may be possible to limit remediation to the site that is subject to building operations.

In all cases the risk evaluation and remediation strategy documentation is likely to be appropriate for demonstrating that restricted remediation is acceptable. The onus is on the applicant to show why part of a site may be excluded from particular remediation measures.

Even if the adjacent land is not subject to Building Regulations, which are concerned with health and safety, it may still be subject to planning control legislation or to control under Part IIA of the Environmental Protection Act 1990.

**2.12** The Planning Authority should be informed prior to any intrusive investigations or if any substance is found which is at variance with any preliminary statements made about the nature of the site.

### Risk estimation and evaluation

**2.13** The detailed ground investigation must provide sufficient information for the confirmation of a conceptual model for the site, the risk assessment and the design and specification of any remedial works. This is likely to involve collection and analysis of soil, soil gas, surface and groundwater samples by the use of invasive and/or non-invasive techniques. An investigation of the groundwater regime, levels and flows is essential for most sites since elevated groundwater levels could bring contaminants close to the surface both beneath the building and in any land associated with the building. Expert advice should be sought.

**2.14** During the development of land affected by contaminants the health and safety of both the public and workers should be considered<sup>46,47</sup>.

**Table 3 Examples of possible contaminants**

Signs of possible contaminants	Possible contaminant
Vegetation (absence, poor or unnatural growth)	Metals Metal compounds
	Organic compounds Gases (landfill or natural source)
Surface materials (unusual colours and contours may indicate wastes and residues)	Metals Metal compounds
	Oily and tarry wastes
	Asbestos
	Other mineral fibres
	Organic compounds including phenols
	Combustible material including coal and coke dust
Fumes and odours (may indicate organic chemicals)	Refuse and waste
	Volatile organic and/or sulphurous compounds from landfill or petrol/solvent spillage
	Corrosive liquids
Damage to exposed foundations of existing buildings	Faecal animal and vegetable matter (biologically active)
	Sulphates
Drums and containers (empty or full)	Various

**Note:** the above list is not exhaustive

## Remedial measures

### Introduction

**2.15** If unacceptable risks to the defined receptor have been identified then these need to be managed through appropriate remedial measures. The risk management objectives are defined by the need to break the pollutant linkages using the methods outlined in paragraph 2.7 and described below. Other objectives will also need to be considered such as timescale, cost, remedial works, planning constraints and sustainability. Depending on the contaminant, three generic types of remedial measures can be considered: treatment, containment and removal. The containment or treatment of waste may require a waste management licence from the Environment Agency.

<sup>46</sup> HSE Report HSG 66 *Protection of workers and the general public during the development of contaminated land*, 1991.

<sup>47</sup> CIRIA Report 132 *A guide to safe working practices for contaminated land*, 1993.

When building work is undertaken on sites affected by contaminants where control measures are already in place, care must be taken not to compromise these measures. For example, cover systems may be breached when new building foundations are constructed, such as when extensions are added.

### Treatment

**2.16** A wide range of treatment processes is now available for dealing with contaminants. Biological, chemical and physical techniques carried out either in or ex situ exist which may decrease one or more of the following features of the contaminants: mass, concentration, mobility, flux or toxicity. The choice of the most appropriate technique for a particular site is a highly site-specific decision for which specialist advice should be sought.

### Containment

**2.17** Containment in its widest sense usually means encapsulation of material containing contaminants but in the context of building development containment is often taken to mean cover systems. However, in-ground vertical barriers may also be required to control lateral migration of contaminants.

**2.18** Cover systems involve the placement of one or more layers of materials over the site to achieve one or more of the following objectives:

- a. break the pollutant linkage between receptors and contaminants;
- b. sustain vegetation;
- c. improve geotechnical properties; and
- d. reduce exposure to an acceptable level.

**2.19** Some of the building structures, e.g. foundations, sub-structure and ground floor, may, dependent on the circumstances and construction, contribute to measures to provide effective protection of health from contaminants.

**2.20** Imported fill and soil for cover systems should be assessed at source to ensure that it is suitable for use<sup>48</sup>. Design and dimensioning of cover systems, particularly soil based ones typically used for gardens, should take account of their long-term performance where intermixing of the soil cover with the contaminants in the ground can take place. Maintenance and monitoring may be necessary. Gradual intermixing due to natural effects and activities such as burrowing animals, gardening, etc. needs to be considered. Excavations by householders for garden features, etc. can penetrate the cover layer and may lead to exposure to contaminants. Further guidance on the design, construction and performance of cover layers is given in the Construction Industry Research and Information Association (CIRIA) Report SP124<sup>49</sup>.

### Removal

**2.21** This involves the excavation and safe disposal to licensed landfill of the contaminants and contaminated material. Excavation can be targeted to contaminant 'hot spots', or it may be necessary to remove sufficient depth of contaminated material to accommodate a cover system within the planned site levels. Removal may not be viable depending on the extent and depth of the contaminants on the site and the availability of suitably licensed landfills. Imported fill should be assessed at source to ensure that there are no materials that will pose unacceptable risks to potential receptors.

**2.22** Further detailed guidance on all three types of remedial measure is given in the Environment Agency/NHBC R & D Publication 66 referred to above and in a series of CIRIA publications<sup>50-55</sup>.

### Risks to buildings, building materials and services

**2.23** The hazards to buildings, building materials and services on sites affected by contaminants need to be considered since these are also receptors. The hazards to consider are:

- a. **Aggressive substances.** These include inorganic and organic acids, alkalis, organic solvents and inorganic chemicals such as sulphates and chlorides which may affect the long-term durability of construction materials (such as concrete, metals and plastics).
- b. **Combustible fill.** This includes domestic waste, colliery spoil, coal, plastics, petrol-soaked ground, etc. which, if ignited, may lead to subterranean fires and consequent damage to the structural stability of buildings, and the integrity or performance of services.
- c. **Expansive slags.** The two main types are blast furnace and steel making slag which may expand some time after deposition – usually when water is introduced onto the site – causing damage to buildings and services.

<sup>48</sup> BS 3882:1994 Specification for topsoil.

<sup>49</sup> CIRIA Special Publication SP124 *Barriers, liners and cover systems for containment and control of land contamination*, 1996.

<sup>50</sup> CIRIA Special Publication SP102 *Decommissioning, decontamination and demolition*, 1995.

<sup>51</sup> CIRIA Special Publication SP104 *Classification and selection of remedial methods*, 1995.

<sup>52</sup> CIRIA Special Publication SP105 *Excavation and disposal*, 1995.

<sup>53</sup> CIRIA Special Publication SP106 *Containment and hydraulic measures*, 1996.

<sup>54</sup> CIRIA Special Publication SP107 *Ex-situ remedial methods for soils, sludges and sediments*, 1995.

<sup>55</sup> CIRIA Special Publication SP109 *In-situ methods of remediation*, 1995.

- d. **Floodwater affected by contaminants.** Substances in the ground, waste matter or sewage may contaminate floodwater. This contaminated water may affect building elements, such as walls or ground floors, that are close to or in the ground. Guidance on flood resilient construction can be found in *Improving the flood performance of new buildings – Flood resilient construction*<sup>8</sup>.

**2.24** Although the building and building materials are the main receptors with these hazards, ultimately there could be harm to health. A particular concern is the effect of hydrocarbons permeating potable water pipes made of polyethylene. Guidance on reducing these risks is given in a Water Research Centre report<sup>58</sup>. Further guidance on the assessment and management of risks to building materials is given in an Environment Agency document<sup>59</sup>.

## METHANE AND OTHER GASES FROM THE GROUND

### Introduction

**2.25** The term ‘methane and other gases’ is used to define hazardous soil gases which either originate from waste deposited in landfill sites or are generated naturally. It does not include radon which is dealt with separately in paragraphs 2.39 and 2.40. However, the term does include volatile organic compounds (VOCs). As stated in Limitations on Requirements above, measures described in this document are the minimum that are needed to comply with the Building Regulations. Further actions may be necessary to deal with the requirements of other legislation.

**2.26** Landfill gas is generated by the action of micro-organisms on biodegradable waste materials in landfill sites. It generally consists of methane and carbon dioxide together with small quantities of VOCs which give the gas its characteristic odour. Methane and oxygen deficient atmospheres (sometimes referred to as stythe or black-damp) containing elevated levels of carbon dioxide and nitrogen can be generated naturally in coal mining areas. Methane and carbon dioxide can also be produced by organic rich soils and sediments such as peat and river silts. A wide range of VOCs can also be present as a result of petrol, oil and solvent spillages. Methane and other gases can migrate through the subsoil and through cracks and fissures into buildings.

**2.27** Methane is an explosive and asphyxiating gas. Carbon dioxide although non-flammable is toxic. VOCs are not only flammable and toxic but can also have a strong, unpleasant odour. Should any of these gases build up to hazardous levels in buildings then they can cause harm to health or compromise safety.

### Risk assessment

**2.28** The risk assessment process outlined in paragraph 2.8 should also be adopted for methane and other gases. Further investigation for hazardous soil gases may be required where the ground to be covered by the building and/or any land associated with the building is:

- On a landfill site, within 250m of the boundary of a landfill site or where there is suspicion that it is within the sphere of influence of such a site. The Environment Agency’s policy on building development on or near to landfills should be followed.
- On a site subject to the wide scale deposition of biodegradable substances (including made ground or fill).
- On a site that has been subject to a use that could give rise to petrol, oil or solvent spillages.
- In an area subject to naturally occurring methane, carbon dioxide and other hazardous gases (e.g. hydrogen sulphide).

**2.29** There are documents that cover hazardous soil gases in these specific contexts:

- Waste Management Paper No. 27<sup>60</sup> gives guidance on the generation and movement of landfill gas as well as techniques for its investigation. Complementary guidance is given in a document<sup>61</sup> by the Chartered Institution of Wastes Management (CIWM).

<sup>8</sup> *Improving the flood performance of new buildings – Flood resilient construction*, Communities and Local Government, Defra and the Environment Agency, May 2007.

<sup>58</sup> Foundation for Water Research Report FR0448 *Laying potable water pipelines in contaminated ground: guidance notes*, 1994.

<sup>59</sup> *Assessment and management of risks to buildings, building materials and services from land contamination*, Environment Agency, 2001.

<sup>60</sup> HMIP Waste Management Paper No. 27 *Landfill gas*, 2nd edition, 1991.

<sup>61</sup> *Monitoring of landfill gas*, Chartered Institution of Wastes Management (CIWM), 2nd edition, 1998.

- b. The Institute of Petroleum has prepared a guidance document covering petroleum retail sites<sup>62</sup>.
- c. The BGS report on naturally occurring methane and other gases<sup>63</sup> gives guidance on the geographical extent of these contaminants, the associated hazards and methods of site investigation. This is supported by a report sponsored by the former DoE on methane and other gases in disused coal mining areas<sup>64</sup>.
- d. In addition, CIRIA has produced three relevant guidance documents on methane and other gases which describe how such gases are generated and move within the ground<sup>65</sup>, methods of detection and monitoring<sup>66</sup> and investigation strategies<sup>67</sup>.

**2.30** During a site investigation for methane and other gases it is important to take measurements over a sufficiently long period of time in order to characterise gas emissions fully. This should also include periods when gas emissions are likely to be higher, e.g. during periods of falling atmospheric pressure. It is also important to establish not only the concentration of these gases in the ground but also the quantity of gas generating materials, their rate of gas generation, gas movement in the ground and gas emissions from the ground surface. This is an important part of the risk estimation stage. Indications about the gas regime in the ground can be obtained through surface emission rate and borehole flow rate measurements, and guidance on this is given in CIRIA Reports 151<sup>68</sup> and 152<sup>69</sup>.

**2.31** Construction activities undertaken as part of building development can alter the gas regime on the site. For example, a site strip can increase surface gas emissions as can piling and excavation for foundations, and dynamic compaction can push dry biodegradable waste into moist, gas-active zones.

**2.32** When assessing gas risks in the context of traditional housing there is a need to consider two pathways for human receptors: (i) gas entering the dwelling through the sub-structure, and building up to hazardous levels, and (ii) subsequent householder exposure in garden areas which can include where outbuildings (e.g. garden sheds and greenhouses) and extensions are constructed, and where there may also be excavations for garden features (e.g. ponds).

**2.33** Guidance on undertaking gas risk assessment is given in CIRIA Report 152<sup>69</sup>, and the GaSIM model is also available for assessing gas emissions from landfill sites<sup>70</sup>. There is further discussion of gas risk assessment in the Defra/Environment Agency document CLR 11<sup>43</sup>.

**2.34** CIRIA Report 149<sup>72</sup> and the Department of the Environment, Transport and the Regions (DETR) Partners in Technology (PIT) report<sup>73</sup> describe a range of ground gas regimes (defined in terms of soil gas concentrations of methane and carbon dioxide as well as borehole flow rate measurements) which can be helpful in assessing gas risks.

**2.35** Depending on the proposed use, for non-domestic development the focus might be on the building only, but the general approach is the same.

## Remedial measures

**2.36** If the risks posed by the gas are unacceptable then these need to be managed through appropriate building remedial measures. Site-wide gas control measures may be required if the risks on any land associated with the building are deemed unacceptable. Such control measures include removal of the gas generating material or covering together with gas extraction systems. Further guidance is contained in CIRIA Report 149<sup>72</sup>. Generally speaking, expert advice should be sought in these circumstances.

**2.37** Gas control measures for dwellings consist of a gas resistant barrier across the whole footprint (i.e. walls and floor) above an extraction (or ventilation) layer from which gases can be dispersed and vented to the atmosphere. They are normally passive, i.e. gas flow is driven by stack (temperature difference) and wind effects. Consideration should be given to the design and layout of buildings to maximise the driving forces of natural ventilation. Further guidance on this and detailed practical guidance on the construction of protective measures for housing is given in the BRE/Environment Agency report

<sup>43</sup> CLR 11. *Model Procedures for the Management of Land Contamination*. Defra/Environment Agency, 2004. [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk).

<sup>62</sup> Institute of Petroleum TP 95 *Guidelines for investigation and remediation of petroleum retail sites*, 1998.

<sup>63</sup> BGS Technical Report WP/95/1 *Methane, carbon dioxide and oil seeps from natural sources and mining areas: characteristics, extent and relevance to planning and development in Great Britain*, 1995.

<sup>64</sup> *Methane and other gases from disused coal mines: the planning response*, DoE, 1996.

<sup>65</sup> CIRIA Report 130 *Methane: its occurrence and hazards in construction*, 1993.

<sup>66</sup> CIRIA Report 131 *The measurement of methane and other gases from the ground*, 1993.

<sup>67</sup> CIRIA Report 150 *Methane investigation strategies*, 1995.

<sup>68</sup> CIRIA Report 151 *Interpreting measurements of gas in the ground*, 1995.

<sup>69</sup> CIRIA Report 152 *Risk assessment for methane and other gases from the ground*, 1995.

<sup>70</sup> Environment Agency GasSIM – Landfill gas assessment tool.

<sup>72</sup> CIRIA Report 149 *Protecting development from methane*, 1995.

BR 414<sup>73</sup>. (In order to accommodate gas resistant membrane, for example as shown in BR414, the position and type of insulation may have to be adjusted). The DETR/Arup Environmental report<sup>74</sup> compares the performance of a range of commonly used gas control measures and can be used as a guide to the design of such measures.

**2.38** Gas control measures for non-domestic buildings use the same principles as those used for housing, and the DETR/Arup Environmental report can also be used as a guide to design. Expert advice should be sought as the floor area of such buildings can be large and it is important to ensure that gas is adequately dispersed from beneath the floor. The use of mechanical (as opposed to passive) systems and monitoring and alarm systems may be necessary. There is a need for continued maintenance and calibration of these systems, so they are more appropriate with non-domestic buildings (as opposed to dwellings) since there is usually scope for this. Again, expert advice should be sought. Special sub-floor ventilation systems are carefully designed to ensure adequate performance and should not be modified unless subjected to a specialist review of the design. Such ventilation systems, particularly those using powered ventilation, are unlikely to be appropriate for owner occupied properties as there is a risk of interference by users.

## RADON

**2.39** Radon is a naturally occurring radioactive colourless and odourless gas which is formed in small quantities by radioactive decay wherever uranium and radium are found. It can move through the subsoil and so into buildings. Some parts of the country, notably the West Country, have higher levels than elsewhere. Exposure to high levels for long periods increases the risk of developing lung cancer. To reduce this risk all new buildings, extensions and conversions, whether residential or non-domestic, built in areas where there may be elevated radon emissions, may need to incorporate precautions against radon.

**2.40** Guidance on whether an area is susceptible to radon, and appropriate protective measures, can be obtained from BRE Report BR 211<sup>75</sup>. The maps in BR 211 are based on the indicative atlas published by Public Health England (formerly the Health Protection Agency) and the British Geological Survey.

Radon risk reports may be used as an alternative approach to the maps for assessing the need for protective measures. These reports are available from:

- UK Radon, [www.UKradon.org](http://www.UKradon.org), for small domestic and workplace buildings (and extensions) that have an existing postal address.

- BGS Georeports, [www.shop.bgs.ac.uk/Georeports](http://www.shop.bgs.ac.uk/Georeports), for other development sites.
- Public Health England (formerly the Health Protection Agency), [radon@phe.gov.uk](mailto:radon@phe.gov.uk), for large workplaces.

BR 211 provides guidance on basic radon protective measures appropriate in areas where 3% to 10% of homes and full radon protective measures in areas where more than 10% of homes are predicted to have radon at or above the Radon Action Level of 200Bq/m<sup>3</sup>.

**Note:** Use of the alternative radon risk reports approach will provide a more accurate assessment of whether radon protective measures are necessary and, if needed, the level of protection that is appropriate.

The Ionising Radiations Regulations<sup>76</sup> and other legislation set out relevant requirements including a national reference level for radon in workplaces. See also the BRE guide *Radon in the workplace*<sup>77</sup>.

The Health and Safety Executive provides guidance on protection from radon in the workplace ([www.hse.gov.uk/radiation/ionising/radon.htm](http://www.hse.gov.uk/radiation/ionising/radon.htm)). Additionally, techniques for installing radon resistant membranes described in BR 211 may be suitable for use in domestic sized buildings with heating and ventilation regimes similar to those used in dwellings but this should be done with caution. Information in 'Radon in the workplace' provides guidance for existing non-domestic buildings.

<sup>73</sup> BRE/Environment Agency Report BR 414 *Protective measures for housing on gas-contaminated land*, 2001.

<sup>74</sup> DETR/Arup Environmental PIT Research Report: *Passive venting of soil gases beneath buildings*, 1997.

<sup>75</sup> BRE Report BR 211 *Radon: Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment)*, 2007.

<sup>76</sup> The Ionising Radiations Regulations 1999 (SI 1999/3232).

<sup>77</sup> BRE Report BR 41 *Radon in the workplace: A guide for building owners and managers* (Second edition), 2011.

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## Section 3: Subsoil drainage

**3.1** The provisions which follow assume that the site of the building is not subject to general flooding (see paragraph 0.8) or, if it is, that appropriate steps are being taken.

**3.2** Where the water table can rise to within 0.25m of the lowest floor of the building, or where surface water could enter or adversely affect the building, either the ground to be covered by the building should be drained by gravity, or other effective means of safeguarding the building should be taken.

**3.3** If an active subsoil drain is cut during excavation and if it passes under the building it should be:

- a. re-laid in pipes with sealed joints and have access points outside the building; or
- b. re-routed around the building; or
- c. re-run to another outfall (see Diagram 3).

**3.4** Where there is a risk that groundwater beneath or around the building could adversely affect the stability and properties of the ground, consideration should be given to site drainage or other protection (see Section 4: Floors).

**3.5** For protecting low lying buildings or basements from localised flooding where foul water drainage also receives rainwater, refer to Approved Document H (Drainage and waste disposal). In heavy rainfall these systems surcharge and where preventative measures are not taken this could lead to increased risks of flooding within the property.

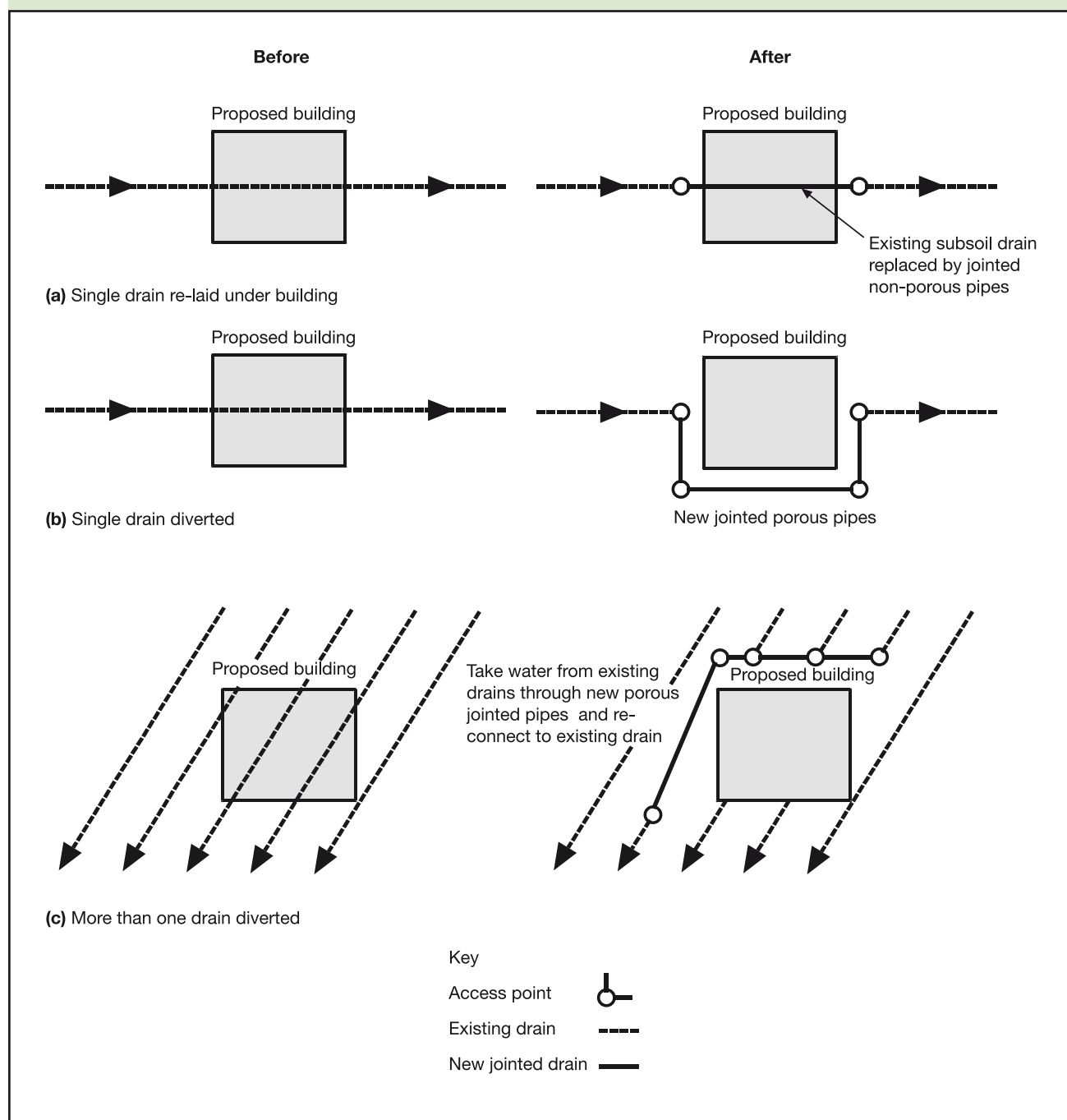
**3.6** Flooding can create blockages in drains and sewers that can lead to backflow of sewage into properties through low level drain gullies, toilets, etc. Guidance on anti-flooding devices is given in a CIRIA publication<sup>79</sup>.

**3.7** General excavation work for foundations and services can alter groundwater flows through the site. Where contaminants are present in the ground, consideration should be given to subsoil drainage to prevent the transportation of water-borne contaminants to the foundations or into the building or its services.

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<sup>79</sup> CIRIA Publication C506 *Low-cost options for prevention of flooding from sewers*, 1998.

Diagram 3 Subsoil drain cut during excavation



## Section 4: Floors

**4.1** This section gives guidance for five situations:

- ground supported floors exposed to moisture from the ground (see paragraphs 4.6 to 4.12);
- suspended timber ground floors exposed to moisture from the ground (see paragraphs 4.13 to 4.16);
- suspended concrete ground floors exposed to moisture from the ground (see paragraphs 4.17 to 4.20);
- the risk of interstitial condensation in ground floors and floors exposed from below (see paragraph 4.21);
- the risk of surface condensation and mould growth on any type of floor (see paragraph 4.22).

**4.2** Floors next to the ground should:

- resist the passage of ground moisture to the upper surface of the floor;
- not be damaged by moisture from the ground;
- not be damaged by groundwater;
- resist the passage of ground gases. To meet requirement C1 (2) floors in some localities may need to resist the passage of hazardous ground gases such as radon or methane. Remedial measures will include a gas resistant barrier which, with proper detailing, can also function as a damp proof membrane. For specific guidance for methane and other gases refer to paragraphs 2.25 to 2.38, and for radon refer to paragraphs 2.39 and 2.40. Guidance is provided in reports BR 414<sup>80</sup> and BR 211<sup>75</sup> respectively.

**4.3** Consideration should be given to whether 4.2(a) need apply to a building used wholly for:

- storing goods, provided that any persons who are habitually employed in the building are engaged only in taking in, caring for or taking out the goods; or
- a purpose such that the provision would not serve to increase protection to the health or safety of any persons habitually employed in the building.

**4.4** Floors next to the ground and floors exposed from below should be designed and constructed so that their structural and thermal performance are not adversely affected by interstitial condensation.

**4.5** All floors should not promote surface condensation or mould growth, given reasonable occupancy conditions.

### GROUND SUPPORTED FLOORS (MOISTURE FROM THE GROUND)

**4.6** Any ground supported floor will meet the requirement if the ground is covered with dense concrete laid on a hardcore bed and a damp-proof membrane is provided. Suitable insulation may be incorporated.

#### Technical solution

**4.7** Unless it is subjected to water pressure, which is likely in the case of buildings on very permeable strata such as chalk, limestone or gravel (in which case see Alternative approach, paragraph 4.12), a concrete ground supported floor may be built as follows (Diagram 4):

- well compacted hardcore bed, no greater than 600mm deep<sup>82</sup>, of clean, broken brick or similar inert material, free from materials including water-soluble sulphates in quantities which could damage the concrete (BRE Digest 276<sup>83</sup>; and
- concrete at least 100mm thick (but thicker if the structural design requires) to mix ST2 in BS 8500 or, if there is embedded reinforcement, to mix ST4 in BS 8500<sup>84</sup>; and
- damp-proof membrane above or below the concrete, and continuous with the damp-proof courses in walls, piers and the like. If the ground could contain water soluble sulphates, or there is any risk that sulphate or other deleterious matter could contaminate the hardcore, the membrane should be placed at the base of the concrete slab<sup>85</sup>.

<sup>75</sup> BRE Report BR 211 *Radon: Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment)*, 2007.

<sup>80</sup> BRE/Environment Agency Report BR 414 *Protective measures for housing on gas-contaminated land*, 2001.

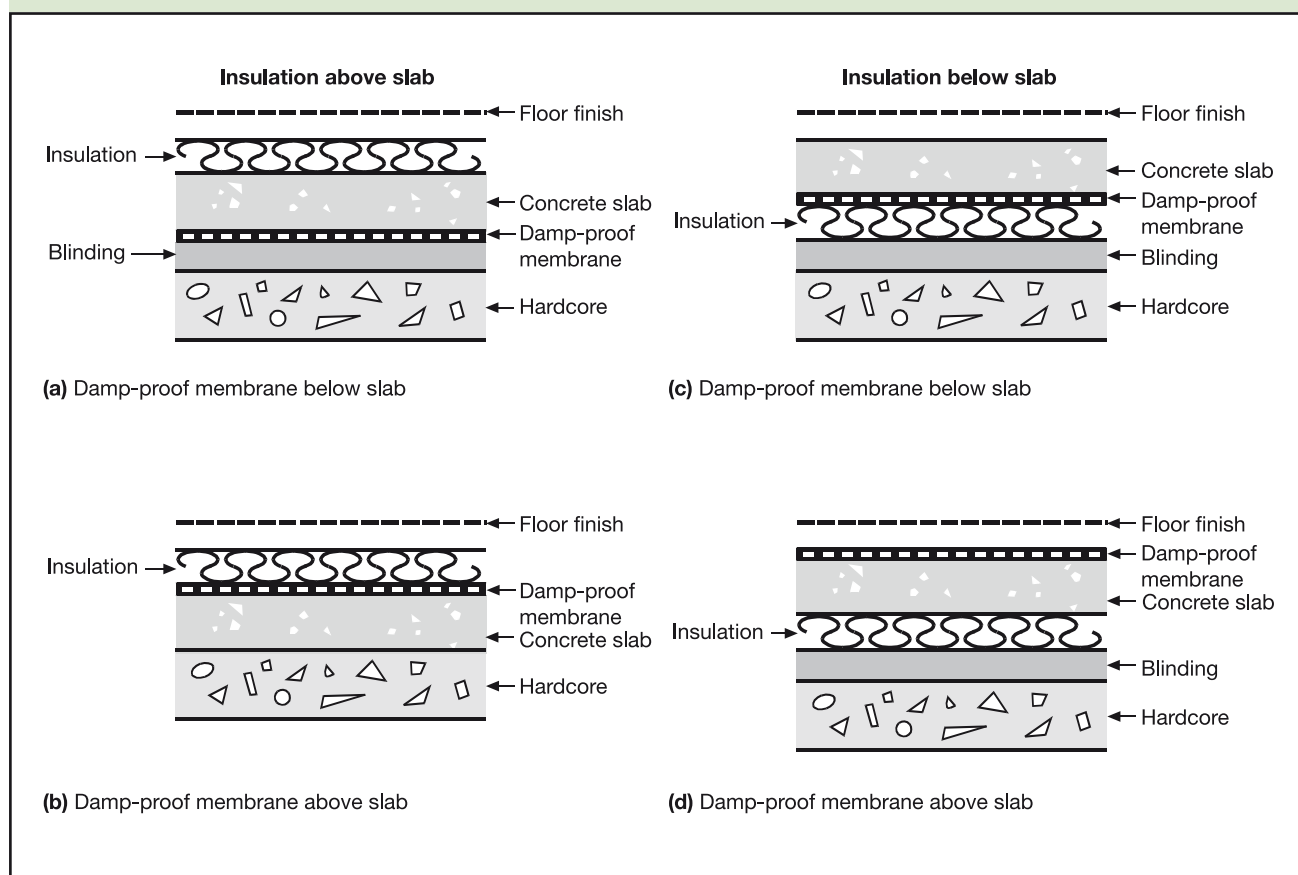
<sup>82</sup> If the hardcore bed is deeper than 600mm, there may be a risk of excessive settlement and cracking of the floor slab. In such cases, a suspended floor slab is advised.

<sup>83</sup> BRE Digest 276 *Hardcore*, 1992.

<sup>84</sup> BS 8500-1:2002 Concrete. Complementary British Standard to BS EN 206-1 Method of specifying and guidance for the specifier.

<sup>85</sup> BRE Special Digest SD1 *Concrete in aggressive ground*, 2003.

Diagram 4 Ground supported floor – construction (see paragraph 4.7)



**4.8** A membrane below the concrete could be formed with a sheet of polyethylene, which should be at least 300µm thick (1200 gauge) with sealed joints and laid on a bed of material that will not damage the sheet.

**4.9** A membrane laid above the concrete may be either polyethylene sheet as described above (but without the bedding material) or three coats of cold applied bitumen solution or similar moisture and water vapour resisting material. In each case it should be protected by either a screed or a floor finish, unless the membrane is pitchmastic or similar material which will also serve as a floor finish.

**4.10** Insulants placed beneath floor slabs should have sufficient strength to resist the weight of the slab and the anticipated floor loading as well as any possible overloading during construction. In order to resist degradation insulation that is placed below the damp proof membrane should have low water absorption. If necessary the insulant should be resistant to contaminants in the ground.

**4.11** A timber floor finish laid directly on concrete may be bedded in a material which may also serve as a damp-proof membrane. Timber fillets laid in the concrete as a fixing for a floor finish should be treated with an effective preservative unless they are above the damp-proof membrane. Some preservative treatments are described in BS 1282:1999<sup>86</sup>.

## Alternative approach

**4.12** The requirement can also be achieved by following the relevant recommendations of Clause 11 of BS CP 102:1973<sup>87</sup>. BS 8102:1990<sup>88</sup> includes recommendations for floors subject to water pressure.

## SUSPENDED TIMBER GROUND FLOORS (MOISTURE FROM THE GROUND)

**4.13** Any suspended timber floor next to the ground will meet the requirement if:

- the ground is covered so as to resist moisture and prevent plant growth; and
- there is a ventilated air space between the ground covering and the timber; and
- there are damp-proof courses between the timber and any material which can carry moisture from the ground.

<sup>86</sup> BS 1282:1999 Wood preservatives. Guidance on choice, use and application.

<sup>87</sup> BS CP 102:1973 Protection of buildings against water from the ground.

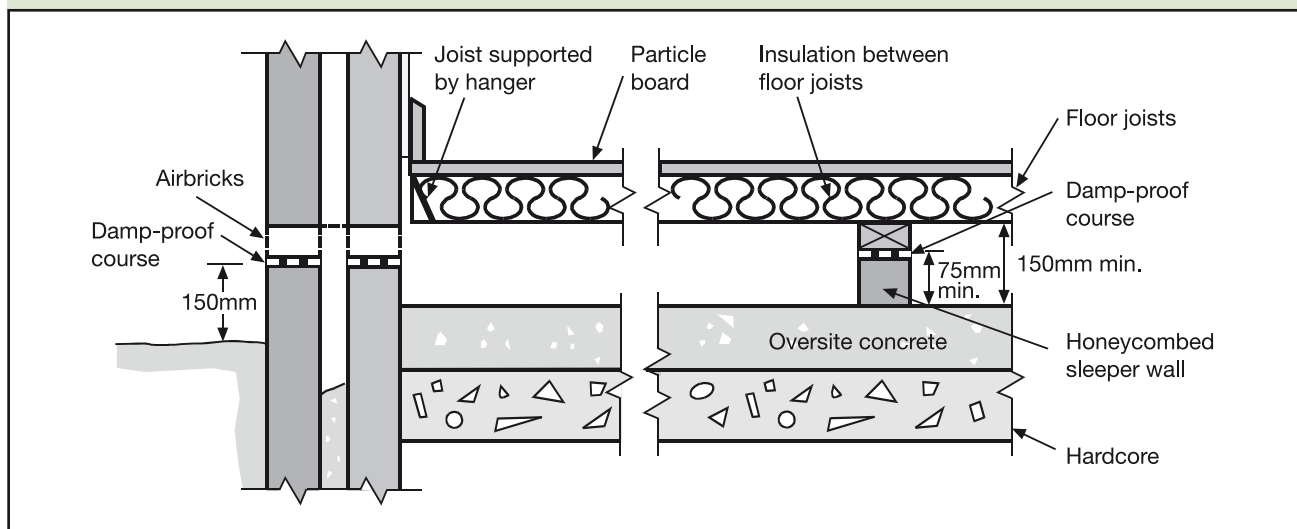
<sup>88</sup> BS 8102:1990 Code of practice for protection of structures against water from the ground.

## Technical solution

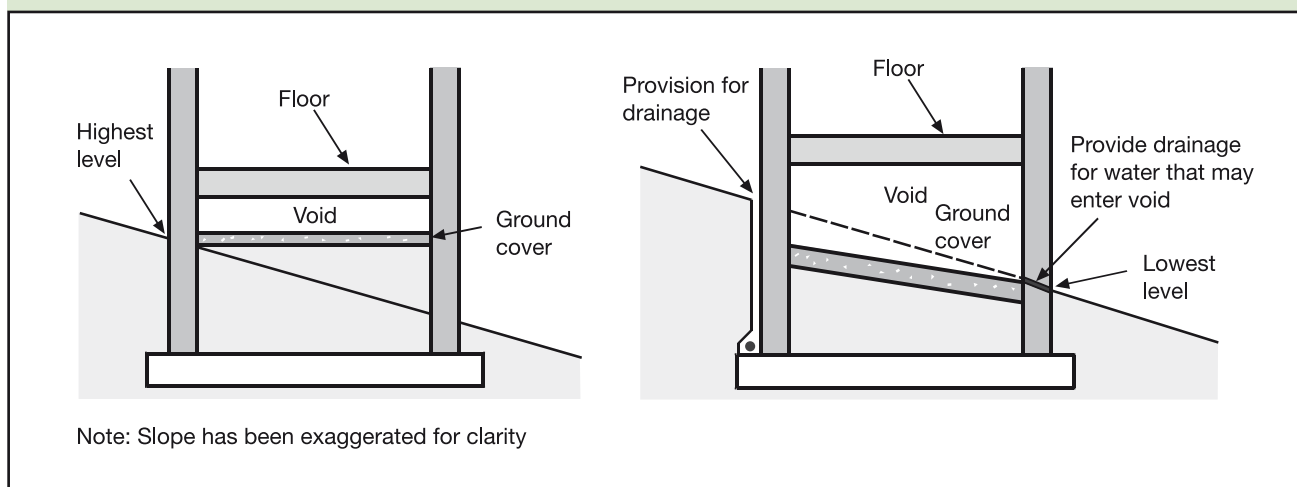
**4.14** Unless it is covered with a floor finish which is highly vapour resistant (in which case see the Alternative approach in paragraph 4.16), a suspended timber floor next to the ground may be built as follows (Diagram 5):

- a. Ground covering either:
  - i. unreinforced concrete at least 100mm thick to mix ST 1 in BS 8500<sup>89</sup>. The concrete should be laid on a compacted hardcore bed of clean, broken brick or any other inert material free from materials including water-soluble sulphates in quantities which could damage the concrete; or
  - ii. concrete, composed as described above, or inert fine aggregate, in either case at least 50mm thick laid on at least 300µm (1200 gauge) polyethylene sheet with sealed joints, and itself laid on a bed of material which will not damage the sheet.
- To prevent water collecting on the ground covering, either the top should be entirely above the highest level of the adjoining ground or, on sloping sites, consideration should be given to installing drainage on the outside of the up-slope side of the building (see Diagram 6).
- b. Ventilated air space measuring at least 75mm from the ground covering to the underside of any wall-plates and at least 150mm to the underside of the suspended timber floor (or insulation if provided). Two opposing external walls should have ventilation openings placed so that the ventilating air will have a free path between opposite sides and to all parts. The openings should be not less than either 1,500mm<sup>2</sup>/m run of external wall or 500mm<sup>2</sup>/m<sup>2</sup> of floor area, whichever gives the greater

**Diagram 5 Suspended timber floor – construction (see paragraph 4.14(a) (i))**



**Diagram 6 Suspended floor – preventing water collection (see paragraph 4.14(a))**



<sup>89</sup> BS 8500-1:2002 Concrete. Complementary British Standard to BS EN 206-1 Method of specifying and guidance for the specifier.

opening area. Any pipes needed to carry ventilating air should have a diameter of at least 100mm. Ventilation openings should incorporate suitable grilles which prevent the entry of vermin to the sub-floor but do not resist the air flow unduly. If floor levels need to be nearer to the ground to provide level access sub-floor ventilation can be provided through offset (periscope) ventilators.

- c. Damp-proof courses of impervious sheet material, engineering brick or slates in cement mortar or other material which will prevent the passage of moisture. Guidance for choice of materials is given in BS 5628:Part 3:2001<sup>90</sup>.
- d. In shrinkable clay soils, the depth of the air space may need to be increased to allow for heave.

**4.15** In areas such as kitchens, utility rooms and bathrooms where water may be spilled, any board used as a flooring, irrespective of the storey, should be moisture resistant. In the case of chipboard it should be of one of the grades with improved moisture resistance specified in BS 7331:1990<sup>91</sup> or BS EN 312 Part 5:1997<sup>92</sup>. It should be laid, fixed and jointed in the manner recommended by the manufacturer. To demonstrate compliance the identification marks should be facing upwards. Any softwood boarding should be at least 20mm thick and from a durable species<sup>93</sup> or treated with a suitable preservative.

### Alternative approach

**4.16** The requirement can also be met (see paragraph 4.14 above) by following the relevant recommendations of Clause 11 of BS CP 102:1973<sup>94</sup>.

## SUSPENDED CONCRETE GROUND FLOORS (MOISTURE FROM THE GROUND)

**4.17** Any suspended floor of in situ or precast concrete, including beam and block floors, next to the ground will meet the requirement if it will adequately prevent the passage of moisture to the upper surface and if the reinforcement is protected against moisture.

### Technical solution

**4.18** One solution for a suspended concrete floor could be:

- a. in situ concrete at least 100mm thick (but thicker if the structural design requires) containing at least 300kg of cement for each m<sup>3</sup> of concrete; or
- b. precast concrete construction with or without infilling slabs; and
- c. reinforcing steel protected by concrete cover of at least 40mm if the concrete is in situ and at least the thickness required for a moderate exposure if the concrete is precast.

**4.19** A suspended concrete floor will meet the requirements if it incorporates:

- a. a damp-proof membrane (if the ground below the floor has been excavated below the lowest level of the surrounding ground and will not be effectively drained); and
- b. a ventilated air space. This should measure at least 150mm clear from the ground to the underside of the floor (or insulation if provided). Two opposing external walls should have ventilation openings placed so that the ventilating air will have a free path between opposite sides and to all parts of the floor void. The openings should be not less than either 1500mm<sup>2</sup>/m run of external wall or 500mm<sup>2</sup>/m<sup>2</sup> of floor area, whichever gives the greater opening area. Any pipes needed to carry ventilating air should have a diameter of at least 100mm. Ventilation openings should incorporate suitable grilles which prevent the entry of vermin to the sub-floor but do not resist the air flow unduly.

**4.20** In localities where flooding is likely, consideration may be given to including means of inspecting and clearing out the sub-floor voids beneath suspended floors. For guidance, see *Improving the flood performance of new buildings – Flood resilient construction*<sup>8</sup>.

<sup>8</sup> *Improving the flood performance of new buildings – Flood resilient construction*, Communities and Local Government, Defra and the Environment Agency, 2007.

<sup>90</sup> BS 5628-3:2001 Code of practice for use of masonry. Materials and components, design and workmanship.

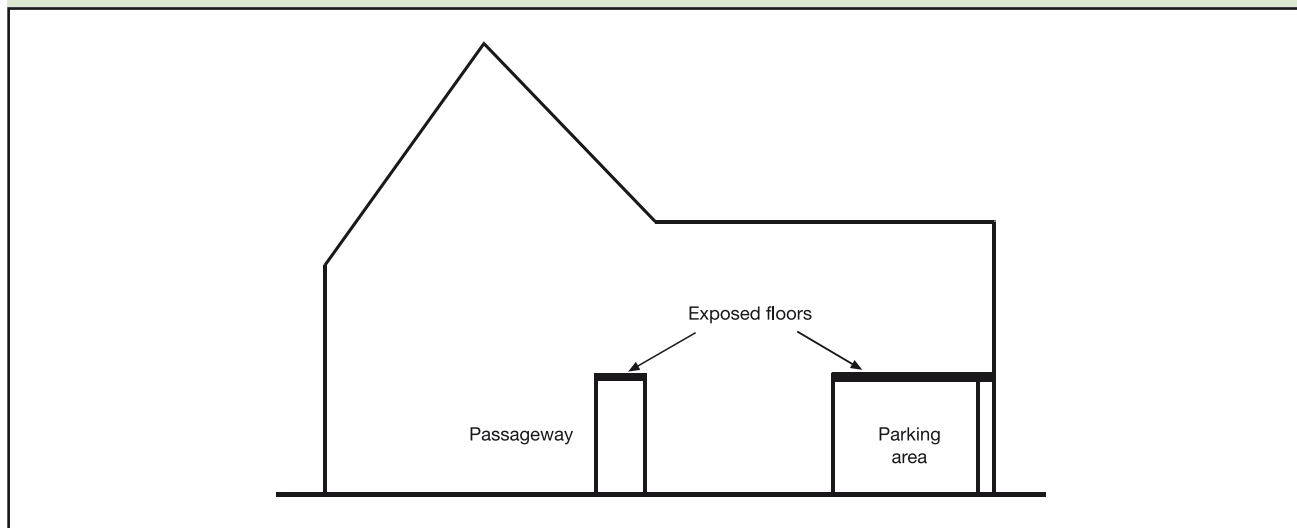
<sup>91</sup> BS 7331:1990 Specification for direct surfaced wood chipboard based on thermosetting resins.

<sup>92</sup> BS EN 312-5:1997 Particleboards. Specifications. Requirements for load-bearing boards for use in humid conditions.

<sup>93</sup> BRE Digest 429 *Timbers: their natural durability and resistance to preservative treatment*, 1998.

<sup>94</sup> BS CP 102:1973 Protection of buildings against water from the ground.

Diagram 7 **Typical floors exposed from below**



## GROUND FLOORS AND FLOORS EXPOSED FROM BELOW (RESISTANCE TO DAMAGE FROM INTERSTITIAL CONDENSATION)

**4.21** A ground floor or floor exposed from below, i.e. above an open parking space or passageway, as shown in Diagram 7, will meet the requirement if it is designed and constructed in accordance with Clause 8.5 and Appendix D of BS 5250:2002<sup>96</sup>, BS EN ISO 13788:2002<sup>97</sup> and BR 262<sup>98</sup>.

## FLOORS (RESISTANCE TO SURFACE CONDENSATION AND MOULD GROWTH)

**4.22** A floor will meet the requirement if:

- a ground floor is designed and constructed so that the thermal transmittance (U-value) does not exceed  $0.7\text{W/m}^2\text{K}$  at any point; and
- in the case of all floors, the junctions between elements are designed to Accredited Construction Details<sup>99</sup>, or follow the guidance of BRE IP17/01<sup>100</sup>.

<sup>96</sup> BS 5250:2002 Code of practice for the control of condensation in buildings.

<sup>97</sup> BS EN ISO 13788:2002 Hygrothermal performance of building components and building elements. Internal surface temperature to avoid critical surface humidity and interstitial condensation. Calculation methods.

<sup>98</sup> BRE Report BR 262 *Thermal insulation: avoiding risks*, 2002.

<sup>99</sup> Accredited Construction Details which can be downloaded from [www.planningportal.gov.uk/buildingregulations/approveddocuments/part1/bcassociateddocuments9/acd](http://www.planningportal.gov.uk/buildingregulations/approveddocuments/part1/bcassociateddocuments9/acd).

<sup>100</sup> BRE Information Paper IP17/01 *Assessing the effects of thermal bridging at junctions and around openings*, 2001.

## Section 5: Walls

**5.1** This section gives guidance for four situations:

- a. internal and external walls exposed to moisture from the ground (see paragraphs 5.4 to 5.6);
- b. external walls exposed to precipitation from the outside, covering:
  - i. solid external walls (see paragraphs 5.8 to 5.11);
  - ii. cavity external walls (see paragraphs 5.12 to 5.15);
  - iii. framed external walls (see paragraph 5.17);
  - iv. cracking of walls (see paragraph 5.18);
  - v. impervious cladding systems (see paragraphs 5.19 to 5.28);
  - vi. the joint between window and door frames and external walls and door thresholds (see paragraphs 5.29 to 5.33);
- c. the risk of interstitial condensation in any type of wall (see paragraphs 5.34 to 5.35);
- d. the risk of surface condensation or mould growth on any type of wall (see paragraph 5.36).

A wall includes piers, columns and parapets. It also includes chimneys if they are attached to the building. It does not include windows, doors and similar openings, but does include the joint between their frames and the wall. In the following, the term 'precipitation' includes the effects of spray blown from the sea or any other body of water adjacent to the building.

**5.2** Walls should:

- a. resist the passage of moisture from the ground to the inside of the building; and
- b. not be damaged by moisture from the ground and not carry moisture from the ground to any part which would be damaged by it, and, if the wall is an external wall:
- c. resist the penetration of precipitation to components of the structure that might be damaged by moisture; and
- d. resist the penetration of precipitation to the inside of the building; and
- e. be designed and constructed so that their structural and thermal performance are not adversely affected by interstitial condensation; and
- f. not promote surface condensation or mould growth, given reasonable occupancy conditions.

**5.3** Consideration should be given to whether provisions 5.2(a) and (d) need apply to a building used wholly for:

- a. storing goods, provided that any persons who are habitually employed in the building are engaged only in taking in, caring for or taking out the goods; or
- b. a purpose such that the provision would not serve to increase protection to the health or safety of any persons habitually employed in the building.

### INTERNAL AND EXTERNAL WALLS (MOISTURE FROM THE GROUND)

**5.4** Any internal or external wall will meet the requirement if a damp proof course is provided.

#### Technical solution

**5.5** An internal or external wall will meet the requirement if it is built as follows (unless it is subject to groundwater pressure, in which case see the Alternative approach – paragraph 5.6):

- a. damp-proof course of bituminous material, polyethylene, engineering bricks or slates in cement mortar or any other material that will prevent the passage of moisture. The damp proof course should be continuous with any damp-proof membrane in the floors; and
- b. if the wall is an external wall, the damp-proof course should be at least 150mm above the level of the adjoining ground (see Diagram 8), unless the design is such that a part of the building will protect the wall; and
- c. if the wall is an external cavity wall, (see Diagram 9a) the cavity should be taken down at least 225mm below the level of the lowest damp-proof course, or a damp-proof tray should be provided so as to prevent precipitation passing into the inner leaf (see Diagram 9b), with weep holes every 900mm to assist in the transfer of moisture through the external leaf. Where the damp-proof tray does not extend the full length of the exposed wall, i.e. above an opening, stop ends and at least two weep holes should be provided.

#### Alternative approach

**5.6** The requirement can also be met by following the relevant recommendations of Clauses 4 and 5 of BS 8215:1991<sup>101</sup>. BS 8102:1990<sup>102</sup>

<sup>101</sup> BS 8215:1991 Code of practice for design and installation of damp-proof courses in masonry construction.

<sup>102</sup> BS 8102:1990 Code of practice for protection of structures against water from the ground.

Diagram 8 Damp proof courses (see paragraph 5.5(b))

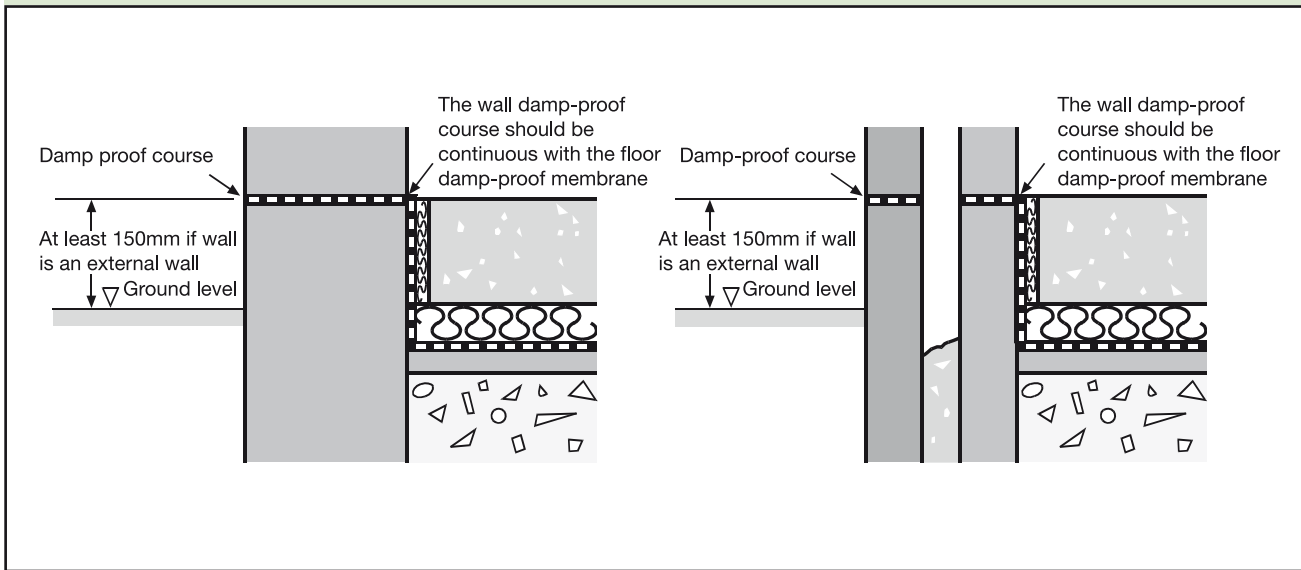
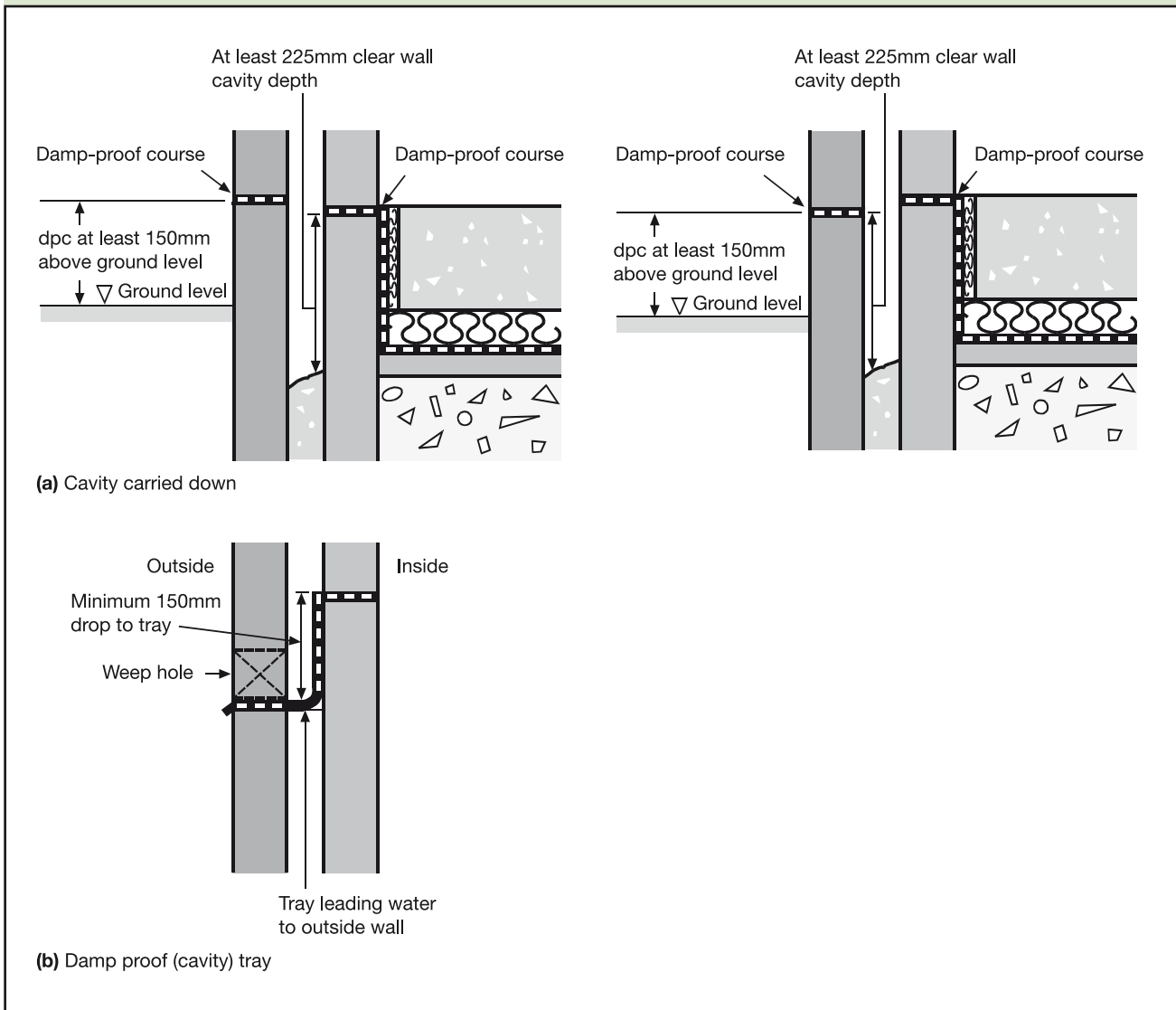


Diagram 9 Protecting inner leaf (see paragraph 5.5(c))



includes recommendations for walls subject to groundwater pressure including basement walls.

## EXTERNAL WALLS (MOISTURE FROM THE OUTSIDE)

**5.7** As well as giving protection against moisture from the ground, an external wall should give protection against precipitation. This protection can be given by a solid wall of sufficient thickness (see paragraphs 5.8 to 5.11), or by a cavity wall (see paragraphs 5.12 to 5.18), or by an impervious or weather-resisting cladding (see paragraphs 5.19 to 5.28).

## SOLID EXTERNAL WALLS

**5.8** Any solid wall will meet the requirement if it will hold moisture arising from rain and snow until it can be released in a dry period without penetrating to the inside of the building, or causing damage to the building. The wall thickness will depend on the type of brick and block and on the severity of wind-driven rain. A method of describing the exposure to wind-driven rain is given in BS 8104:1992<sup>103</sup>; see also BS 5628-3:2001<sup>104</sup>.

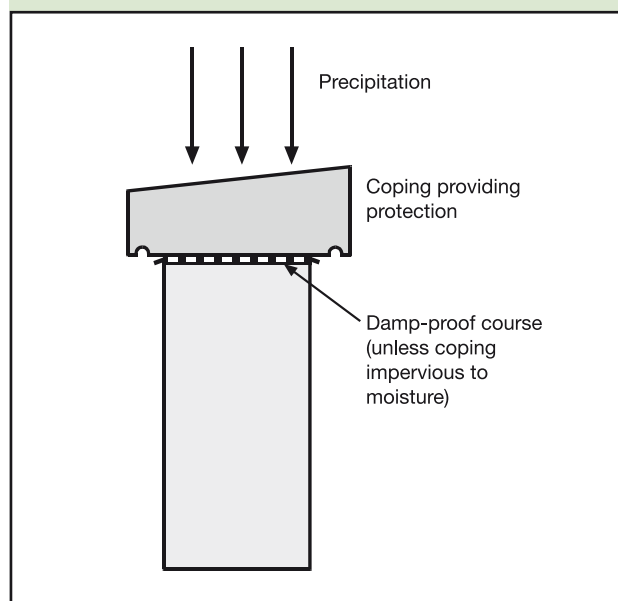
## Technical solution

**5.9** A solid external wall in conditions of **very severe** exposure should be protected by external impervious cladding, but in conditions of **severe** exposure may be built as follows:

- brickwork or stonework** at least 328mm thick, dense aggregate concrete **blockwork** at least 250mm thick, or lightweight aggregate or aerated autoclaved concrete **blockwork** at least 215mm thick; and
- rendering**: the exposed face of the bricks or blocks should be rendered or be given no less protection. Rendering should be in two coats with a total thickness of at least 20mm and should have a scraped or textured finish. The strength of the mortar should be compatible with the strength of the bricks or blocks. The joints, if the wall is to be rendered, should be raked out to a depth of at least 10mm. Further guidance is given in BS EN 998:2003<sup>105</sup>. The rendering mix should be one part of cement, one part of lime and six parts of well graded sharp sand (nominal mix 1:1:6) unless the blocks are of dense concrete aggregate, in which case the mix may be 1:0.5:4. BS 5262:1991<sup>106</sup> includes recommendations for a wider range of mixes according to the severity of exposure and the type of brick or block.

Premixed and proprietary renders should be used in accordance with the manufacturer's instructions;

Diagram 10 **Protection of wall head from precipitation**  
(see paragraph 5.9(c))



- protection** should be provided where the top of walls, etc. would otherwise be unprotected (see Diagram 10). Unless the protection and joints will be a complete barrier to moisture, a damp-proof course should also be provided;
- damp-proof courses, cavity trays and closers** should be provided and designed to ensure that water drains outwards:
  - where the downward flow will be interrupted by an obstruction, such as some types of lintel; and
  - under openings, unless there is a sill and the sill and its joints will form a complete barrier; and
  - at abutments between walls and roofs.

**5.10 Insulation.** A solid external wall may be insulated on the inside or on the outside. Where it is on the inside a cavity should be provided to give a break in the path for moisture and where it is on the outside it should provide some resistance to the ingress of moisture to ensure the wall remains relatively dry (see Diagram 11).

<sup>103</sup> BS 8104:1992 Code of practice for assessing exposure of walls to wind-driven rain.

<sup>104</sup> BS 5628-3:2001 Code of practice for use of masonry. Materials and components, design and workmanship.

<sup>105</sup> BS EN 998-2:2003 Specification for mortar for masonry. Masonry mortar.

<sup>106</sup> BS 5262:1991 Code of practice for external renderings.

## Alternative approach

**5.11** The requirement can also be met by following the relevant recommendations of BS 5628-3:2001<sup>107</sup>. The code describes alternative constructions to suit the severity of the exposure and the type of brick or block.

## CAVITY EXTERNAL WALLS

**5.12** Any external cavity wall will meet the requirement if the outer leaf is separated from the inner leaf by a drained air space, or in any other way which will prevent precipitation from being carried to the inner leaf.

## Technical solution

**5.13** The construction of a cavity external wall could include:

- a. outer leaf masonry (bricks, blocks, stone or manufactured stone); and
- b. cavity at least 50mm wide. The cavity is to be bridged only by wall ties, cavity trays provided to prevent moisture being carried to the inner leaf (see paragraph 5.15 for cavity insulation), and cavity barriers, firestops and cavity closures, where appropriate; and
- c. inner leaf masonry or frame with lining.

Masonry units should be laid on a full bed of mortar with the cross joints substantially and continuously filled to ensure structural robustness and weather resistance.

Where a cavity is to be partially filled, the residual cavity should not be less than 50mm wide (see Diagram 11).

## Alternative approach

**5.14** The requirement can also be met by following the relevant recommendations of BS 5628-3:2001<sup>108</sup>. The code describes factors affecting rain penetration of cavity walls.

## CAVITY INSULATION

**5.15** A full or partial fill insulating material may be placed in the cavity between the outer leaf and an inner leaf of masonry subject to the following conditions:

- a. The suitability of a wall for installing insulation into the cavity should be determined either by reference to the map in Diagram 12 and the associated Table 4 or following the calculation or assessment procedure in current British or CEN standards. When partial fill materials are to be used, the residual cavity should not be less than 50mm nominal; and
- b. A rigid (board or batt) thermal insulating material built into the wall should be the subject of current certification from an appropriate body or a European Technical Approval and the work should be carried out in accordance with the requirements of that document; or

- c. Other insulating materials inserted into the cavity after the wall has been constructed should have certification from an appropriate body and be installed in accordance with the appropriate installations code. The suitability of the wall for filling is to be assessed before the work is carried out and the person undertaking the work should operate under an Approved Installer Scheme that includes an assessment of capability. Alternatively the insulating material should be the subject of current certification from an appropriate body or a European Technical Approval and the work should be carried out in accordance with the requirements of that document by operatives either directly employed by the holder of the document or employed by an installer approved to operate under the document; or
- d. Urea-formaldehyde foam inserted into the cavity should be in accordance with BS 5617:1985<sup>109</sup> and be installed in accordance with BS 5618:1985<sup>110</sup>. The suitability of the wall for foam filling is to be assessed before the work is carried out and the person undertaking the work should operate under an Approved Installer Scheme that includes an assessment of capability.
- e. When the cavity of an existing house is being filled, special attention should be given to the condition of the external leaf of the wall, e.g. its state of repair and type of pointing. Guidance is given in BS 8208-1:1985<sup>111</sup>. Some materials that are used to fill existing cavity walls may have a low risk of moisture being carried over to the internal leaf of the wall. In cases where a third party assessment of such a cavity fill material contains a method of assessing the construction of the walls and exposure risk, the procedure set out below may be replaced by that method.

<sup>107</sup> BS 5628-3:2001 Code of practice for use of masonry. Materials and components, design and workmanship.

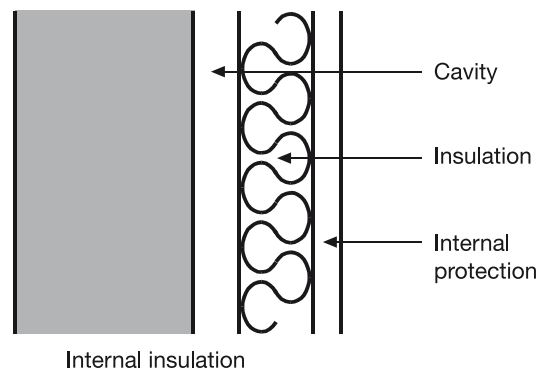
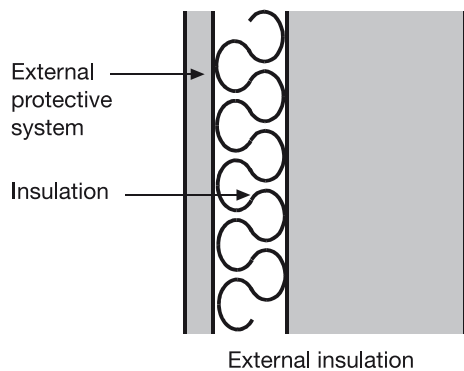
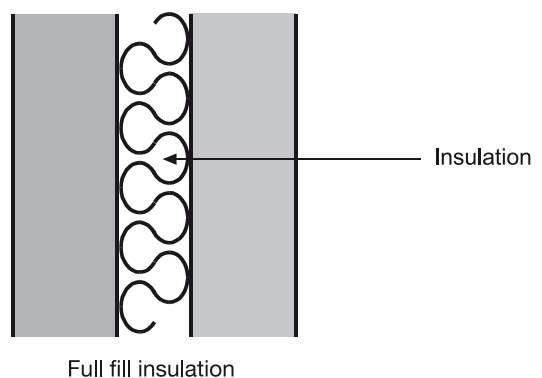
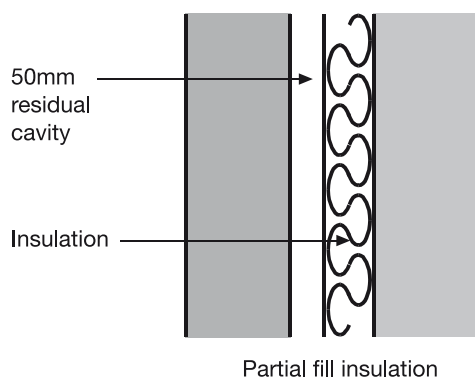
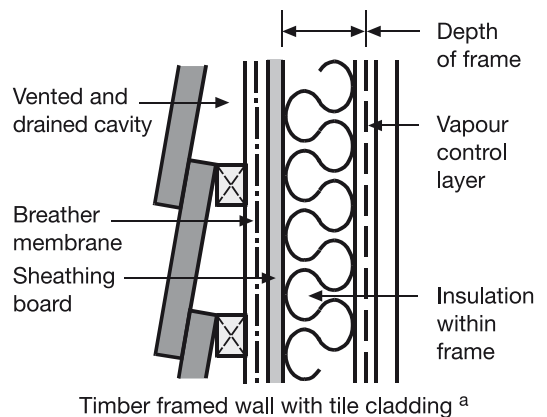
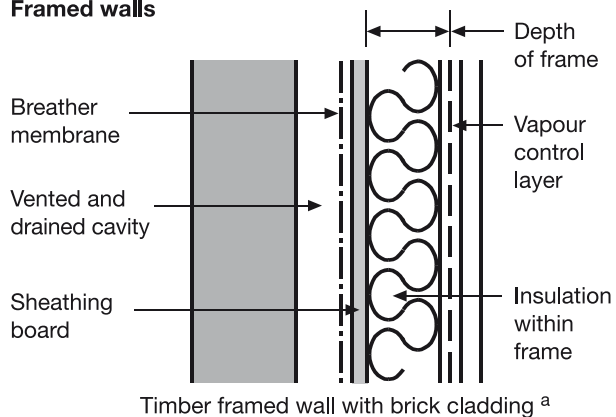
<sup>108</sup> BS 5628-3:2001 Code of practice for use of masonry. Materials and components, design and workmanship.

<sup>109</sup> BS 5617:1985 Specification for urea-formaldehyde (UF) foam systems suitable for thermal insulation of cavity walls with masonry or concrete inner and outer leaves.

<sup>110</sup> BS 5618:1985 Code of practice for thermal insulation of cavity walls (with masonry or concrete inner and outer leaves) by filling with urea-formaldehyde (UF) foam systems.

<sup>111</sup> BS 8208-1:1985 Guide to assessment of suitability of external cavity walls for filling with thermal insulation.

Diagram 11 Insulated external walls: examples (see paragraphs 5.10, 5.13 and 5.17)

**Solid walls****Cavity walls****Framed walls**

Note: a) In the case of light steel frame the insulation inside the cavity is placed over the frame.

Diagram 12 **UK zones for exposure to driving rain**

Table 4 Maximum recommended exposure zones for insulated masonry walls

Wall construction		Maximum recommended exposure zone for each construction						
Insulation method	Min. width of filled or clear cavity (mm)	Impervious cladding		Rendered finish		Facing masonry		
		Full height of wall	Above facing masonry	Full height of wall	Above facing masonry	Tooled flush joints	Recessed mortar joints	Flush sills and copings
<b>Built-in full fill</b>	50	4	3	3	3	2	1	1
	75	4	3	4	3	3	1	1
	100	4	4	4	3	3	1	2
	125	4	4	4	3	3	1	2
	150	4	4	4	4	4	1	2
<b>Injected fill not UF foam</b>	50	4	2	3	2	2	1	1
	75	4	3	4	3	3	1	1
	100	4	3	4	3	3	1	1
	125	4	4	4	3	3	1	2
	150	4	4	4	4	4	1	2
<b>Injected fill UF foam</b>	50	4	2	3	2	1	1	1
	75	4	2	3	2	2	1	1
	100	4	2	3	2	2	1	1
<b>Partial fill</b>								
Residual 50mm cavity	50	4	4	4	4	3	1	1
Residual 75mm cavity	75	4	4	4	4	4	1	1
Residual 100mm cavity	100	4	4	4	4	4	2	1
<b>Internal insulation</b>								
Clear cavity 50mm	50	4	3	4	3	3	1	1
Clear cavity 100mm	100	4	4	4	4	4	2	2
Fully filled cavity 50mm	50	4	3	3	3	2	1	1
Fully filled cavity 100mm	100	4	4	4	3	3	1	2

**5.16** If the map given in Diagram 12 is used, determine the national exposure and, where appropriate, apply the following modifiers:

- where local conditions accentuate wind effects, such as open hillsides or valleys where the wind is funnelled onto the wall, add one to this exposure zone value;
- where walls do not face into the prevailing wind, subtract one from this exposure zone value.

(The national exposure zone value can be more accurately calculated from the larger scale maps and correction factors given in BS 8104:1992<sup>112</sup>.)

<sup>112</sup> BS 8104:1992 Code of practice for assessing exposure of walls to wind-driven rain.

Determine the recommended constructions from the modified exposure zone values given in Table 4. Further guidance as to the use of this table is given in BRE Report 262<sup>113</sup>.

## FRAMED EXTERNAL WALLS

**5.17** Any framed external wall will meet the requirement if the cladding is separated from the insulation or sheathing by a vented and drained cavity with a membrane that is vapour open, but resists the passage of liquid water, on the inside of the cavity (see Diagram 11).

## CRACKING OF EXTERNAL WALLS

**5.18** Severe rain penetration may occur through cracks in masonry external walls caused by thermal movement in hot weather or subsidence after prolonged droughts. The possibility of this should be taken into account when designing a building. Detailed guidance is given in:

- BRE Building Elements: Walls, windows and doors<sup>114</sup>; and
- BRE Report 292<sup>115</sup>;
- Guidance for choice of materials is given in BS 5628-3:2001<sup>116</sup>.

## IMPERVIOUS CLADDING SYSTEMS FOR WALLS

**5.19** Cladding systems for walls should:

- resist the penetration of precipitation to the inside of the building; and
- not be damaged by precipitation and not carry precipitation to any part of the building which would be damaged by it.

**5.20** Cladding can be designed to protect a building from precipitation (often driven by the wind) either by holding it at the face of the building or by stopping it from penetrating beyond the back of the cladding.

**5.21** Any cladding will meet the requirement if:

- it is jointless or has sealed joints, and is impervious to moisture (so that moisture will not enter the cladding); or
- it has overlapping dry joints, is impervious or weather resisting, and is backed by a material which will direct precipitation which enters the cladding towards the outer face.

**5.22** Some materials can deteriorate rapidly without special care and they should only be used as the weather-resisting part of a cladding system if certain conditions are met (see Approved Document 7, Materials and workmanship). The weather-resisting part of a cladding system does not include paint nor does it include any coating, surfacing or rendering which will not itself provide all the weather resistance.

## Technical solution

**5.23** Cladding may be:

- impervious** including metal, plastic, glass and bituminous products; or
- weather resisting** including natural stone or slate, cement based products, fired clay and wood; or
- moisture resisting** including bituminous and plastic products lapped at the joints, if used as a sheet material, and permeable to water vapour unless there is a ventilated space directly behind the material; or
- jointless materials** and **sealed joints**, which would allow for structural and thermal movement.

**5.24** Dry joints between cladding units should be designed so that precipitation will not pass through them, or the cladding should be designed so that precipitation which enters the joints will be directed towards the exposed face without it penetrating beyond the back of the cladding.

**Note: Whether dry joints are suitable will depend on the design of the joint or the design of the cladding and the severity of the exposure to wind and rain.**

**5.25** Each sheet, tile and section of cladding should be securely fixed. Guidance as to appropriate fixing methods is given in BS 8000-6:1990<sup>117</sup>. Particular care should be taken with detailing and workmanship at the junctions between cladding and window and door openings as they are vulnerable to moisture ingress.

**5.26** Insulation can be incorporated into the construction provided it is either protected from moisture or unaffected by it.

**5.27** Where cladding is supported by timber components or is on the façade of a timber framed building, the space between the cladding and the building should be ventilated to ensure rapid drying of any water that penetrates the cladding.

<sup>113</sup> BRE Report BR 262 *Thermal insulation: avoiding risks*, 2002.

<sup>114</sup> BRE Report 352 *BRE Building elements: Walls, windows and doors*, 2002.

<sup>115</sup> BRE Report BR 292 *Cracking in buildings*, 1995.

<sup>116</sup> BS 5628-3:2001 Code of practice for use of masonry. Materials and components, design and workmanship.

<sup>117</sup> BS 8000-6:1990 Workmanship on building sites. Code of practice for slating and tiling of roofs and claddings.

## Alternative approach

**5.28** The requirement can also be met by following the relevant recommendations of:

- a. BS CP 143<sup>118</sup> for sheet roof and wall coverings made from the following materials:
  - Part 1:1958 Corrugated and troughed aluminium
  - Part 5:1964 Zinc
  - Part 10:1973 Galvanised corrugated steel
  - Part 12:1970 (1988) Copper
  - Part 15:1973 (1986) Aluminium
  - Part 16:1974 Semi-rigid asbestos bitumen sheets
 Recommendations for lead are included in BS 6915:2001<sup>119</sup>;
- b. BS 8219:2001<sup>120</sup>;
- c. BS 8200:1985<sup>121</sup>;
- d. BS 8297:2000<sup>122</sup>;
- e. BS 8298:1994<sup>123</sup>;
- f. MCRMA Technical Paper 6<sup>124</sup>;
- g. MCRMA Technical Paper 9<sup>125</sup>.

These documents describe the materials and contain design considerations including recommendations for fixing.

## JOINT BETWEEN DOORS AND WINDOWS

**5.29** The joint between walls and door and window frames should:

- a. resist the penetration of precipitation to the inside of the building; and
- b. not be damaged by precipitation and not permit precipitation to reach any part of the building which would be damaged by it.

**5.30** Damp-proof courses should be provided to direct moisture towards the outside:

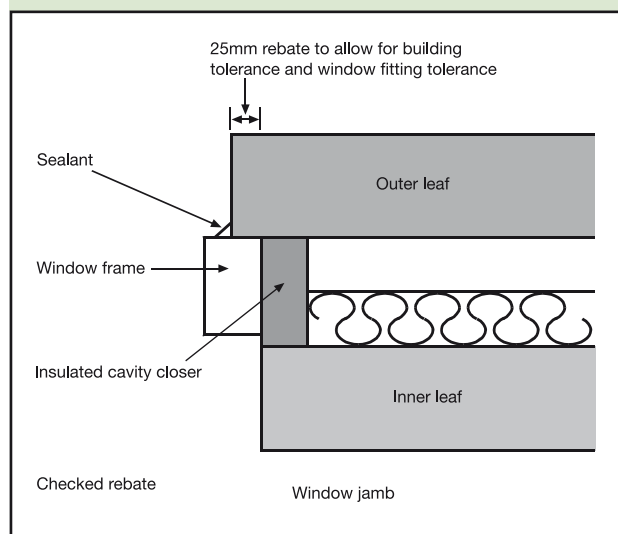
- a. where the downward flow of moisture would be interrupted at an obstruction, e.g. at a lintel;
- b. where sill elements, including joints, do not form a complete barrier to the transfer of precipitation, e.g. under openings, windows and doors;
- c. where reveal elements, including joints, do not form a complete barrier to the transfer of rain and snow, e.g. at openings, windows and doors.

**5.31** In some cases the width of the cavity due to thermal insulation and the 50mm clearance for drainage may be such that the window frame is not wide enough to completely cover the cavity closer. The reveal may need to be lined with plasterboard, dry lining, a support system or

a thermal backing board. Direct plastering of the internal reveal should only be used with a backing of expanded metal lathing or similar.

**5.32** In areas of the country in driving rain exposure zone 4 checked rebates should be used in all window and door reveals. The frame should be set back behind the outer leaf of masonry, which should overlap it as shown in Diagram 13. Alternatively an insulated finned cavity closer may be used.

**Diagram 13 Window reveals for use in areas of severe or very severe exposure to driving rain (see paragraph 5.32)**

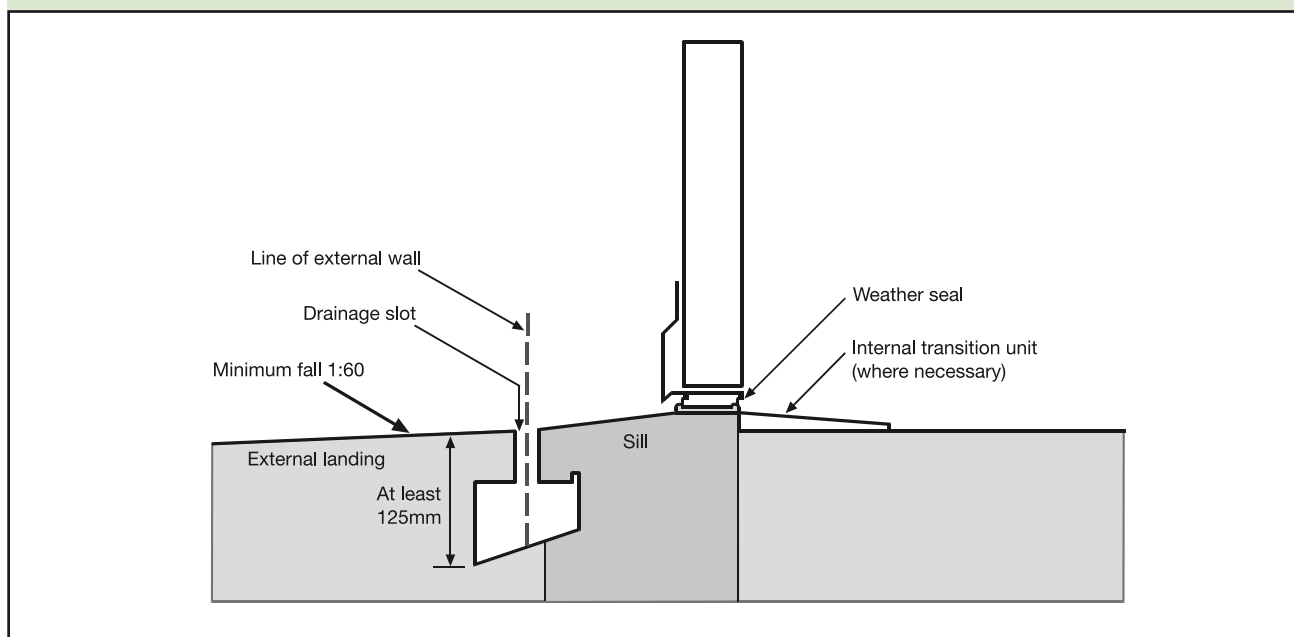


## DOOR THRESHOLDS

**5.33** Where an accessible threshold is provided to allow unimpeded access, as specified in Part M, Access to and use of buildings, it will meet the requirement if:

- <sup>118</sup> BS CP 143 Code of practice for sheet roof and wall coverings.
- <sup>119</sup> BS 6915:2001 Design and construction of fully supported lead sheet roof and wall coverings. Code of practice.
- <sup>120</sup> BS 8219:2001 Installation of sheet roof and wall coverings. Profiled fibre cement. Code of practice.
- <sup>121</sup> BS 8200:1985 Code of practice for the design of nonloadbearing external vertical enclosures of buildings.
- <sup>122</sup> BS 8297:2000 Code of practice for design and installation of non-loadbearing precast concrete cladding.
- <sup>123</sup> BS 8298:1994 Code of practice for design and installation of natural stone cladding and lining.
- <sup>124</sup> MCRMA Technical Paper 6 *Profiled metal roofing design guide*, revised edition, 1996.
- <sup>125</sup> MCRMA Technical Paper 9 *Composite roof and wall cladding panel design guide*, 1995.

Diagram 14 **Accessible threshold for use in exposed areas<sup>128</sup> (see paragraph 5.33)**



- a. the external landing (Diagram 14) is laid to a fall between 1 in 40 and 1 in 60 in a single direction away from the doorway;
  - b. the sill leading up to the door threshold has a maximum slope of 15°.
- b. the junctions between elements and details of openings, such as doors and windows, are designed to Accredited Construction Details<sup>99</sup>, or follow the guidance of BRE IP17/01<sup>132</sup>.

Further advice for the development of accessible thresholds is given in BRE GBG 47<sup>126</sup> and the TSO document<sup>127</sup>.

## EXTERNAL WALLS (RESISTANCE TO DAMAGE FROM INTERSTITIAL CONDENSATION)

**5.34** An external wall will meet the requirement if it is designed and constructed in accordance with Clause 8.3 of BS 5250:2002<sup>129</sup>, and BS EN ISO 13788:2002<sup>130</sup>.

**5.35** Because of the high internal temperatures and humidities, there is a particular risk of interstitial condensation in the walls of swimming pools and other buildings in which high levels of moisture are generated; specialist advice should be sought when these are being designed.

## EXTERNAL WALLS (RESISTANCE TO SURFACE CONDENSATION AND MOULD GROWTH)

**5.36** An external wall will meet the requirement if:

- a. it is designed and constructed so that the thermal transmittance (U-value) does not exceed 0.7W/m<sup>2</sup>K at any point; and

<sup>99</sup> Accredited Construction Details which can be downloaded from [www.planningportal.gov.uk/buildingregulations/approveddocuments/part1/bcassociateddocuments9/acd](http://www.planningportal.gov.uk/buildingregulations/approveddocuments/part1/bcassociateddocuments9/acd).

<sup>126</sup> BRE GBG 47 *Level external thresholds: reducing moisture penetration and thermal bridging*, 2001.

<sup>127</sup> *Accessible thresholds in new buildings: guidance for house builders and designers*, TSO, 1999.

<sup>128</sup> The drainage channel and adjacent paving and threshold are usually made up from precast concrete or other pre-formed components.

<sup>129</sup> BS 5250:2002 Code of practice for the control of condensation in buildings.

<sup>130</sup> BS EN ISO 13788:2002 Hygrothermal performance of building components and building elements. Internal surface temperature to avoid critical surface humidity and interstitial condensation. Calculation methods.

<sup>132</sup> BRE Information Paper IP17/01 *Assessing the effects of thermal bridging at junctions and around openings*, 2001.

## Section 6: Roofs

**6.1** This section gives guidance for three situations:

- roofs exposed to precipitation from the outside (see paragraphs 6.3 to 6.9);
- the risk of interstitial condensation in roofs (see paragraphs 6.10 to 6.13);
- the risk of condensation or mould growth on the internal surface of roofs (see paragraph 6.14).

**6.2** Roofs should:

- resist the penetration of precipitation to the inside of the building; and
- not be damaged by precipitation and not carry precipitation to any part of the building which would be damaged by it;
- be designed and constructed so that their structural and thermal performance are not adversely affected by interstitial condensation.

### ROOFS (RESISTANCE TO MOISTURE FROM THE OUTSIDE)

**6.3** Roofing can be designed to protect a building from precipitation either by holding the precipitation at the face of the roof or by stopping it from penetrating beyond the back of the roofing system.

**6.4** Any roof will meet the requirement if:

- it is jointless or has sealed joints, and is impervious to moisture (so that moisture will not enter the roofing system); or
- it has overlapping dry joints, is impervious or weather resisting, and is backed by a material which will direct precipitation which enters the roof towards the outer face (as with roofing felt).

**6.5** Some materials can deteriorate rapidly without special care and they should only be used as the weather-resisting part of a roof if certain conditions are met (see Approved Document 7, Materials and workmanship<sup>133</sup>). The weather-resisting part of a roofing system does not include paint nor does it include any coating, surfacing or rendering which will not itself provide all the weather resistance.

### Technical solution

**6.6** Roofing systems may be:

- impervious** including metal, plastic and bituminous products; or
- weather resisting** including natural stone or slate, cement based products, fired clay and wood; or

- moisture resisting** including bituminous and plastic products lapped at the joints, if used as a sheet material, and permeable to water vapour unless there is a ventilated space directly behind the material; or
- jointless materials** and **sealed joints**, which would allow for structural and thermal movement.

**6.7** Dry joints between roofing sheets should be designed so that precipitation will not pass through them, or the system should be designed so that precipitation which enters the joints will be drained away without penetrating beyond the back of the roofing system. **Note: Whether dry joints are suitable will depend on the design of the joint or the design of the roofing system and the severity of the exposure to wind and rain.**

**6.8** Each sheet, tile and section of roof should be fixed in an appropriate manner. Guidance as to appropriate fixing methods is given in BS 8000-6:1990<sup>134</sup>.

### Alternative approach

**6.9** The requirement can also be met by following the relevant recommendations of:

- BS CP 143<sup>135</sup> for sheet roof and wall coverings made from the following materials:

Part 1:1958 *Corrugated and troughed aluminium*

Part 5:1964 Zinc

Part 10:1973 Galvanized corrugated steel

Part 12:1970 (1988) Copper

Part 15:1973 (1986) Aluminium

Part 16:1974 Semi-rigid asbestos bitumen sheets.

Recommendations for lead are included in BS 6915:2001<sup>136</sup>;

- BS 8219:2001<sup>137</sup>;
- BS 8200:1985<sup>138</sup>;

<sup>133</sup> Approved Document 7: Materials and workmanship, DCLG, 2013 edition.

<sup>134</sup> BS 8000-6:1990 Workmanship on building sites. Code of practice for slating and tiling of roofs and claddings.

<sup>135</sup> BS CP 143 Code of practice for sheet roof and wall coverings.

<sup>136</sup> BS 6915:2001 Design and construction of fully supported lead sheet roof and wall coverings. Code of practice.

<sup>137</sup> BS 8219:2001 Installation of sheet roof and wall coverings. Profiled fibre cement. Code of practice.

<sup>138</sup> BS 8200:1985 Code of practice for the design of nonloadbearing external vertical enclosures of buildings.

- d. MCRMA Technical Paper 6<sup>139</sup>;
- e. MCRMA Technical Paper 9<sup>140</sup>.

These documents describe the materials and contain design considerations including recommendations for fixing.

## ROOFS (RESISTANCE TO DAMAGE FROM INTERSTITIAL CONDENSATION)

**6.10** A roof will meet the requirement if it is designed and constructed in accordance with Clause 8.4 of BS 5250:2002<sup>141</sup> and BS EN ISO 13788:2002<sup>142</sup>. Further guidance is given in the BRE Report BR 262<sup>143</sup>.

**6.11** The requirement will be met by the ventilation of cold deck roofs, i.e. those roofs where the moisture from the building can permeate the insulation. For the purposes of health and safety it may not always be necessary to provide ventilation to small roofs such as those over porches and bay windows. Although a part of a roof which has a pitch of 70° or more is to be insulated as though it were a wall, the provisions in this document apply to roofs of any pitch.

**6.12** To avoid excessive moisture transfer to roof voids gaps and penetrations for pipes and electrical wiring should be filled and sealed; this is particularly important in areas of high humidity, e.g. bathrooms and kitchens. An effective draught seal should be provided to loft hatches to reduce inflow of warm air and moisture.

**6.13** Because of the high internal temperatures and humidities, there is a particular risk of interstitial condensation in the roofs of swimming pools and other buildings in which high levels of moisture are generated; specialist advice should be sought when these are being designed.

## ROOFS (RESISTANCE TO SURFACE CONDENSATION AND MOULD GROWTH)

**6.14** A roof will meet the requirement if:

- a. it is designed and constructed so that the thermal transmittance (U-value) does not exceed 0.35W/m<sup>2</sup>K at any point; and
- b. the junctions between elements and the details of openings, such as windows, are designed to Accredited Construction Details<sup>99</sup>, or follow the guidance of BRE IP17/01<sup>145</sup> or MCRMA Paper 14<sup>146</sup> for profiled metal roofing.

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<sup>99</sup> Accredited Construction Details which can be downloaded from [www.planningportal.gov.uk/buildingregulations/approveddocuments/part1/bcassociateddocuments9/acd](http://www.planningportal.gov.uk/buildingregulations/approveddocuments/part1/bcassociateddocuments9/acd).

<sup>139</sup> MCRMA Technical Paper 6 *Profiled metal roofing design guide*, revised edition, 1996.

<sup>140</sup> MCRMA Technical Paper 9 *Composite roof and wall cladding panel design guide*, 1995.

<sup>141</sup> BS 5250:2002 Code of practice for the control of condensation in buildings.

<sup>142</sup> BS EN ISO 13788:2002 Hygrothermal performance of building components and building elements. Internal surface temperature to avoid critical surface humidity and interstitial condensation. Calculation methods.

<sup>143</sup> BRE Report BR 262 *Thermal insulation: avoiding risks*, 2002.

<sup>145</sup> BRE Information Paper IP17/01 *Assessing the effects of thermal bridging at junctions and around openings*, 2001.

<sup>146</sup> MCRMA Technical Paper 14 *Guidance for the design of metal roofing and cladding to comply with approved document L2:2001*, 2002.

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Guide to the principles of the conservation of historic buildings.
- <sup>14</sup> **BS EN 1997-2:2007:**  
Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing; with its UK National Annex to BS EN 1997-2:2007.
- <sup>21</sup> **BS 8103-1:2011**  
Structural design of low-rise buildings – Part 1: Code of practice for stability, site investigation, precast concrete floors and ground floor slabs for housing.
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Code of practice for site investigations.
- <sup>37</sup> **BS 10175:2011**  
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Specification for topsoil. AMD 9938 1998.
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Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier. AMD 14639 2003.
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Code of practice for protection of buildings against water from the ground. AMD 1551 1974, AMD 2196 1977, AMD 2470 1978.
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- <sup>90,102,104,107,108,116</sup> **BS 5628-3:2001**  
Code of practice for use of masonry. Materials and components, design and workmanship.
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Specification for direct surfaced wood chipboard based on thermosetting resins. AMD 8537 1995. (Withdrawn.)
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Code of practice for the control of condensation in buildings.
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- <sup>101</sup> **BS 8215:1991**  
Code of practice for design and installation of damp-proof courses in masonry construction.
- <sup>103,112</sup> **BS 8104:1992**  
Code of practice for assessing exposure of walls to wind-driven rain. AMD 8358 1995.
- <sup>105</sup> **BS EN 998-2:2003**  
Specification for mortar for masonry. Masonry mortar.
- <sup>106</sup> **BS 5262:1991**  
Code of practice for external renderings.
- <sup>109</sup> **BS 5617:1985**  
Specification for urea-formaldehyde (UF) foam systems suitable for thermal insulation of cavity walls with masonry or concrete inner and outer leaves.
- <sup>110</sup> **BS 5618:1985**  
Code of practice for thermal insulation of cavity walls (with masonry or concrete inner and outer leaves) by filling with urea-formaldehyde (UF) foam systems. AMD 6262 1990, AMD 7114 1992.
- <sup>111</sup> **BS 8208-1:1985**  
Guide to assessment of suitability of external cavity walls for filling with thermal insulants. Existing traditional cavity construction. AMD 4996 1985.
- <sup>117,134</sup> **BS 8000-6:1990**  
Workmanship on building sites. Code of practice for slating and tiling of roofs and claddings.
- <sup>118,135</sup> **CP 143-1:1958**  
Code of practice for sheet roof and wall coverings. Aluminium, corrugated and troughed. Amended by PD 4346 1961. (Obsolescent.)
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Design and construction of fully supported lead sheet roof and wall coverings. Code of practice.
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Installation of sheet roof and wall coverings. Profiled fibre cement. Code of practice.
- <sup>121,138</sup> **BS 8200:1985**  
Code of practice for the design of non-loadbearing external vertical enclosures of buildings.  
(Obsolescent.)
- <sup>122</sup> **BS 8297:2000**  
Code of practice for design and installation of non-loadbearing precast concrete cladding. AMD 11064 2000, AMD 13018 2000.
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Code of practice for design and installation of natural stone cladding and lining.

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<sup>47</sup> Report 132 *A guide for safe working on contaminated sites*, 1996. ISBN 0 86017 451 4

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HM Government

The Building Regulations 2010

## Toxic substances

D

### APPROVED DOCUMENT

#### D1 Cavity insulation

For use in England\*

1992 edition  
incorporating 2002,  
2010 and 2013  
amendments

## **MAIN CHANGES MADE BY THE 2010 AMENDMENTS**

The 2010 amendments reflect the changes made as a result of the Building Regulations 2010 and Building (Approved inspector etc) Regulations 2010. These were mainly regulation number changes as a result of re-ordering. There were no amendments to the substantive requirements in Schedule 1 (i.e. Parts A to P) of the Building Regulations.

## **CHANGES MADE BY THE 2013 AMENDMENTS**

The changes, which apply only to England\*, were to guidance on materials and workmanship.

There were no changes to Part D of Schedule 1 to the Building Regulations 2010.

\*This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No 2) Order 2009.

# Use of guidance

## THE APPROVED DOCUMENTS

The Building Regulations 2010 (SI 2010/2214), which came into operation on 1 October 2010, replace the Building Regulations 2000 (SI 2000/2531) and consolidate all subsequent revisions to those regulations. This document is one of a series that has been approved and issued by the Secretary of State for the purpose of providing practical guidance with respect to the requirements of Schedule 1 to and Regulation 7 of the Building Regulations 2010 for England and Wales.

**At the back of this document is a list of all the documents that have been approved and issued by the Secretary of State for this purpose.**

Approved Documents are intended to provide guidance for some of the more common building situations. However, there may well be alternative ways of achieving compliance with the requirements.

**Thus there is no obligation to adopt any particular solution contained in an Approved Document if you prefer to meet the relevant requirement in some other way.**

### Other requirements

The guidance contained in an Approved Document relates only to the particular requirements of the Regulations which the document addresses. The building work will also have to comply with the requirements of any other relevant paragraphs in Schedule 1 to the Regulations.

There are Approved Documents which give guidance on each of the parts of Schedule 1 and on Regulation 7.

## LIMITATION ON REQUIREMENTS

In accordance with Regulation 8, the requirements in Part D of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings).

## MATERIALS AND WORKMANSHIP

Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations shall be carried out in accordance with regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in Approved Document 7.

Building Regulations are made for specific purposes, primarily the health and safety, welfare and convenience of people and for energy conservation. Standards and other technical specifications may provide relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance or matters which, although they relate to health and safety etc., are not covered by the Building Regulations.

When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

### THE WORKPLACE (HEALTH, SAFETY AND WELFARE) REGULATIONS 1992

The Workplace (Health, Safety and Welfare) Regulations 1992 contain some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see: *Workplace health, safety and welfare. Workplace (Health, Safety and Welfare) Regulations 1992. Approved code of practice and guidance*, 1998. HSE, L 24. ISBN 0 71760 413 6.

The Workplace (Health, Safety and Welfare) Regulations 1992 apply to the common parts of flats and similar buildings if people such as cleaners and caretakers are employed to work in these common parts. Where the requirements of the Building Regulations that are covered by this part do not apply to dwellings, the provisions may still be required in the situations described above in order to satisfy the Workplace Regulations.

# The Requirement

This Approved Document deals with the following Requirement from Part D of Schedule 1 to the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>Cavity insulation</b>	
<b>D1.</b> If insulating material is inserted into a cavity in a cavity wall, reasonable precautions shall be taken to prevent the subsequent permeation of any toxic fumes from that material into any part of the building occupied by people.	

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## **Acceptable level of performance**

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To reduce the risks to the health of persons in buildings formaldehyde fumes given off by urea formaldehyde foams should not penetrate to the occupied parts of buildings to an extent which would give rise to an irritant concentration.

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# Provisions meeting the performance

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## Urea formaldehyde (UF) foam

**1.1** Insulating materials which give off formaldehyde fumes (either when used or later in normal use) may be used to insulate the cavity in a cavity wall where there is a continuous barrier which will minimise as far as practicable the passage of fumes to the occupiable parts.

### Technical solution

**1.2** A cavity wall may be insulated with UF foam where:

- a. the **inner leaf** of the wall is built of masonry (bricks or blocks); and
- b. the **suitability** of the wall for foam filling is assessed before the work is carried out in accordance with BS 8208-1:1985 Guide to assessment of suitability of external cavity walls for filling with thermal insulants. Existing traditional cavity construction; and
- c. the **person** carrying out the work holds (or operates under) a current Certificate of Registration of Assessed Capability for the work he is doing; and
- d. the **material** is in accordance with the relevant recommendations of BS 5617:1985 Specifications for urea formaldehyde (UF) foam systems suitable for thermal insulation of cavity walls with masonry or concrete inner and outer leaves; and
- e. the **installation** is in accordance with BS 5618:1985 Code of practice for thermal insulation of cavity walls (with masonry or concrete inner and outer leaves) by filling with urea formaldehyde (UF) foam systems.

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# Standards referred to

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**D1****BS 5617:1985**

Specification for urea formaldehyde (UF) foam systems suitable for thermal insulation of cavity walls with masonry or concrete inner and outer leaves.

**BS 5618:1985**

Code of practice for thermal insulation of cavity walls (with masonry or concrete inner and outer leaves) by filling with urea formaldehyde (UF) foam systems. AMD 6262 1990, AMD 7114 1992.

**BS 8208-1:1985**

Guide to assessment of suitability of external cavity walls for filling with thermal insulants. Existing traditional cavity construction. AMD 4996 1985.

The Building Regulations 2010  
The Building (Approved Inspections etc) Regulations 2010

## Resistance to the passage of sound



### APPROVED DOCUMENT

- E1** Protection against sound from other parts of the building and adjoining buildings
- E2** Protection against sound within a dwelling-house etc
- E3** Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes
- E4** Acoustic conditions in schools

**Regulation 41 The Building Regulations 2010**

**Regulation 20(1) and (5) The Building (Approved Inspections etc) Regulations 2010**

## MAIN CHANGES MADE TO THE 2003 EDITION BY INCORPORATING AMENDMENTS 2004†

This edition of Approved Document E, Resistance to the passage of sound, supersedes the original 2003 edition by incorporating the changes made by Amendments 2004 (issued in June 2004) to Approved Document E 2003. Minor corrections and clarifications have also been made, but there is no new information.

Part E in Schedule 1 to the Building Regulations 2000 (as amended) came into force on 1 July 2003. At the same time a new regulation 20A was introduced into the Building Regulations 2000, and a new regulation 12A was introduced into the Building (Approved Inspector etc) Regulations 2000. Regulations 20A and 12A introduced pre-completion testing for sound insulation as a means of demonstrating compliance. Pre-completion testing has applied to rooms for residential purposes, houses and flats formed by conversion of other buildings since 1 July 2003, and to new houses and flats from 1 July 2004. Also, from 1 July 2004, use of robust details in new houses and flats has been accepted as an alternative to pre-completion testing.

Robust details are high performance separating wall and floor constructions (with associated construction details) that are expected to be sufficiently reliable not to need the check provided by pre-completion testing.

The introduction of robust details has necessitated the amendment of regulations 20A and 12A. The amendments have been made by the Building (Amendment) Regulations 2004 and the Building (Approved Inspector etc) (Amendment) Regulations 2004. Regulations 20A and 12A were reproduced in Approved Document E, original 2003 Edition; and so amended versions have been included in this edition.

Section 0 of Approved Document E, original 2003 Edition, has been amended in this edition to explain the use of robust details and Annex E has been added for the same reason.

The original 2003 edition of Part E introduced a new class of dwelling known as a *room for residential purposes*, which covers hostel types of accommodation and hotel rooms. The expression 'room for residential purposes' is defined in Regulation 2 of the Building Regulations 2000 and the definition was reproduced in Approved Document E, 2003. However, the definition has been interpreted in different ways by building control bodies, particularly in respect of student halls of residence, and it has, therefore, been clarified, by means of the Building (Amendment) Regulations 2004, and the clarified version has been reproduced in this edition.

†On this page, references to the 2000 Regulations have not been updated to reflect changes in the 2010 Regulations.

## MAIN CHANGES MADE BY THE 2010 AMENDMENTS

The main changes reflect the Building Regulations 2010 and Building (Approved Inspectors etc.) Regulations 2010.

There were no changes to Part E of Schedule 1 to the Building Regulations 2010.

## MAIN CHANGES MADE BY THE 2013 AMENDMENTS

The main changes, which apply only to England\*, were to materials and workmanship.

There were no changes to Part E of Schedule 1 to the Building Regulations 2010.

## CHANGE MADE BY THE 2015 AMENDMENT

The change, which applies only to England\*, from 6 April 2015, is an update of the reference to standards for schools.

\*This Approved Document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions)(No 2) Order 2009.

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# Introduction to amendments 2004\*

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The current edition of Part E in Schedule 1 to the Building Regulations 2000 (as amended) came into force on 1 July 2003. At the same time a new Regulation 20A was introduced into the Building Regulations 2000, and a new Regulation 12A was introduced into the Building (Approved Inspectors, etc.) Regulations 2000. Regulations 20A and 12A introduced pre-completion testing for sound insulation as a means of demonstrating compliance. Pre-completion testing has applied to rooms for residential purposes, houses and flats formed by conversion of other buildings since 1 July 2003, and it will apply to new houses and flats from 1 July 2004. Also, from 1 July 2004, use of robust details in new houses and flats will be accepted as an alternative to testing.

Robust details are high performance separating wall and floor constructions (with associated construction details) that are expected to be sufficiently reliable not to need the check provided by pre-completion testing.

The introduction of robust details has necessitated the amendment of Regulations 20A and 12A. The amendments have been made by the Building (Amendment) Regulations 2004 and the Building (Approved Inspectors, etc.) (Amendment) Regulations 2004. Regulations 20A and 12A are reproduced in Approved Document E, 2003 Edition; and so amendments to that Approved Document are needed to pick up the changes.

Section 0 of Approved Document E, 2003 edition, has also been amended to explain the use of robust details.

The 2003 edition of Part E introduced a new class of dwelling known as a *room for residential purposes*, which covers hostel types of accommodation and hotel rooms. The expression 'room for residential purposes' is defined in Regulation 2 of the Building Regulations 2000 and the definition is reproduced in Approved Document E, 2003 Edition. However, the definition has been interpreted in different ways by building control bodies, particularly in respect of student halls of residence, and it has, therefore, been clarified, by means of the Building (Amendment) Regulations 2004.

A number of errors have been found in Approved Document E, 2003 Edition, and also some guidance that is unclear.

This Amendment document sets out the text of the amended regulations 20A and 12A, the clarified definition of *room for residential purposes*, and also amendments, corrections and clarifications to the text of Approved Document E, 2003 Edition. This document is approved by the Secretary of State from 1 July 2004.

**Buildings Division  
Office of the Deputy Prime Minister  
June 2004**

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\*On this page, references to the 2000 Regulations have not been updated to reflect changes in the 2010 Regulations.

# Use of guidance

## THE APPROVED DOCUMENTS

This document is one of a series that has been approved and issued by the Secretary of State for the purpose of providing practical guidance with respect to the requirements of Schedule 1 to, and Regulation 7 of, the Building Regulations 2010 (SI 2010/2214) for England and Wales.

**At the back of this document is a list of all the documents that have been approved and issued by the Secretary of State for this purpose.**

Approved Documents are intended to provide guidance for some of the more common building situations. However, there may well be alternative ways of achieving compliance with the requirements. Thus there is no obligation to adopt any particular solution contained in an Approved Document if you prefer to meet the relevant requirement in some other way.

### Other requirements

The guidance contained in an Approved Document relates only to the particular requirements of the Regulations which the document addresses. The building work will also have to comply with the requirements of any other relevant paragraphs in Schedule 1 to the Regulations.

There are Approved Documents which give guidance on each of the parts of Schedule 1 and on Regulation 7.

## LIMITATION ON REQUIREMENTS

In accordance with Regulation 8, the requirements in Parts A to D, F to K and N (except for paragraphs H2 and J7) of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings). This is one of the categories of purpose for which building regulations may be made.

Paragraphs H2 and J7 are excluded from Regulation 8 because they deal directly with prevention of the contamination of water. Parts E and M (which deal, respectively, with resistance to the passage of sound, and access and facilities for disabled people) are excluded from Regulation 8 because they address the welfare and convenience of building users. Part L is excluded from Regulation 8 because it addresses the conservation of fuel and power. All these matters are amongst the purposes, other than health and safety, that may be addressed by Building Regulations.

## MATERIALS AND WORKMANSHIP

### Materials and workmanship

Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations shall be carried out in accordance with regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in Approved Document 7.

Building Regulations are made for specific purposes, primarily the health and safety, welfare and convenience of people and for energy conservation. Standards and other technical specifications may provide relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance or matters which, although they relate to health and safety etc., are not covered by the Building Regulations.

When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

## THE WORKPLACE (HEALTH, SAFETY AND WELFARE) REGULATIONS 1992

The Workplace (Health, Safety and Welfare) Regulations 1992 contain some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see – *Workplace health, safety and welfare*. L24 *Workplace (Health, Safety and Welfare) Regulations 1992. Approved Code of Practice and Guidance*, 1998. ISBN 0 71760 413 6.

The Workplace (Health, Safety and Welfare) Regulations 1992 apply to the common parts of flats and similar buildings if people such as cleaners and caretakers are employed to work in these common parts. Where the requirements of the Building Regulations that are covered by this Part do not apply to dwellings, the provisions may still be required in the situations described above in order to satisfy the Workplace Regulations.



## The Requirements

This Approved Document, which took effect on 1 July 2003, deals with the Requirements of Part E of Schedule 1 to the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>Protection against sound from other parts of the building and adjoining buildings</b>	
<b>E1.</b> Dwelling-houses, flats and rooms for residential purposes shall be designed and constructed in such a way that they provide reasonable resistance to sound from other parts of the same building and from adjoining buildings.	
<b>Protection against sound within a dwelling-house etc.</b>	
<b>E2.</b> Dwelling-houses, flats and rooms for residential purposes shall be designed and constructed in such a way that: <ul style="list-style-type: none"> <li>(a) internal walls between a bedroom or a room containing a water closet, and other rooms; and</li> <li>(b) internal floors</li> </ul> provide reasonable resistance to sound.	Requirement E2 does not apply to: <ul style="list-style-type: none"> <li>(a) an internal wall which contains a door;</li> <li>(b) an internal wall which separates an en suite toilet from the associated bedroom;</li> <li>(c) existing walls and floors in a building which is subject to a material change of use.</li> </ul>
<b>Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes</b>	
<b>E3.</b> The common internal parts of buildings which contain flats or rooms for residential purposes shall be designed and constructed in such a way as to prevent more reverberation around the common parts than is reasonable.	
<b>Acoustic conditions in schools</b>	
<b>E4.</b> (1) Each room or other space in a school building shall be designed and constructed in such a way that it has the acoustic conditions and the insulation against disturbance by noise appropriate to its intended use.	
(2) For the purposes of this Part – ‘school’ has the same meaning as in Section 4 of the Education Act 1996 <sup>[4]</sup> ; and ‘school building’ means any building forming a school or part of a school.	
Requirement E3 only applies to corridors, stairwells, hallways and entrance halls which give access to the flat or room for residential purposes.	

[4] 1996 c.56. Section 4 was amended by Schedule 22 to the Education Act 1997 (c. 44).

**Attention is drawn to the following extracts from the Building Regulations 2010.**

**Interpretation (Regulation 2)** 'room for residential purposes' means a room, or a suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep and includes a room in a hostel, an hotel, a boarding house, a hall of residence or a residential home, but does not include a room in a hospital, or other similar establishment, used for patient accommodation.

**Meaning of material change of use (Regulation 5)**

For the purposes of paragraph 8 (1)(e) of Schedule 1 to the Act and for the purposes of these Regulations, there is a material change of use where there is a change in the purposes for which or the circumstances in which a building is used, so that after the change:

- a. the building is used as a dwelling, where previously it was not;
- b. the building contains a flat, where previously it did not;
- c. the building is used as an hotel or boarding house, where previously it was not;
- d. the building is used as an institution, where previously it was not;
- e. the building is used as a public building, where previously it was not;
- f. the building is not a building described in Classes 1 to 6 in Schedule 2, where previously it was;
- g. the building, which contains at least one dwelling, contains a greater or lesser number of dwellings than it did previously;
- h. the building contains a room for residential purposes, where previously it did not; or
- i. the building, which contains at least one room for residential purposes, contains a greater or lesser number of such rooms than it did previously.
- j. the building is used as a shop, where previously it was not.

**Requirements relating to material change of use (Regulation 6)**

1. Where there is a material change of use of the whole of a building, such work, if any, shall be carried out as is necessary to ensure that the building complies with the applicable requirements of the following paragraphs of Schedule 1:

- a. in all cases,
  - B1 (means of warning and escape)
  - B2 (internal fire spread – linings)
  - B3 (internal fire spread – structure)
  - B4(2) (external fire spread – roofs)

- B5 (access and facilities for the fire service)
  - C2(c) (interstitial and surface condensation)
  - F1 (ventilation)
  - G1 (cold water supply)
  - G3(1) to (3) (hot water supply and systems)
  - G4 (sanitary conveniences and washing facilities)
  - G5 (bathrooms)
  - G6 (kitchens and food preparation areas)
  - H1 (foul water drainage)
  - H6 (solid waste storage)
  - J1 to J4 (combustion appliances)
  - L1 (conservation of fuel and power – dwellings)
  - P1 (electrical safety);
- b. in the case of a material change of use described in Regulations 5(c),(d), (e) or (f), A1 to A3 (structure);
  - c. in the case of a building exceeding fifteen metres in height, B4(1) (external fire spread – walls);
  - d. in the case of a material change of use described in Regulation 5(a), (b), (c), (d), (g), (h), (i) or, where the material change of use provides new residential accommodation, (f), C1 (2) (resistance to contaminants);
  - e. in the case of material change of use described in Regulation 5(a), C2 (resistance to moisture);
  - f. in the case of a material change of use described in Regulation 5(a), (b), (c), (g), (h) or (i) E1 to E3;
  - g. in the case of a material change of use described in Regulation 5(e), where the public building consists of or contains a school, E4 (acoustic conditions in schools);
  - h. in the case of a material change of use described in regulation 5(a) or (b), G2 (water efficiency) and G3(4) (hot water supply and systems: hot water supply to fixed baths);
  - i. in the case of a material change of use described in regulation 5(c), (d), (e) or (j), M1 (access and use).

2. Where there is a material change of use of part only of a building, such work, if any, shall be carried out as is necessary to ensure that:

- a. that part complies in all cases with any applicable requirement referred to in paragraph (1)(a);
- b. in a case to which sub-paragraphs (b), (e), (f) or (g) of paragraph (1) apply, that part complies with the requirements referred to in the relevant sub-paragraphs;

- c. in the case to which sub-paragraph (c) of paragraph (1) applies, the whole building complies with the requirement referred to in that sub-paragraph; and
- d. in a case to which sub-paragraph (i) of paragraph (1) applies –
  - i. that part and any sanitary conveniences provided in or in connection with that part comply with the requirements referred to in that sub-paragraph; and
  - ii. the building complies with requirement M1(a) of Schedule 1 to the extent that reasonable provision is made to provide either suitable independent access to that part or suitable access through the building to that part.

### Sound insulation testing (Regulation 41)

#### 41.

1. Subject to paragraph (4) below, this regulation applies to:
  - a. building work in relation to which paragraph E1 of Schedule 1 imposes a requirement; and
  - b. work which is required to be carried out to a building to ensure that it complies with paragraph E1 of Schedule 1 by virtue of Regulation 6(1)(f) or 6(2)(b).
2. Where this Regulation applies, the person carrying out the work shall, for the purpose of ensuring compliance with paragraph E1 of Schedule 1:
  - a. ensure that appropriate sound insulation testing is carried out in accordance with a procedure approved by the Secretary of State; and
  - b. give a copy of the results of the testing referred to in sub-paragraph (a) to the local authority.
3. The results of testing referred to in paragraph (2)(a) shall be:
  - a. recorded in a manner approved by the Secretary of State; and
  - b. given to the local authority in accordance with paragraph (2)(b) not later than the date on which the notice required by regulation 16(4) is given.

4. Where building work consists of the erection of a dwelling-house or a building containing flats, this regulation does not apply to any part of the building in relation to which the person carrying out the building work notifies the local authority, not later than the date on which he gives notice of commencement of the work under Regulation 16(1), that for the purpose of achieving compliance of the work with paragraph E1 of Schedule 1 he is using one or more design details approved by Robust Details Limited<sup>(a)</sup>, provided that:

- a. the notification specifies:
  - i. the part or parts of the building in respect of which he is using the design detail;
  - ii. the design detail concerned; and
  - iii. the unique number issued by Robust Details Limited in respect of the specified use of that design detail; and
- b. the building work carried out in respect of the part or parts of the building identified in the notification is in accordance with the design detail specified in the notification.

**Attention is drawn to the following extract from the Building (Approved Inspectors etc.) Regulations 2010 (SI 2010/2215)**

### Sound insulation testing (Regulation 20(1) and (5))

#### Application of regulations 20, 27, 29, 37, 41, 42, 43 and 44 of the Principal

**20.**—(1) Regulations 20 (provisions applicable to self-certification schemes), 27 (CO<sub>2</sub> emission rate calculations), 29 (energy performance certificates), 37 (wholesome water consumption calculation), 41 (sound insulation testing), 42 (mechanical ventilation air flow rate testing), 43 (pressure testing) and 44 (commissioning) of the Principal Regulations apply in relation to building work which is the subject of an initial notice as if references to the local authority were references to the approved inspector.

(5) Regulation 41 of the Principal Regulations applies in relation to building work which is the subject of an initial notice as if –

- a. for paragraph (3)(b) there were substituted – “(b) given to the approved inspector in accordance with paragraph (2)(b) not later than five days after completion of the work to which the initial notice relates.”;
- b. for the words in paragraph (4) “not later than the date on which notice of commencement of the work is given under regulation 16(1)” there were substituted the words “prior to the commencement of the building work on site”.

<sup>(a)</sup> A company incorporated under the Companies Acts with the registration number 04980223.

**For the purposes of Approved Document E the following definitions apply:**

**‘Adjoining’:** Adjoining dwelling-houses, adjoining flats, adjoining rooms for residential purposes and adjoining buildings are those in direct physical contact with another dwelling-house, flat, room for residential purposes or building.

**‘Historic buildings’:** Historic buildings include:

- a. listed buildings
- b. buildings situated in conservation areas
- c. buildings which are of architectural and historical interest and which are referred to as a material consideration in a local authority’s development plan
- d. buildings of architectural and historical interest within national parks, areas of outstanding natural beauty, and world heritage sites
- e. vernacular buildings of traditional form and construction.

# Section 0: Performance

## Performance standards

**0.1** In the Secretary of State's view the normal way of satisfying Requirement E1 will be to build separating walls, separating floors, and stairs that have a separating function, together with the associated flanking construction, in such a way that they achieve the sound insulation values for dwelling-houses and flats set out in Table 1a, and the values for rooms for residential purposes (see definition in Regulation 2) set out in Table 1b. For walls that separate rooms for residential purposes from adjoining dwelling-houses and flats, the performance standards given in Table 1a should be achieved.

**0.2** Regulation 41 of the Building Regulations 2010 and Regulation 20(1) and (5) of the Building (Approved Inspectors, etc.) Regulations 2010 apply to building work to which Requirement E1 applies, and require appropriate sound insulation testing to be carried out. The exception is that, in the case of new-build houses and buildings containing flats, Regulations 41 and 20(1) and (5) do not apply to any relevant part of the building

where the design embodies a design detail or details from the set approved and published by Robust Details Ltd; a valid notification is given to the building control body; and the actual work complies with the detail or details specified in the notification. Subject to this exception, which is further explained in *Annex E: Design details approved by Robust Details Ltd*, Regulation 44 applies where building control is being carried out by a local authority, and Regulation 20(1) and (5) applies where it is being carried out by an Approved Inspector. The normal way of satisfying Regulation 41 or 20(1) and (5) will be to implement a programme of sound insulation testing according to the guidance set out in Section 1: Pre-completion testing, of this Approved Document. It is possible for a builder to opt to use design details approved by Robust Details Ltd in some only of the relevant separating structures in a new house or building containing flats, with the other relevant separating structures remaining subject to testing under Regulation 41 or 20(1) and (5). However, it is recommended that expert advice is taken to ensure compatibility of the constructions.

**Table 0.1a Dwelling-houses and flats – performance standards for separating walls, separating floors, and stairs that have a separating function**

	Airborne sound insulation sound insulation $D_{nT,w} + C_{tr}$ dB (Minimum values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum values)
<b>Purpose built dwelling-houses and flats</b>		
Walls	45	-
Floors and stairs	45	62
<b>Dwelling-houses and flats formed by material change of use</b>		
Walls	43	-
Floors and stairs	43	64

**Table 0.1b Rooms for residential purposes – performance standards for separating walls, separating floors, and stairs that have a separating function**

	Airborne sound insulation sound insulation $D_{nT,w} + C_{tr}$ dB (Minimum values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum values)
<b>Purpose built rooms for residential purposes</b>		
Walls	43	-
Floors and stairs	45	62
<b>Rooms for residential purposes formed by material change of use</b>		
Walls	43	-
Floors and stairs	43	64

**Table 0.2 Laboratory values for new internal walls and floors within dwelling-houses, flats and rooms for residential purposes, whether purpose built or formed by material change of use**

	Airborne sound insulation $R_w$ dB (Minimum values)
Walls	40
Floors	40

**0.3** The sound insulation testing should be carried out in accordance with the procedure described in Annex B of this Approved Document, which is the procedure formally approved by the Secretary of State for the purpose of paragraph (2)(a) of Regulation 41 and paragraph (2)(a) of Regulation 20(1) and (5). The results of the testing must be recorded in the manner described in paragraph 1.41 of Section 1 of this Approved Document, which is the manner approved by the Secretary of State for the purposes of paragraph (3)(a) of Regulation 41 and paragraph (3)(a) of Regulation 20(1) and (5). The test results must be given to the building control body in accordance with the time limits set down in Regulation 41 (for cases where building control is being done by the local authority) or Regulation 20(1) and (5) (in cases where it is being done by an Approved Inspector).

**0.4** The person carrying out the building work should arrange for sound insulation testing to be carried out by a test body with appropriate third party accreditation. Test bodies conducting testing should preferably have UKAS accreditation (or a European equivalent) for field measurements. The DCLG also regards members of the ANC Registration Scheme as suitably qualified to carry out pre-completion testing.

**0.5** Sections 2, 3, 4 and 6 of this Approved Document give examples of constructions which, if built correctly, should achieve the sound insulation values for dwelling-houses and flats set out in Table 1a, and the values for rooms for residential purposes set out in Table 1b. The guidance in these sections is not exhaustive and other designs, materials or products may be used to achieve the required performance.

**0.6** Buildings constructed from sub-assemblies that are delivered newly made or selected from stock are no different from any other new building and must comply with all requirements in Schedule 1 of the Building Regulations 2010. In some applications, such as buildings that are constructed to be temporary dwelling-houses, flats, rooms for residential purposes, or school buildings, the provision of reasonable resistance to the passage of sound may vary depending upon the circumstances in the particular case. For example, (a) a building created by dismantling, transporting and re-erecting the sub-assemblies

on the same premises would normally be considered to meet the requirements, (b) a building constructed from sub-assemblies obtained from other premises or from stock manufactured before 1 July 2003 would normally be considered to meet the requirements if it satisfies the relevant requirements of Part E that were applicable in 1992 or, for school buildings, the relevant provisions relating to acoustics set out in the 1997 edition of Building Bulletin 87 (ISBN 011271013 1).

**0.7** In the case of some historic buildings undergoing a material change of use, it may not be practical to improve the sound insulation to the standards set out in Tables 1a and 1b. The need to conserve the special characteristics of such historic buildings needs to be recognised<sup>1</sup>, and in such work, the aim should be to improve sound insulation to the extent that it is practically possible, always provided that the work does not prejudice the character of the historic building, or increase the risk of long-term deterioration to the building fabric or fittings. In arriving at an appropriate balance between historic building conservation and improving sound insulation it would be appropriate to take into account the advice of the local planning authority's conservation officer. In such cases it will be reasonable to improve the sound insulation as much as is practical, and to affix a notice showing the sound insulation value(s) obtained by testing in accordance with Regulation 41 or 20(1) and (5), in a conspicuous place inside the building.

**0.8** The performance standards set out in Tables 1a and 1b are appropriate for walls, floors and stairs that separate spaces used for normal domestic purposes. A higher standard of sound insulation may be required between spaces used for normal domestic purposes and communal or non-domestic purposes. In these situations the appropriate level of sound insulation will depend on the noise generated in the communal or non-domestic space. Specialist advice may be needed to establish if a higher standard of sound insulation is required and, if so, to determine the appropriate level.

<sup>1</sup> BS 7913 *The principles of the conservation of historic buildings*, 1998 provides guidance on the principles that should be applied when proposing work on historic buildings.

**0.9** In the Secretary of State's view the normal way of satisfying Requirement E2 will be to use constructions for new walls and floors within a dwelling-house, flat or room for residential purposes (including extensions), that provide the laboratory sound insulation values set out in Table 2. Test bodies conducting testing should preferably have UKAS accreditation (or a European equivalent) for laboratory measurements. It is not intended that performance should be verified by testing on site.

**0.10** Section 5 gives examples of constructions that should achieve the laboratory values set out in Table 2. The guidance in these sections is not exhaustive and other designs, materials or products may be used to achieve the required performance.

**0.11** In the Secretary of State's view the normal way of satisfying Requirement E3 will be to apply the sound absorption measures described in Section 7 of this Approved Document, or other measures of similar effectiveness.

**0.12** In the Secretary of State's view the normal way of satisfying Requirement E4 will be to meet the values for sound insulation, reverberation time and indoor ambient noise which are given in Building Bulletin 93 *Acoustic design of schools: performance standards*, published by the Department for Education and available on the internet at [www.gov.uk](http://www.gov.uk).

**0.13** Diagrams 0.1 to 0.3 illustrate the relevant parts of the building that should be protected from airborne and impact sound in order to satisfy Requirements E1 and E2.

Diagram 0.1 Requirement E1

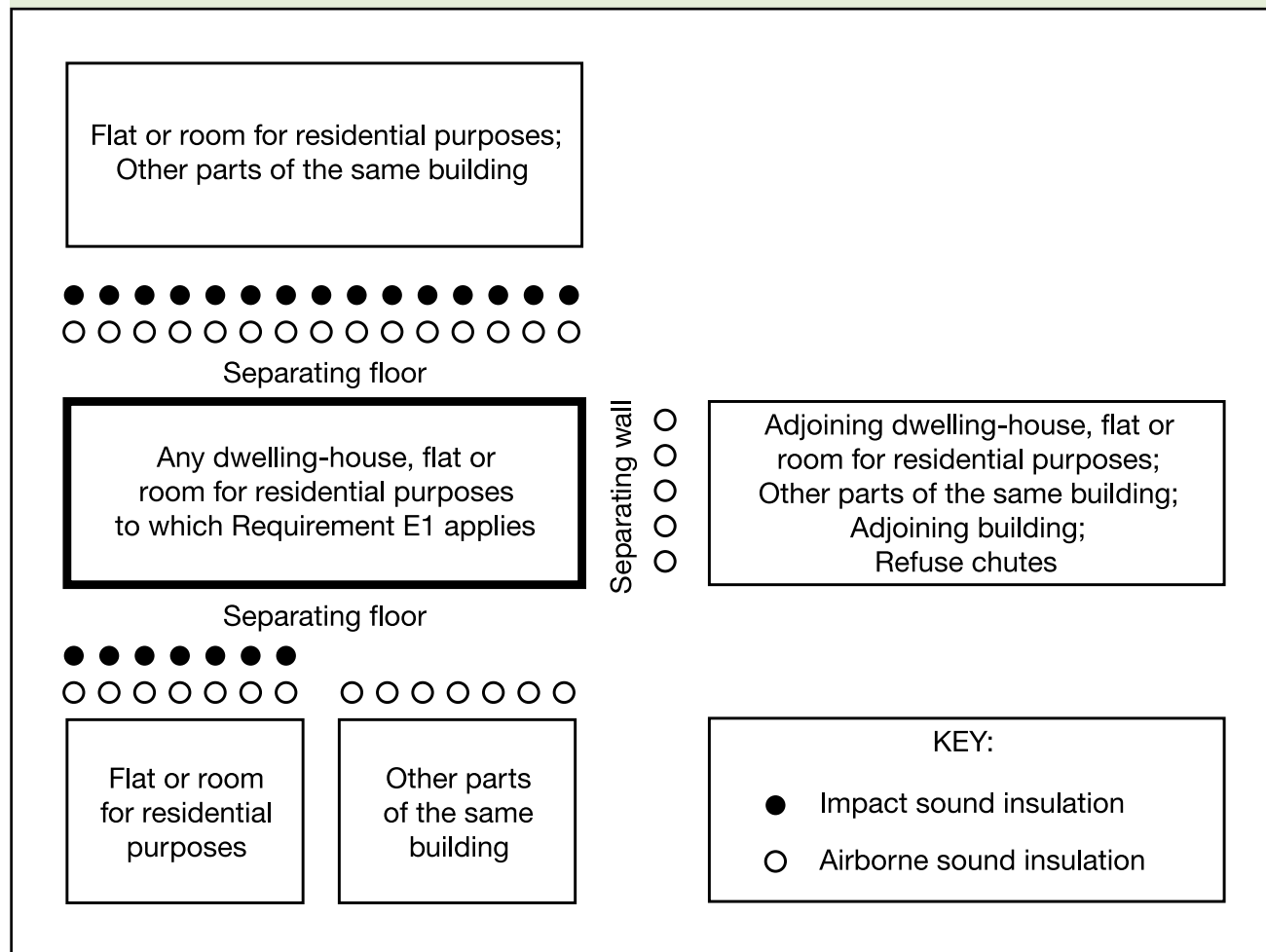


Diagram 0.2 Requirement E2(a)

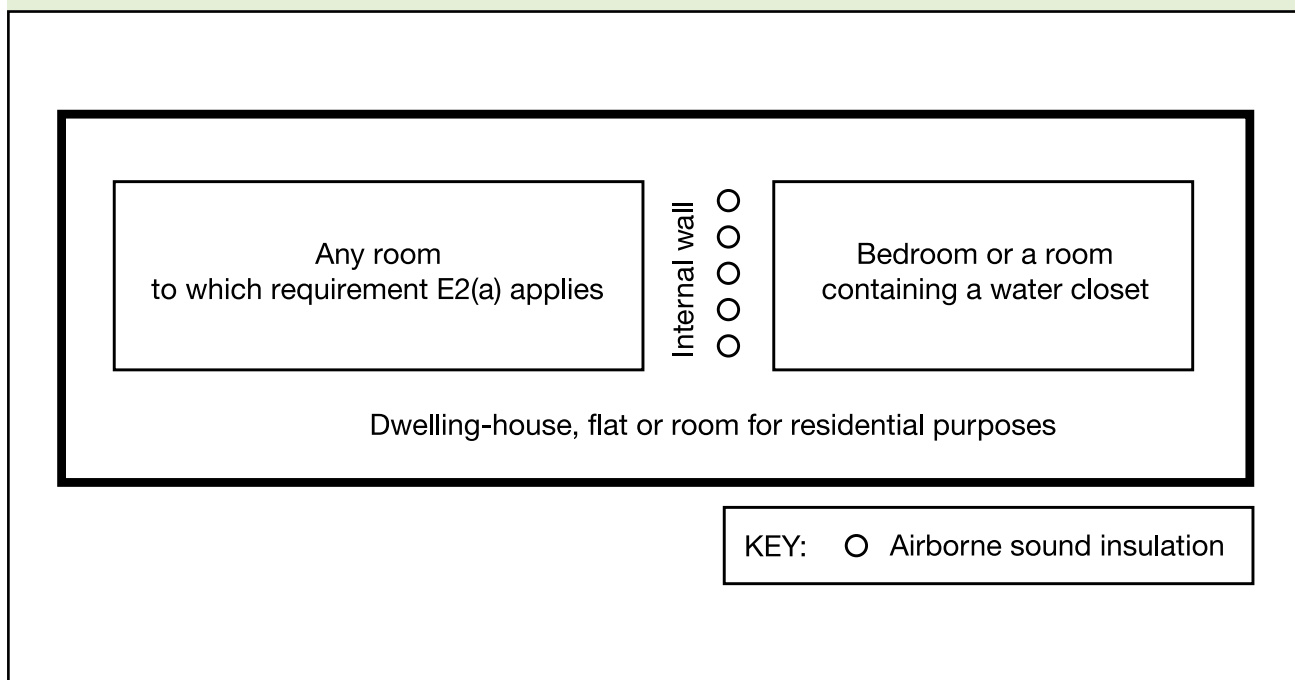
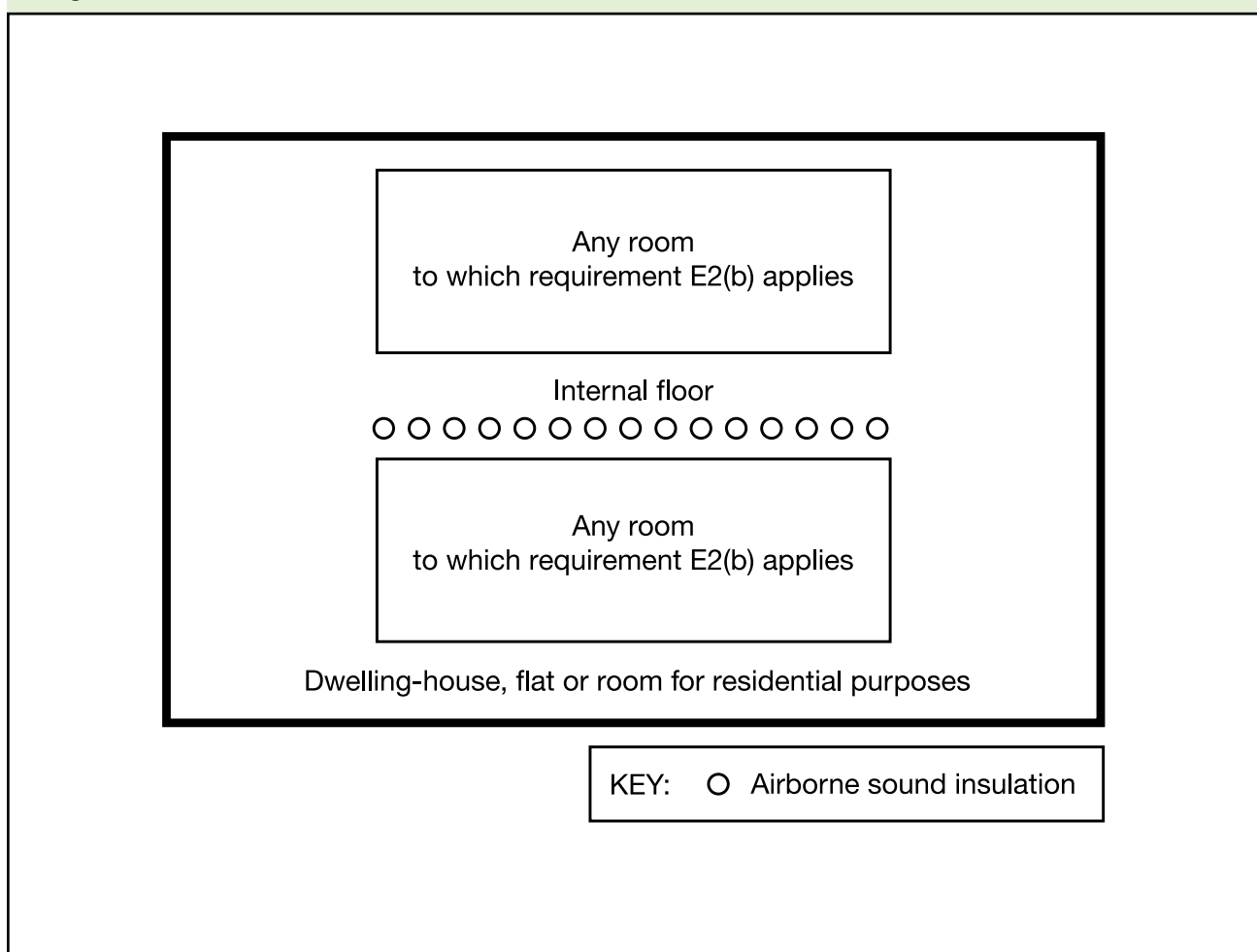


Diagram 0.3 Requirement E2(b)



# Section 1: Pre-completion testing

## Introduction

**1.1** This section provides guidance on an appropriate programme of sound insulation testing for a sample of properties, under Regulation 41 of the Building Regulations and Regulation 20(1) and (5) of the Approved Inspectors Regulations.

**1.2** Sound insulation testing to demonstrate compliance with Requirement E1 should be carried out on site as part of the construction process, and in this Approved Document it is referred to as pre-completion testing. Under Regulation 41 and Regulation 20(1) and (5), the duty of ensuring that appropriate sound insulation testing is carried out falls on the person carrying out the building work, who is also responsible for the cost of the testing. Therefore, the guidance in this section is addressed in the first place to persons carrying out the work (and to testing bodies employed by them). However, it is also addressed to building control bodies, as the Secretary of State expects building control bodies to determine, for each relevant development, the properties selected for testing.

**1.3** Testing should be carried out for:

- a. purpose built dwelling-houses and flats;
- b. dwelling-houses and flats formed by material change of use;
- c. purpose built rooms for residential purposes;
- d. rooms for residential purposes formed by material change of use.

**1.4** The normal programme of testing is described in paragraphs 1.29 to 1.31.

**1.5** The testing procedure formally approved by the Secretary of State is described in Annex B: Procedures for sound insulation testing.

**1.6** The performance standards that should be demonstrated by pre-completion testing are set out in Section 0: Performance – Tables 1a and 1b. The sound insulation values in these tables have a built-in allowance for measurement uncertainty, so if any test shows one of these values not to have been achieved by any margin, the test has been failed.

**1.7** The person carrying out the building work should ensure that the guidance on construction given in this Approved Document, or in another suitable source, is followed properly to minimise the chances of a failed test. Where additional guidance is required, specialist advice on the building design should be sought at an early stage.

**1.8** Testing should not be carried out between living spaces and: corridors, stairwells or hallways.

**1.9** Tests should be carried out between rooms or spaces that share a common area of separating wall or separating floor.

**1.10** Tests should be carried out once the dwelling-houses, flats or rooms for residential purposes either side of a separating element are essentially complete, except for decoration. Impact sound insulation tests should be carried out without a soft covering (e.g. carpet, foam backed vinyl) on the floor. For exceptions and further information on floor coverings and testing see Annex B: paragraphs B2.13 and B2.14.

## Grouping

**1.11** The results of tests only apply to the particular constructions tested but are indicative of the performance of others of the same type in the same development. Therefore, in order for meaningful inferences to be made from tests, it is essential that developments are considered as a number of notional groups, with the same construction type within each group.

**1.12** Grouping should be carried out according to the following criteria. Dwelling-houses (including bungalows), flats and rooms for residential purposes should be considered as three separate groups. In addition, if significant differences in construction type occur within any of these groups, sub-groups should be established accordingly.

**1.13** The following guidance should allow suitable sub-grouping in most circumstances.

## Sub-grouping for new buildings

**1.14** For dwelling-houses (including bungalows), sub-grouping should be by type of separating wall. For flats, sub-grouping should be by type of separating floor and type of separating wall. Rooms for residential purposes should be grouped using similar principles.

**1.15** The construction of flanking elements (e.g. walls, floors, cavities) and their junctions are also important. Where there are significant differences between flanking details, further sub-grouping will be necessary.

**1.16** Sub-grouping may not be necessary for dwelling-houses, flats and rooms for residential purposes that have the same separating wall and/or separating floor construction, with the same associated flanking construction(s), and where the room dimensions and layouts are broadly similar.

**1.17** Some dwelling-houses, flats or rooms for residential purposes may be considered to have unfavourable features: an example could be flats with large areas of flanking wall without a window at the gable end. It would be inappropriate for these to be included as part of a group and these should form their own sub-group(s).

## Sub-grouping for material change of use

**1.18** The same principles as for new buildings apply, but in practice significant differences are more likely to occur between separating wall and/or separating floor constructions as well as the associated flanking construction(s) in a development. More sub-groups may therefore be required, and group sizes may be smaller. Building control bodies should exercise judgement when setting up sub-groups.

## Sets of tests in dwelling-houses (including bungalows)

**1.19** Normally, one set of tests should comprise two individual sound insulation tests (two airborne tests):

- A test of insulation against airborne sound between one pair of rooms (where possible suitable for use as living rooms) on opposite sides of the separating wall.
- A test of insulation against airborne sound between another pair of rooms (where possible suitable for use as bedrooms) on opposite sides of the separating wall.

## Sets of tests in flats with separating floors but without separating walls

**1.20** Normally, one set of tests should comprise four individual sound insulation tests (two airborne tests, two impact tests):

- Tests of insulation against both airborne and impact sound between one pair of rooms (where possible suitable for use as living rooms) on opposite sides of the separating floor.
- Tests of insulation against both airborne and impact sound between another pair of rooms (where possible suitable for use as bedrooms) on opposite sides of the separating floor.

## Sets of tests in flats with a separating floor and a separating wall

**1.21** Normally, one set of tests should comprise six individual sound insulation tests (four airborne tests, two impact tests):

- A test of insulation against airborne sound between one pair of rooms (where possible suitable for use as living rooms) on opposite sides of the separating wall.
- A test of insulation against airborne sound between another pair of rooms (where possible suitable for use as bedrooms) on opposite sides of the separating wall.
- Tests of insulation against both airborne and impact sound between one pair of rooms (where possible suitable for use as living rooms) on opposite sides of the separating floor.

- Tests of insulation against both airborne and impact sound between another pair of rooms (where possible suitable for use as bedrooms) on opposite sides of the separating floor.

**1.22** To conduct a full set of tests, access to at least three flats will be required.

## Types of rooms for testing

**1.23** It is preferable that each set of tests contains individual tests in bedrooms and living rooms.

**1.24** Where pairs of rooms on either side of the separating element are different (e.g. a bedroom and a study, a living room and a bedroom), at least one of the rooms in one of the pairs should be a bedroom and at least one of the rooms in the other pair should be a living room.

**1.25** Where the layout has only one pair of rooms on opposite sides of the entire area of separating wall or floor between two dwelling-houses, flats or rooms for residential purposes then the number of airborne and impact sound insulation tests set out in paragraphs 1.19 to 1.21 may be reduced accordingly.

**1.26** The approved procedure described in Annex B includes requirements relating to rooms.

## Sets of tests in rooms for residential purposes

**1.27** To conduct a set of tests, the sound insulation between the main rooms should be measured according to the principles set out in this section for new buildings and material change of use, but adapting them to suit the circumstances.

## Properties sold before fitting out

**1.28** Some properties, for example loft apartments, may be sold before being fitted out with internal walls and other fixtures and fittings. Measurements of sound insulation should be made between the available spaces, according to the principles set out in this section. Steps should be taken to ensure that fitting out will not adversely affect the sound insulation. Some guidance on internal wall and floor constructions is given in Section 5. Junction details between these internal walls and floors and separating walls and floors are described in Sections 2 and 3.

## Normal programme of testing

**1.29** Building control bodies should consult with developers on likely completion times on site, and ask for one set of tests to be carried out between the first dwelling-houses, flats or rooms for residential purposes scheduled for completion and/or sale in each group or sub-group. This applies regardless of the intended size of the group or sub-group. Therefore if a site comprises only one pair of dwelling-houses, flats or rooms for residential purposes, they should be tested.

**1.30** As further properties on a development become ready for testing, building control bodies should indicate at what point(s) they wish any further set(s) of tests to be conducted. Assuming no tests are failed, building control bodies should stipulate at least one set of tests for every ten dwelling-houses, flats or rooms for residential purposes in a group or sub-group.

**1.31** Testing should be conducted more frequently at the beginning of a series of completions than towards the end, to allow any potential problems to be addressed at an early stage. However, on large developments testing should be carried out over a substantial part of the construction period.

### **Action following a failed set of tests**

**1.32** A set of tests is failed if any of its individual tests of airborne or impact sound insulation do not show sound insulation values equal to or better than those set out in Section 0: Performance – Tables 1a and 1b.

**1.33** In the event of a failed set of tests, appropriate remedial treatment should be applied to the rooms that failed the test.

**1.34** A failed set of tests raises questions over the sound insulation between other rooms sharing the same separating element in the dwelling-houses, flats or rooms for residential purposes in which the tests were conducted. The developer should demonstrate to the building control body's satisfaction that these rooms meet the performance standards. Normally this would be done by (a) additional testing, and/or (b) applying the appropriate remedial treatment to the other rooms and/or (c) demonstrating that the cause of failure does not occur in other rooms.

**1.35** A failed set of tests raises questions over properties between which tests have not been carried out. The developer should demonstrate to the building control body's satisfaction that such properties meet the performance standards. Once a dwelling-house, flat or room for residential purposes is occupied, any action affecting it should be a matter for local negotiation.

**1.36** After a failed set of tests, the rate of testing should be increased until the building control body is satisfied that the problem has been solved.

### **Remedial treatment**

**1.37** Appropriate remedial treatment should be applied following a failed set of tests. It is essential that remedial work is appropriate to the cause of failure. Guidance is available in BRE Information Paper IP 14/02.

**1.38** Where the cause of failure is attributed to the construction of the separating and/or associated flanking elements, other rooms that have not been tested may also fail to meet the performance standards. Therefore, remedial treatment may be needed in rooms other than those in which the tests were conducted.

**1.39** Where remedial treatment has been applied, the building control body should be satisfied with its efficacy. Normally this will be assessed through additional sound insulation testing.

### **Material change of use**

**1.40** As stated in Section 0, in the case of some historic buildings undergoing a material change of use, it may not always be practical to achieve the sound insulation values set out in Section 0: Performance – Tables 1a and 1b. However, in such cases building control bodies should be satisfied that everything reasonable has been done to improve the sound insulation. Tests should be carried out, and the results displayed as indicated in Section 0, paragraph 0.7.

### **Approved manner of recording pre-completion testing results**

**1.41** In order to satisfy the requirements of paragraph (3)(a) of Regulation 41 or Regulation 20(1) and (5), the test report of a set of tests (where set of tests has the meaning given in paragraphs 1.19–1.21 and 1.27) must contain at least the following information, in the order below:

1. Address of building.
2. Type(s) of property. Use the definitions in Regulation 2: dwelling-house, flat, room for residential purposes. State if the building is a historic building (see definition in the section on Requirements of this Approved Document).
3. Date(s) of testing.
4. Organisation carrying out testing, including:
  - a. name and address;
  - b. third party accreditation number (e.g. UKAS or European equivalent);
  - c. name(s) of person(s) in charge of test;
  - d. name(s) of client(s).

5. A statement (preferably in a table) giving the following information:
  - a. the rooms used for each test within the set of tests;
  - b. the measured single-number quantity ( $D_{nT,w} + C_{tr}$  for airborne sound insulation and  $L'_{nT,w}$  for impact sound insulation) for each test within the set of tests;
  - c. the sound insulation values that should be achieved according to the values set out in Section 0: Performance – Table 1a or 1b; and
  - d. an entry stating 'Pass' or 'Fail' for each test within the set of tests according to the sound insulation values set out in Section 0: Performance – Table 1a or 1b.
6. Brief details of test, including:
  - a. equipment;
  - b. a statement that the test procedures in Annex B have been followed. If the procedure could not be followed exactly then the exceptions should be described and reasons given;
  - c. source and receiver room volumes (including a statement on which rooms were used as source rooms);
  - d. results of tests shown in tabular and graphical form for third octave bands according to the relevant part of the BS EN ISO 140 series and BS EN ISO 717 series, including:
    - i. single-number quantities and the spectrum adaptation terms;
    - ii.  $D_{nT}$  and  $L'_{nT}$  data from which the single-number quantities are calculated.

# Section 2: Separating walls and associated flanking constructions for new buildings

## Introduction

**2.1** This section gives examples of wall types which, if built correctly, should achieve the performance standards set out in Section 0: Performance – Table 1a.

**2.2** The guidance in this section is not exhaustive and other designs, materials or products may be used to achieve the performance standards set out in Section 0: Performance – Table 1a. Advice should be sought from the manufacturer or other appropriate source.

**2.3** The walls are grouped into four main types. See Diagram 2.1.

**2.4 Wall type 1: Solid masonry**

The resistance to airborne sound depends mainly on the mass per unit area of the wall.

**2.5 Wall type 2: Cavity masonry**

The resistance to airborne sound depends on the mass per unit area of the leaves and on the degree of isolation achieved. The isolation is affected by connections (such as wall ties and foundations) between the wall leaves and by the cavity width.

**2.6 Wall type 3: Masonry between independent panels**

The resistance to airborne sound depends partly on the type and mass per unit area of the core, and partly on the isolation and mass per unit area of the independent panels.

**2.7 Wall type 4: Framed walls with absorbent material**

The resistance to airborne sound depends on the mass per unit area of the leaves, the isolation of the frames, and the absorption in the cavity between the frames.

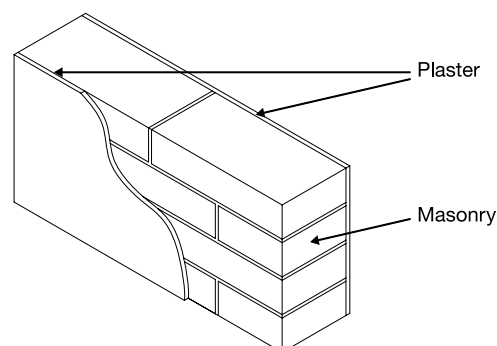
**2.8** Within each wall type the constructions are ranked, as far as possible, with constructions providing higher sound insulation given first.

## Junctions between separating walls and other building elements

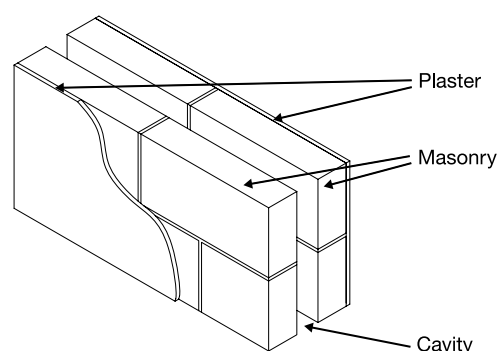
**2.9** In order for the construction to be fully effective, care should be taken to correctly detail the junctions between the separating wall and other elements, such as floors, roofs, external walls and internal walls. Recommendations are also given for the construction of these elements, where it is necessary to control flanking transmission. Notes and diagrams explain the junction details for each of the separating wall types.

**2.10** Table 2.1 indicates the inclusion of guidance in this document on the junctions that may occur between each of the four separating wall types and various attached building elements.

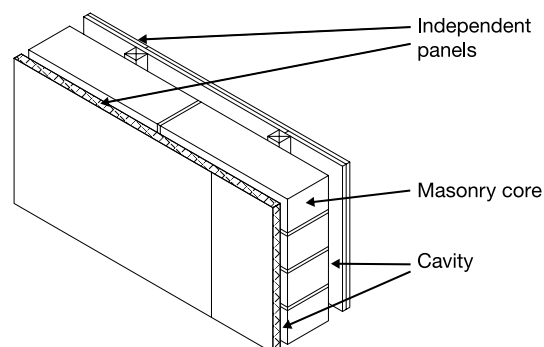
Diagram 2.1 Types of separating wall



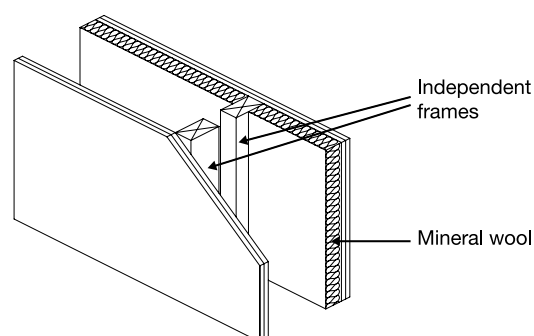
(a) Wall type 1



(b) Wall type 2



(c) Wall type 3



(d) Wall type 4

**Table 2.1 Separating wall junctions reference table**

Building element attached to separating wall	Separating wall type			
	Type 1	Type 2	Type 3	Type 4
External cavity wall with masonry inner leaf	G	G	G	N
External cavity wall with timber frame inner leaf	G	G	G	G
External solid masonry wall	N	N	N	N
Internal wall – framed	G	G	G	G
Internal wall – masonry	G	G	X	G
Internal floor – timber	G	G	G	G
Internal floor – concrete	G	G	G	N
Ground floor – timber	G	G	G	G
Ground floor – concrete	G	G	G	G
Ceiling and roof space	G	G	G	G
For flats the following may also apply:	<i>See Guidance in Section 3, Separating floors and associated flanking constructions for new buildings</i>			
Separating floor type 1 – concrete base with ceiling and soft floor covering				
Separating floor type 2 – concrete base with ceiling and floating floor				
Separating floor type 3 – timber frame base with ceiling and platform floor				

Key: G = guidance available; N = no guidance available (seek specialist advice); X = do not build

**Note:**

Where any building element functions as a separating element (e.g. a ground floor that is also a separating floor for a basement flat) then the separating element requirements should take precedence.

## Mass per unit area of walls

**2.11** The mass per unit area of a wall is expressed in kilograms per square metre (kg/m<sup>2</sup>). The method for calculating mass per unit area is shown in Annex A.

**2.12** The density of the materials used (and on which the mass per unit area of the wall depends) is expressed in kilograms per cubic metre (kg/m<sup>3</sup>). When calculating the mass per unit area for bricks and blocks use the density at the appropriate moisture content from Table 3.2, CIBSE Guide A (1999).

**2.13** The guidance describes constructions that use blocks without voids. For blocks with voids, seek advice from the manufacturer.

## Plasterboard linings on separating and external masonry walls

**2.14** The guidance describes some constructions with only wet finishes. For dry finishes, seek advice from the manufacturer.

**2.15** Wherever plasterboard is recommended, or the finish is not specified, a drylining laminate of plasterboard with mineral wool may be used. For other drylining laminates, seek advice from the manufacturer.

**2.16** Plasterboard linings should be fixed according to manufacturer's instructions.

## Cavity widths in separating cavity masonry walls

**2.17** Recommended cavity widths are minimum values.

## Walls ties in separating and external cavity masonry walls

**2.18** Suitable wall ties for use in masonry cavity walls are indicated in the guidance by reference to either tie type A or B.

### 2.19 Tie type A

Connect the leaves of a cavity masonry wall only where necessary by butterfly ties as described in BS 1243:1978 Metal ties for cavity wall construction, and spaced as required for structural purposes (BS 5628-3:2001 *Code of practice for use of masonry. Materials and components, design and workmanship*, which limits this tie type and spacing to cavity widths of 50mm to 75mm with a minimum masonry leaf thickness of 90mm). Alternatively, use wall ties with an appropriate measured dynamic stiffness for the cavity width. The specification for wall ties of dynamic stiffness,  $k_{xmm}$  in MN/m with a cavity width of Xmm and  $n$  ties/m<sup>2</sup> is  $n \cdot k_{xmm} < 4.8 \text{ MN/m}^3$ .

**2.20 Tie type B** (for use only in external masonry cavity walls where tie type A does not satisfy the requirements of Building Regulation Part A – Structure)

Connect the leaves of a cavity masonry wall only where necessary by double-triangle ties as described in BS 1243:1978 *Metal ties for cavity wall construction*, and spaced as required for structural purposes (BS 5628-3:2001 *Code of practice for use of masonry. Materials and components, design and workmanship*, which limits this tie type and spacing to cavity widths of 50mm to 75mm with a minimum masonry leaf thickness of 90mm). Alternatively, use wall ties with an appropriate measured dynamic stiffness for the cavity width. The specification for wall ties of dynamic stiffness,  $k_{xmm}$  in MN/m with a cavity width of  $Xmm$  and  $n$  ties/m<sup>2</sup> is  $n.k_{xmm} < 113MN/m^3$ .

**Note:** In external cavity masonry walls, tie type B may decrease the airborne sound insulation due to flanking transmission via the external wall leaf compared to tie type A.

**2.21** Measurements of the wall tie dynamic stiffness,  $k_{xmm}$ , should be carried out according to BRE Information Paper, IP 3/01.

**2.22** The number of ties per square metre,  $n$ , is calculated from the horizontal and vertical tie spacing distances,  $S_x$  and  $S_y$  in metres using  $n = 1 / (S_x.S_y)$ . Example: for horizontal and vertical tie spacing distances of 0.9m and 0.45m,  $n$  is 2.5 ties/m<sup>2</sup>.

**2.23** If  $k_{xmm}$  is not available for the required cavity width, it is acceptable to use available  $k_{xmm}$  data for  $Xmm$  values less than the required cavity width to calculate  $n.k_{xmm}$ .

**2.24** All wall ties and spacings specified using the dynamic stiffness parameter should also satisfy the Requirements of Building Regulation Part A – Structure.

## Corridor walls and doors

**2.25** The separating walls described in this section should be used between corridors and rooms in flats, in order to control flanking transmission and to provide the required sound insulation. However, it is likely that the sound insulation will be reduced by the presence of a door.

**2.26** Ensure that any door has good perimeter sealing (including the threshold where practical) and a minimum mass per unit area of 25kg/m<sup>2</sup> or a minimum sound reduction index of 29 dB  $R_w$  (measured according to BS EN ISO 140-3:1995 and rated according to BS EN ISO 717-1:1997). The door should also satisfy the Requirements of Building Regulation Part B – Fire safety.

**2.27** Noisy parts of the building should preferably have a lobby, double door or high performance doorset to contain the noise. Where this is not possible, nearby flats should have similar protection. However, there should be a sufficient number of flats that are suitable for disabled access, see Building Regulation Part M – Access and facilities for disabled people.

## Refuse chutes

**2.28** A wall separating a habitable room or kitchen and a refuse chute should have a mass per unit area (including any finishes) of at least 1320kg/m<sup>2</sup>. A wall separating a non-habitable room from a refuse chute should have a mass per unit area (including any finishes) of at least 220kg/m<sup>2</sup>.

## Wall type 1: solid masonry

**2.29** The resistance to airborne sound depends mainly on the mass per unit area of the wall.

### Constructions

**2.30** Three wall type 1 constructions (types 1.1, 1.2, and 1.3) are described in this guidance.

**2.31** Details of how junctions should be made to limit flanking transmission are also described in this guidance.

**2.32** Points to watch

### Do

- Do fill and seal all masonry joints with mortar.
- Do lay bricks frog up to achieve the required mass per unit area and avoid air paths.
- Do use bricks/blocks that extend to the full thickness of the wall.
- Do ensure that an external cavity wall is stopped with a flexible closer at the junction with a separating wall, unless the cavity is fully filled with mineral wool or expanded polystyrene beads (seek manufacturer's advice for other suitable materials).
- Do control flanking transmission from walls and floors connected to the separating wall as described in the guidance on junctions.
- Do stagger the position of sockets on opposite sides of the separating wall.
- Do ensure that flue blocks will not adversely affect the sound insulation and that a suitable finish is used over the flue blocks (see BS 1289-1:1986 and seek manufacturer's advice).

### Do not

- Do not try and convert a cavity separating wall to a type 1 (solid masonry) separating wall by inserting mortar or concrete into the cavity between the two leaves.
- Do not use deep sockets and chases in the separating wall, and do not place sockets back to back.
- Do not create a junction between a solid wall type 1 and a cavity wall type 2 in which the cavity wall is bridged by the solid wall.

## 2.33 Wall type 1.1 Dense aggregate concrete block, plaster on both room faces (see Diagram 2.2)

- minimum mass per unit area including plaster 415kg/m<sup>2</sup>;
- 13mm plaster on both room faces;
- use blocks that are laid flat to the full thickness of the wall.

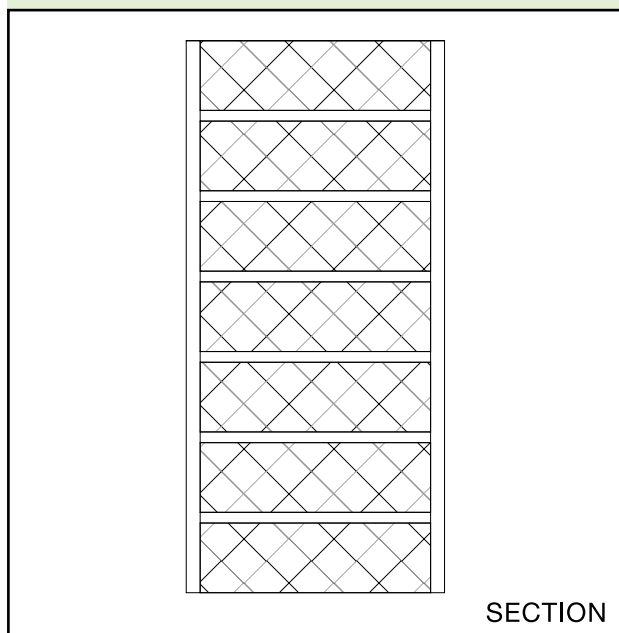
### Example of wall type 1.1

The required mass per unit area would be achieved by using

- 215mm block laid flat
- block density 1840kg/m<sup>3</sup>
- 110mm coursing
- 13mm lightweight plaster (minimum mass per unit area 10kg/m<sup>2</sup>) on both room faces

This is an example only. See Annex A for a simplified method of calculating mass per unit area. Alternatively use manufacturer's actual figures where these are available.

Diagram 2.2 Wall type 1.1



## 2.34 Wall type 1.2 Dense aggregate concrete cast in-situ, plaster on both room faces (see Diagram 2.3)

- minimum mass per unit area including plaster 415kg/m<sup>2</sup>;
- plaster on both room faces.

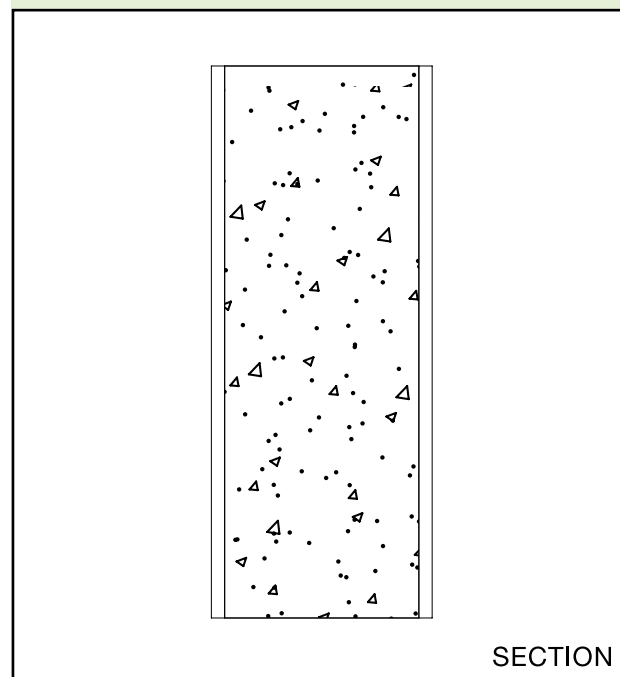
### Example of wall type 1.2

The required mass per unit area would be achieved by using

- 190mm concrete
- concrete density 2200kg/m<sup>3</sup>
- 13mm lightweight plaster (minimum mass per unit area 10kg/m<sup>2</sup>) on both room faces

This is an example only. See Annex A for a simplified method of calculating mass per unit area. Alternatively use manufacturer's actual figures where these are available.

Diagram 2.3 Wall type 1.2



## 2.35 Wall type 1.3 Brick, plaster on both room faces (see Diagram 2.4)

- minimum mass per unit area including plaster 375kg/m<sup>2</sup>;
- 13mm plaster on both room faces;
- bricks to be laid frog up, coursed with headers.

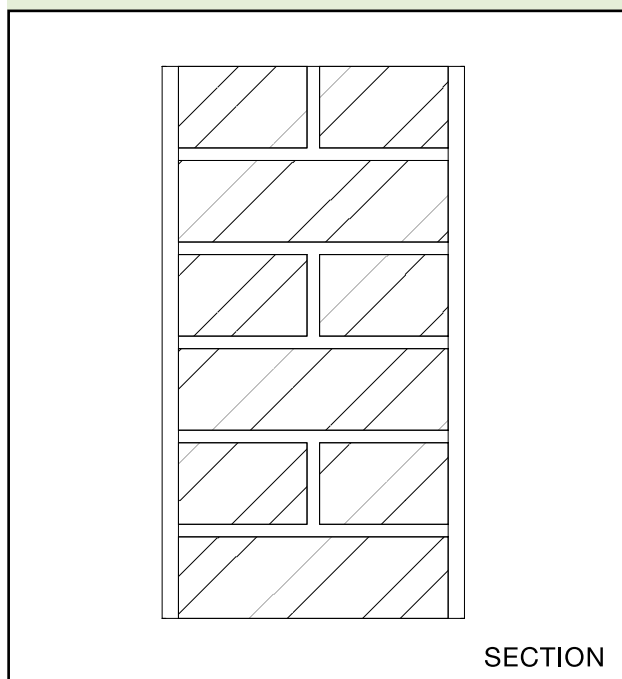
### Example of wall type 1.3

The required mass per unit area would be achieved by using

- 215mm brick
- brick density 1610kg/m<sup>3</sup>
- 75mm coursing
- 13mm lightweight plaster (minimum mass per unit area 10kg/m<sup>2</sup>) on both room faces

This is an example only. See Annex A for a simplified method of calculating mass per unit area. Alternatively use manufacturer's actual figures where these are available.

Diagram 2.4 Wall type 1.3



## Junction requirements for wall type 1

### Junctions with an external cavity wall with masonry inner leaf

#### 2.36 Where the external wall is a cavity wall:

- the outer leaf of the wall may be of any construction; and
- the cavity should be stopped with a flexible closer (see Diagram 2.5) unless the cavity is fully filled with mineral wool or expanded

polystyrene beads (seek manufacturer's advice for other suitable materials).

#### 2.37 The separating wall should be joined to the inner leaf of the external cavity wall by one of the following methods:

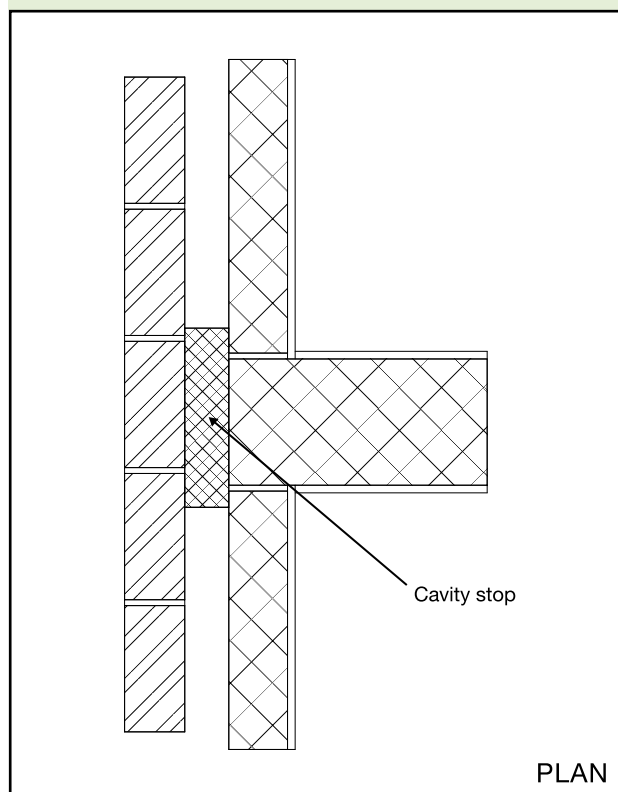
- Bonded. The separating wall should be bonded to the external wall in such a way that the separating wall contributes at least 50% of the bond at the junction. See Diagram 2.6.
- Tied. The external wall should abut the separating wall and be tied to it. See Diagram 2.7. Also, see Building Regulation Part A – Structure.

#### 2.38 The masonry inner leaf should have a mass per unit area of at least 120kg/m<sup>2</sup> excluding finish. However, there is no minimum mass requirement where there are openings in the external wall (see Diagram 2.8) that are:

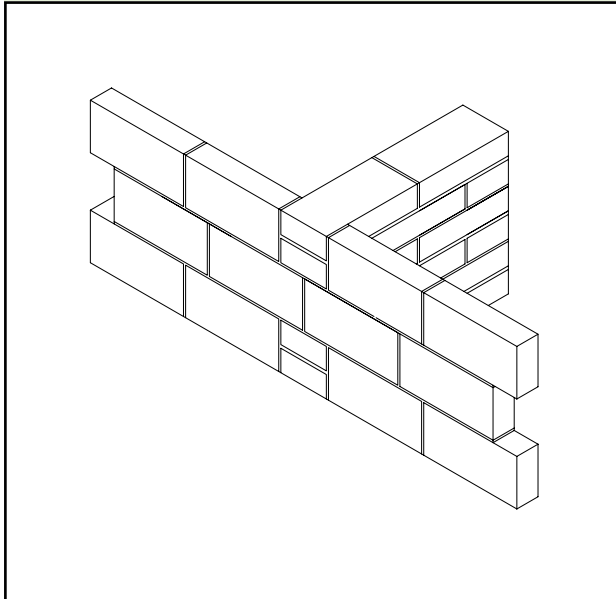
- not less than 1 metre high; and
- on both sides of the separating wall at every storey; and
- not more than 700mm from the face of the separating wall on both sides.

#### 2.39 Where there is also a separating floor then the requirement for a minimum mass per unit area of 120kg/m<sup>2</sup> excluding finish should always apply, irrespective of the presence or absence of openings.

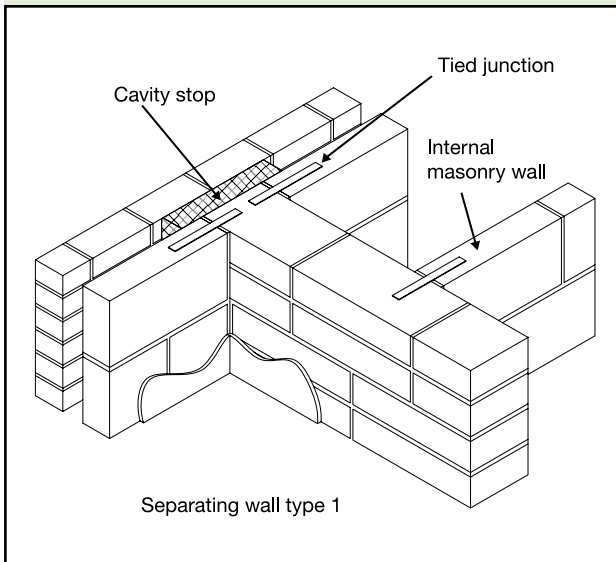
Diagram 2.5 Wall type 1 – external cavity wall with masonry inner leaf



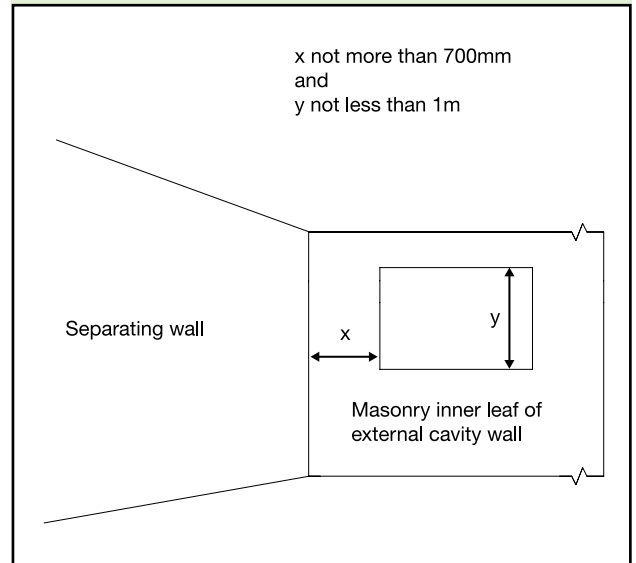
**Diagram 2.6 Wall type 1 – bonded junction – masonry inner leaf of external cavity wall with solid separating wall**



**Diagram 2.7 Wall type 1 – tied junction – external cavity wall with internal masonry wall**



**Diagram 2.8 Wall type 1 – position of openings in masonry inner leaf of external cavity wall**



## Junctions with an external cavity wall with timber frame inner leaf

**2.40** Where the external wall is a cavity wall:

- the outer leaf of the wall may be of any construction; and
- the cavity should be stopped with a flexible closer. See Diagram 2.9.

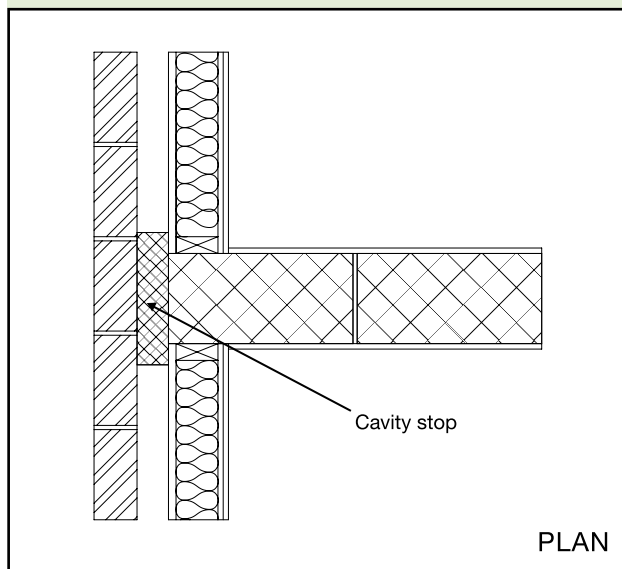
**2.41** Where the inner leaf of an external cavity wall is of framed construction, the framed inner leaf should:

- abut the separating wall; and
- be tied to it with ties at no more than 300mm centres vertically.

The wall finish of the framed inner leaf of the external wall should be:

- one layer of plasterboard; or
- two layers of plasterboard where there is a separating floor;
- each sheet of plasterboard to be of minimum mass per unit area  $10\text{kg/m}^2$ ; and
- all joints should be sealed with tape or caulked with sealant.

Diagram 2.9 **Wall type 1 – external cavity wall with timber frame inner leaf**



#### Junctions with an external solid masonry wall

**2.42** No guidance available (seek specialist advice).

#### Junctions with internal framed walls

**2.43** There are no restrictions on internal framed walls meeting a type 1 separating wall.

#### Junctions with internal masonry walls

**2.44** Internal masonry walls that abut a type 1 separating wall should have a mass per unit area of at least 120kg/m<sup>2</sup> excluding finish.

#### Junctions with internal timber floors

**2.45** If the floor joists are to be supported on a type 1 separating wall then they should be supported on hangers and should not be built in. See Diagram 2.10.

#### Junctions with internal concrete floors

**2.46** An internal concrete floor slab may only be carried through a type 1 separating wall if the floor base has a mass per unit area of at least 365kg/m<sup>2</sup>. See Diagram 2.11.

**2.47** Internal hollow-core concrete plank floors and concrete beams with infilling block floors should not be continuous through a type 1 separating wall.

**2.48** For internal floors of concrete beams with infilling blocks, avoid beams built in to the separating wall unless the blocks in the floor fill the space between the beams where they penetrate the wall.

Diagram 2.10 **Wall type 1 – internal timber floor**

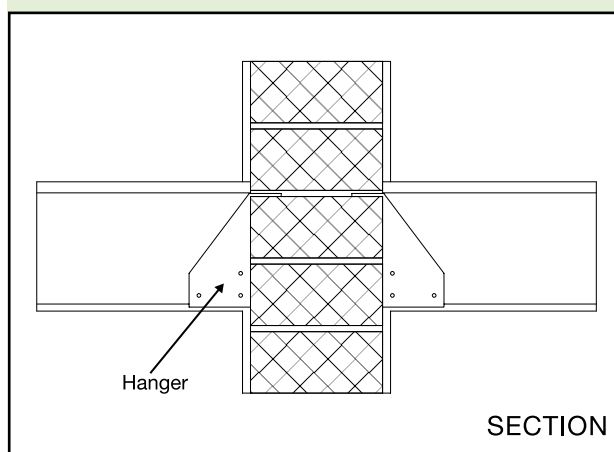
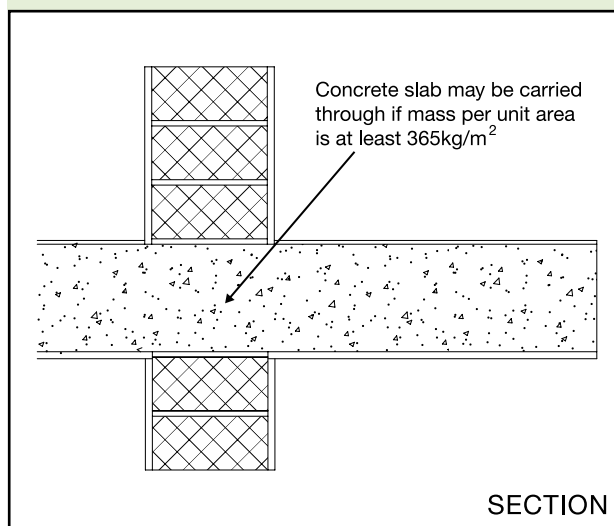


Diagram 2.11 **Wall type 1 – internal concrete floor**



#### Junctions with timber ground floors

**2.49** If the floor joists are to be supported on a type 1 separating wall then they should be supported on hangers and should not be built in.

**2.50** See Building Regulation Part C – Site preparation and resistance to moisture, and Building Regulation Part L – Conservation of fuel and power.

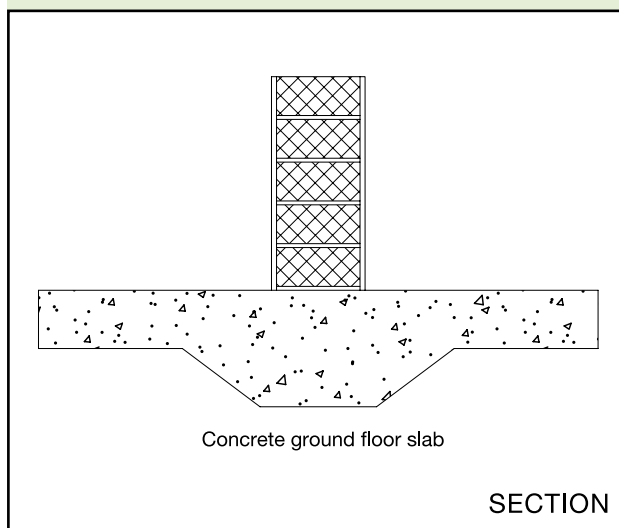
#### Junctions with concrete ground floors

**2.51** The ground floor may be a solid slab, laid on the ground, or a suspended concrete floor. A concrete slab floor on the ground may be continuous under a type 1 separating wall. See Diagram 2.12.

**2.52** A suspended concrete floor may only pass under a type 1 separating wall if the floor has a mass of at least 365kg/m<sup>2</sup>.

**2.53** Hollow core concrete plank and concrete beams with infilling block floors should not be continuous under a type 1 separating wall.

**Diagram 2.12 Wall type 1 – concrete ground floor**



**2.54** See Building Regulation Part C – Site preparation and resistance to moisture, and Building Regulation Part L – Conservation of fuel and power.

## Junctions with ceiling and roof

**2.55** Where a type 1 separating wall is used it should be continuous to the underside of the roof.

**2.56** The junction between the separating wall and the roof should be filled with a flexible closer which is also suitable as a fire stop. See Diagram 2.13.

**2.57** Where the roof or loft space is not a habitable room and there is a ceiling with a minimum mass per unit area of  $10\text{kg/m}^2$  with sealed joints, then the mass per unit area of the separating wall above the ceiling may be reduced to  $150\text{kg/m}^2$ . See Diagram 2.13.

**2.58** If lightweight aggregate blocks of density less than  $1200\text{kg/m}^3$  are used above ceiling level, then one side should be sealed with cement paint or plaster skim.

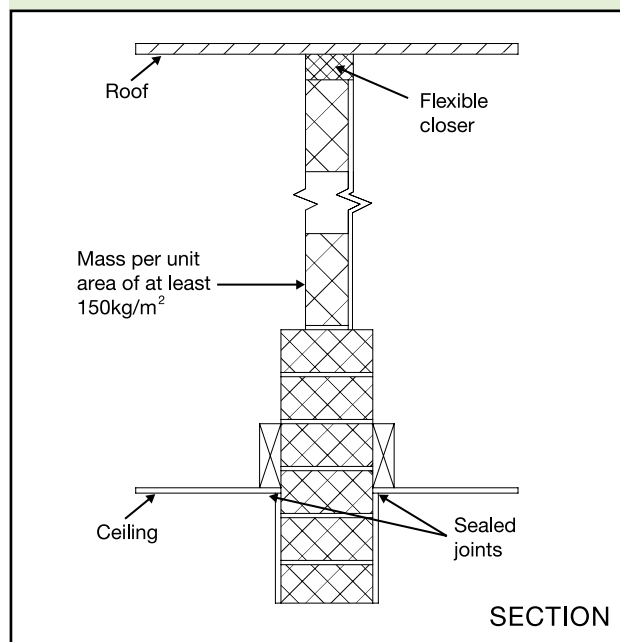
**2.59** Where there is an external cavity wall, the cavity should be closed at eaves level with a suitable flexible material (e.g. mineral wool). See Diagram 2.14.

**Note:** A rigid connection between the inner and external wall leaves should be avoided. If a rigid material is used, then it should only be rigidly bonded to one leaf. See BRE BR 262, Thermal Insulation: avoiding risks, Section 2.3.

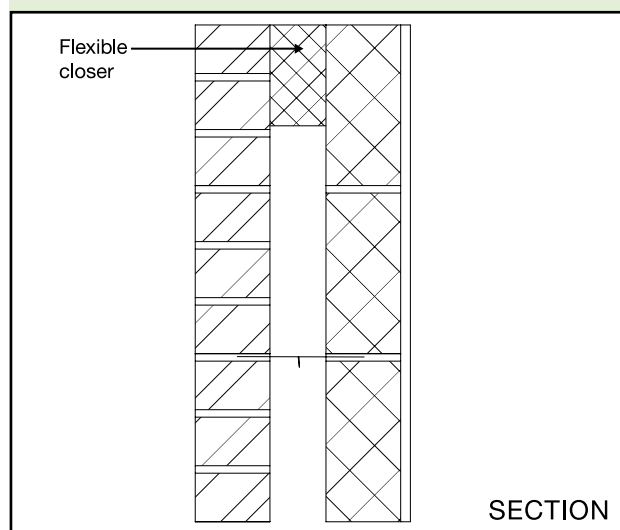
## Junctions with separating floors

**2.60** There are important details in Section 3 concerning junctions between wall type 1 and separating floors.

**Diagram 2.13 Wall type 1 – ceiling and roof junction**



**Diagram 2.14 External cavity wall at eaves level**



**Wall type 2: cavity masonry**

**2.61** The resistance to airborne sound depends on the mass per unit area of the leaves and on the degree of isolation achieved. The isolation is affected by connections (such as wall ties and foundations) between the wall leaves and by the cavity width.

**Constructions**

**2.62** Four wall type 2 constructions (types 2.1, 2.2, 2.3 and 2.4) are described in this guidance.

**2.63** Two of these wall constructions (types 2.3 and 2.4) are only suitable when a step in elevation and/or a stagger in plan is incorporated at the separating wall.

**2.64** Details of how junctions should be made to limit flanking transmission are also described in this guidance.

**2.65** Points to watch:

**Do**

- a. Do fill and seal all masonry joints with mortar.
- b. Do keep the cavity leaves separate below ground floor level.
- c. Do ensure that any external cavity wall is stopped with a flexible closer at the junction with the separating wall, unless the cavity is fully filled with mineral wool or expanded polystyrene beads (seek manufacturer's advice for other suitable materials).
- d. Do control flanking transmission from walls and floors connected to the separating wall as described in the guidance on junctions.
- e. Do stagger the position of sockets on opposite sides of the separating wall.
- f. Do ensure that flue blocks will not adversely affect the sound insulation and that a suitable finish is used over the flue blocks (see BS 1289-1:1986 and seek manufacturer's advice).

**Do not**

- a. Do not try and convert a cavity separating wall to a type 1 (solid masonry) separating wall by inserting mortar or concrete into the cavity between the two leaves.
- b. Do not change to a solid wall construction in the roof space as a rigid connection between the leaves will reduce wall performance.
- c. Do not build cavity walls off a continuous solid concrete slab floor.
- d. Do not use deep sockets and chases in the separating wall, do not place them back to back.

**Wall ties in separating cavity masonry walls**

**2.66** The wall ties used to connect the leaves of a cavity masonry wall should be tie type A.

**Cavity widths in separating cavity masonry walls**

**2.67** Recommended cavity widths are minimum values.

**Blocks with voids**

**2.68** The guidance describes constructions that use blocks without voids. For blocks with voids, seek advice from the manufacturer.

**2.69 Wall type 2.1** *Two leaves of dense aggregate concrete block with 50mm cavity, plaster on both room faces (see Diagram 2.15)*

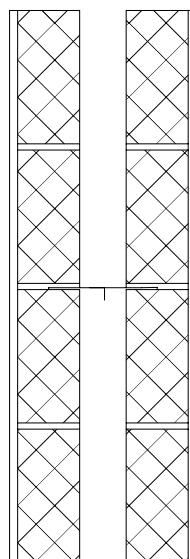
- minimum mass per unit area including plaster 415kg/m<sup>2</sup>;
- minimum cavity width of 50mm;
- 13mm plaster on both room faces.

**Example of wall type 2.1**

The required mass per unit area would be achieved by using

- 100mm block leaves
- block density 1990kg/m<sup>3</sup>
- 225mm coursing
- 13mm lightweight plaster (minimum mass per unit area 10kg/m<sup>2</sup>) on both room faces

This is an example only. See Annex A for a simplified method of calculating mass per unit area. Alternatively use manufacturer's actual figures where these are available.

**Diagram 2.15 Wall type 2.1**

SECTION

**2.70 Wall type 2.2** *Two leaves of lightweight aggregate block with 75mm cavity, plaster on both room faces (see Diagram 2.16)*

- minimum mass per unit area including plaster 300kg/m<sup>2</sup>;
- minimum cavity width of 75mm;
- 13mm plaster on both room faces.

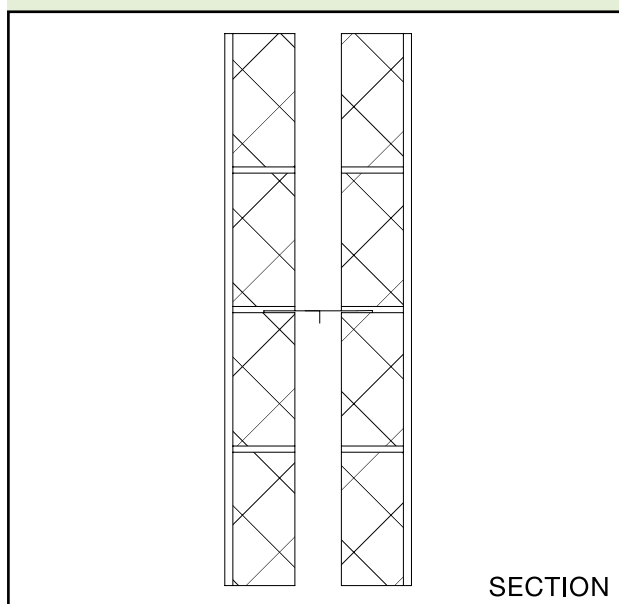
### Example of wall type 2.2

The required mass per unit area would be achieved by using

- 100mm block leaves
- block density 1375kg/m<sup>3</sup>
- 225mm coursing
- 13mm lightweight plaster (minimum mass per unit area 10kg/m<sup>2</sup>) on both room faces

This is an example only. See Annex A for a simplified method of calculating mass per unit area. Alternatively use manufacturer's actual figures where these are available.

Diagram 2.16 Wall type 2.2



**Additional construction: wall type 2.3 should only be used where there is a step and/or stagger of at least 300mm.**

**2.71 Wall type 2.3** *Two leaves of lightweight aggregate block with 75mm cavity and step/stagger, plasterboard on both room faces (see Diagram 2.17)*

- minimum mass per unit area including plasterboard 290kg/m<sup>2</sup>;
- lightweight aggregate blocks should have a density in the range 1350 to 1600kg/m<sup>3</sup>;
- minimum cavity width of 75mm;
- plasterboard, each sheet of minimum mass per unit area 10kg/m<sup>2</sup>, on both room faces.

**Note:** The composition of the lightweight aggregate blocks contributes to the performance of this construction with a plasterboard finish. Using denser blocks may not give an equivalent performance.

### Example of wall type 2.3

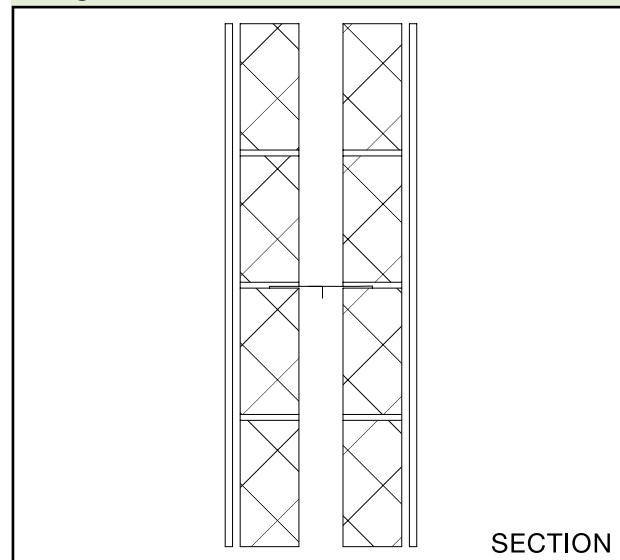
The required mass per unit area would be achieved by using

- 100mm block leaves
- block density 1375kg/m<sup>3</sup>
- 225mm coursing
- plasterboard, each sheet of minimum mass per unit area 10kg/m<sup>2</sup>, on both room faces

This is an example only. See Annex A for a simplified method of calculating mass per unit area. Alternatively use manufacturer's actual figures where these are available.

**Note:** Increasing the size of the step or stagger in the separating wall tends to increase the airborne sound insulation.

Diagram 2.17 Wall type 2.3



**Additional construction: Wall type 2.4 should only be used in constructions without separating floors and where there is a step and/or stagger of at least 300mm.**

**2.72 Wall type 2.4** Two leaves of aircrete block with 75mm cavity and step/stagger, plasterboard or plaster on both room faces (see Diagram 2.18)

- minimum mass per unit area including finish 150kg/m<sup>2</sup>;
- minimum cavity width of 75mm;
- plasterboard, each sheet of minimum mass per unit area 10kg/m<sup>2</sup>, on both room faces; or
- 13mm plaster on both room faces.

#### Example of wall type 2.4

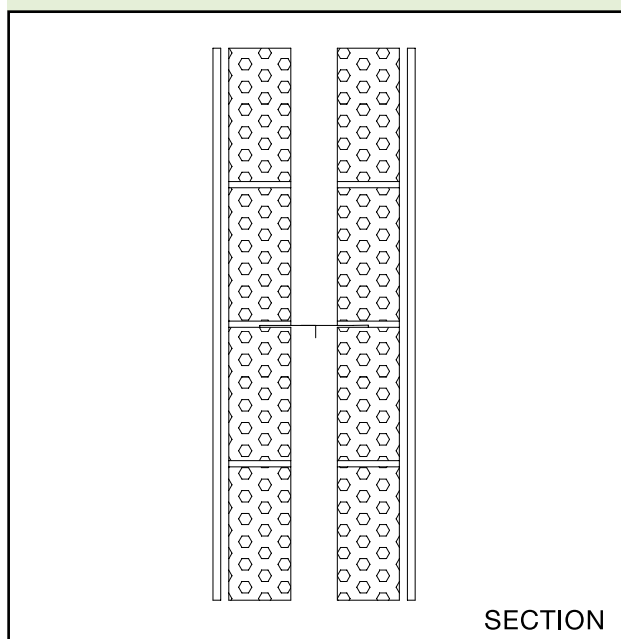
The required mass per unit area would be achieved by using

- 100mm aircrete block leaves
- block density 650kg/m<sup>3</sup>
- 225mm coursing
- plasterboard, each sheet of minimum mass per unit area 10kg/m<sup>2</sup>, on both room faces

This is an example only. See Annex A for a simplified method of calculating mass per unit area. Alternatively use manufacturer's actual figures where these are available.

**Note:** Increasing the size of the step or stagger in the separating wall tends to increase the airborne sound insulation.

Diagram 2.18 Wall type 2.4



## Junction requirements for wall type 2

**Junctions with an external cavity wall with masonry inner leaf**

**2.73** Where the external wall is a cavity wall:

- the outer leaf of the wall may be of any construction; and
- the cavity should be stopped with a flexible closer (for wall types 2.1 and 2.2 see Diagram 2.19, for wall types 2.3 and 2.4 see Diagram 2.20) unless the cavity is fully filled with mineral wool or expanded polystyrene beads (seek manufacturer's advice for other suitable materials).

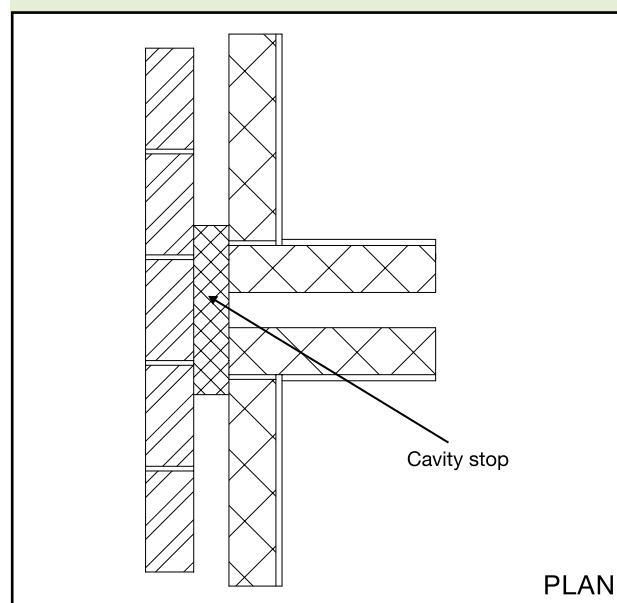
**2.74** The separating wall should be joined to the inner leaf of the external cavity wall by one of the following methods:

- Bonded. The separating wall should be bonded to the external wall in such a way that the separating wall contributes at least 50% of the bond at the junction.
- Tied. The external wall should abut the separating wall and be tied to it. See Diagram 2.21. Also, see Building Regulation Part A – Structure.

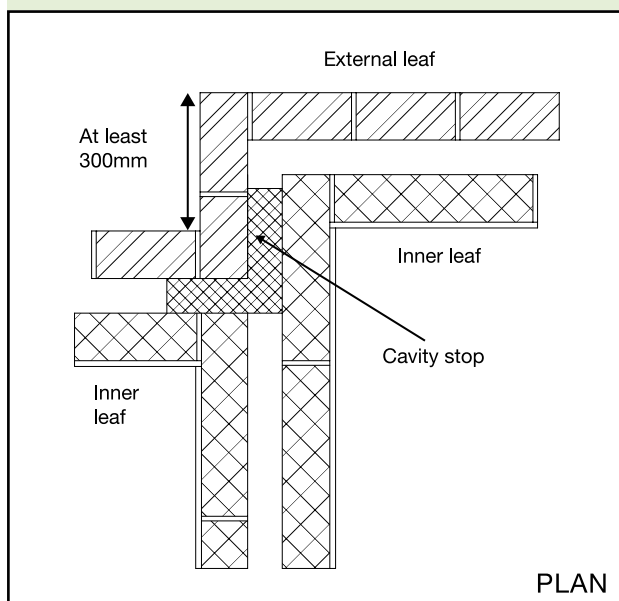
**2.75** The masonry inner leaf should have a mass per unit area of at least 120kg/m<sup>2</sup> excluding finish. However, there is no minimum mass requirement where separating wall type 2.1, 2.3 or 2.4 is used.

**2.76** Where there is also a separating floor then the requirement for a minimum mass per unit area of 120kg/m<sup>2</sup> excluding finish should always apply, even when wall type 2.1, 2.3 or 2.4 is used.

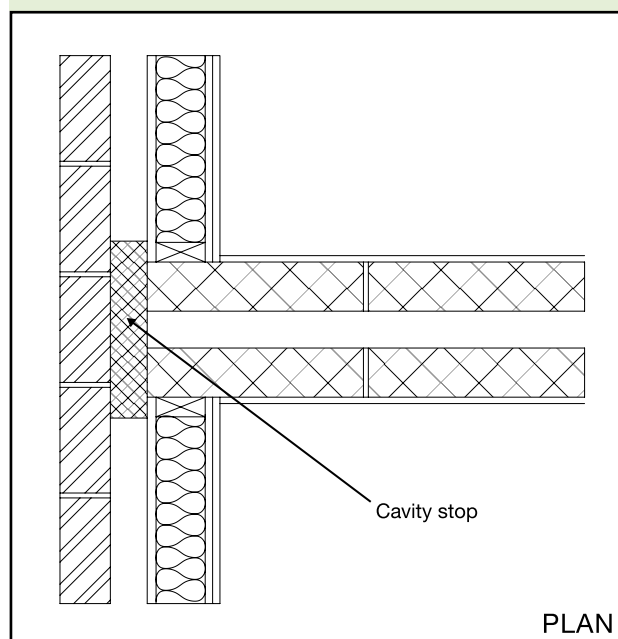
Diagram 2.19 Wall types 2.1 and 2.2  
– external cavity wall  
with masonry inner leaf



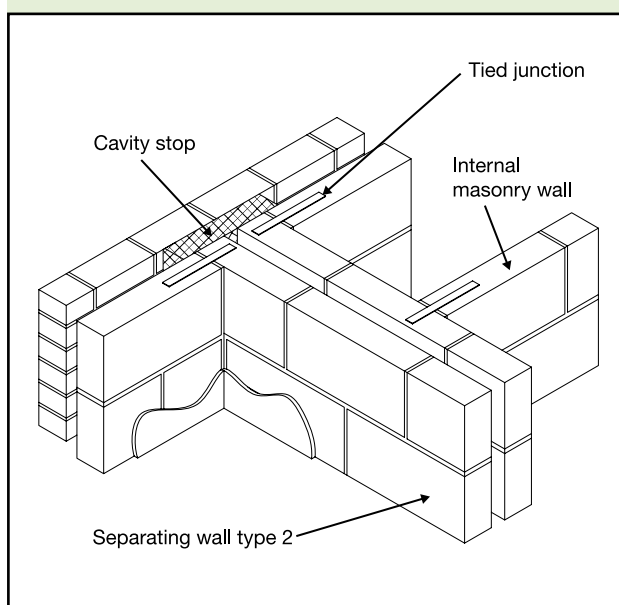
**Diagram 2.20 Wall types 2.3 and 2.4 – external cavity wall with masonry inner leaf – stagger**



**Diagram 2.22 Wall type 2 – external cavity wall with timber frame inner leaf**



**Diagram 2.21 Wall type 2 – tied junction – external cavity wall with internal masonry wall**



## Junctions with an external cavity wall with timber frame inner leaf

**2.77** Where the external wall is a cavity wall:

- the outer leaf of the wall may be of any construction; and
- the cavity should be stopped with a flexible closer. See Diagram 2.22.

**2.78** Where the inner leaf of an external cavity wall is of framed construction, the framed inner leaf should:

- abut the separating wall; and
- be tied to it with ties at no more than 300mm centres vertically.

The wall finish of the inner leaf of the external wall should be:

- one layer of plasterboard; or
- two layers of plasterboard where there is a separating floor;
- each sheet of plasterboard to be of minimum mass per unit area  $10\text{kg/m}^2$ ; and
- all joints should be sealed with tape or caulked with sealant.

## Junctions with an external solid masonry wall

**2.79** No guidance available (seek specialist advice).

## Junctions with internal framed walls

**2.80** There are no restrictions on internal framed walls meeting a type 2 separating wall.

## Junctions with internal masonry walls

**2.81** Internal masonry walls that abut a type 2 separating wall should have a mass per unit area of at least  $120\text{kg/m}^2$  excluding finish.

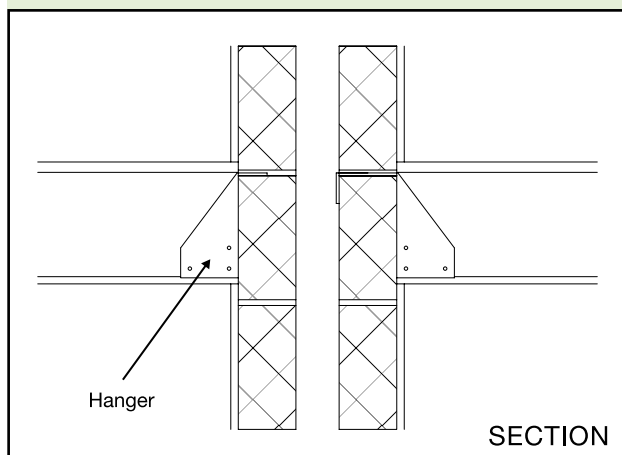
**2.82** Where there is a separating floor, internal masonry walls should have a mass per unit area of at least  $120\text{kg/m}^2$  excluding finish.

**2.83** When there is no separating floor with separating wall type 2.3 or 2.4 there is no minimum mass per unit area for internal masonry walls.

## Junctions with internal timber floors

**2.84** If the floor joists are to be supported on the separating wall then they should be supported on hangers and should not be built in. See Diagram 2.23.

**Diagram 2.23 Wall type 2 – internal timber floor**



## Junctions with internal concrete floors

**2.85** Internal concrete floors should generally be built into a type 2 separating wall and carried through to the cavity face of the leaf. The cavity should not be bridged. See Diagram 2.24.

## Junctions with timber ground floors

**2.86** If the floor joists are to be supported on the separating wall then they should be supported on hangers and should not be built in.

**2.87** See Building Regulation Part C – Site preparation and resistance to moisture, and Building Regulation Part L – Conservation of fuel and power.

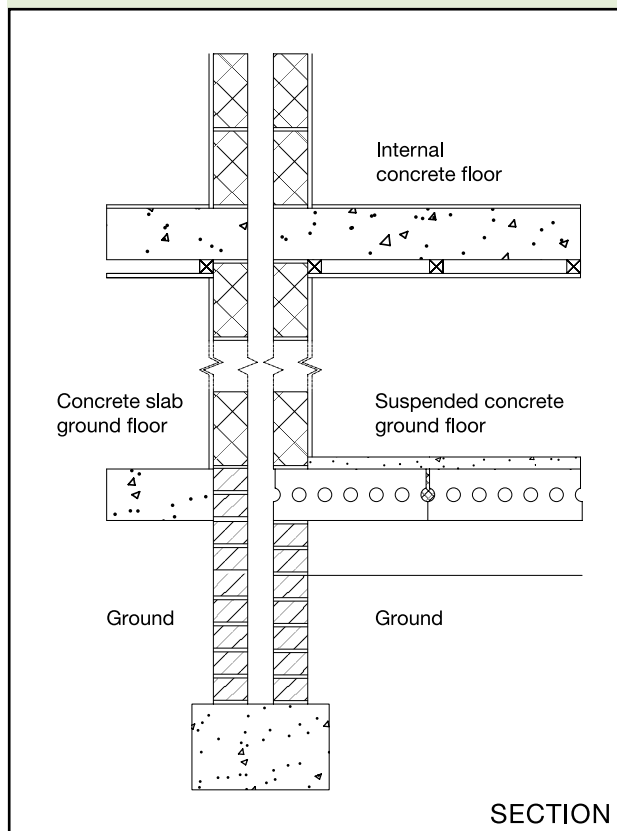
## Junctions with concrete ground floors

**2.88** The ground floor may be a solid slab, laid on the ground, or a suspended concrete floor. A concrete slab floor on the ground should not be continuous under a type 2 separating wall. See Diagram 2.24.

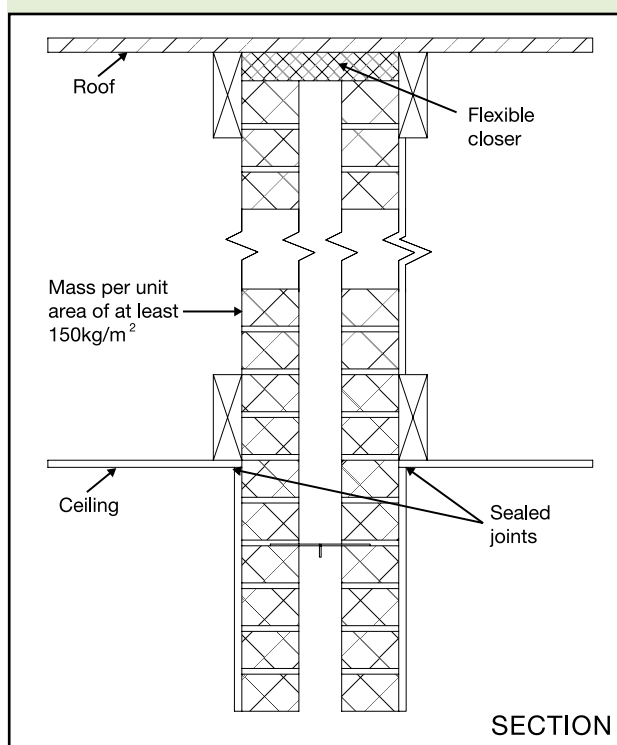
**2.89** A suspended concrete floor should not be continuous under a type 2 separating wall, and should be carried through to the cavity face of the leaf. The cavity should not be bridged. See Diagram 2.24.

**2.90** See Building Regulation Part C – Site preparation and resistance to moisture, and Building Regulation Part L – Conservation of fuel and power.

**Diagram 2.24 Wall type 2 – internal concrete floor and concrete ground floor**



**Diagram 2.25 Wall type 2 – ceiling and roof junction**



## Junctions with ceiling and roof space

**2.91** Where a type 2 separating wall is used it should be continuous to the underside of the roof.

**2.92** The junction between the separating wall and the roof should be filled with a flexible closer which is also suitable as a fire stop. See Diagram 2.25.

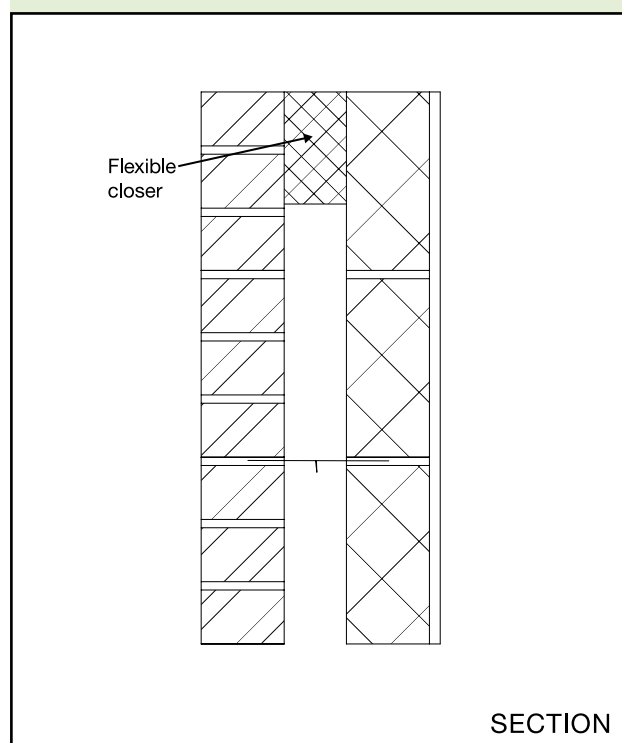
**2.93** Where the roof or loft space is not a habitable room and there is a ceiling with a minimum mass per unit area of  $10\text{kg/m}^2$  with sealed joints, then the mass per unit area of the separating wall above the ceiling may be reduced to  $150\text{kg/m}^2$ , but it should still be a cavity wall. See Diagram 2.25.

**2.94** If lightweight aggregate blocks of density less than  $1200\text{kg/m}^3$  are used above ceiling level, then one side should be sealed with cement paint or plaster skim.

**2.95** Where there is an external cavity wall, the cavity should be closed at eaves level with a suitable flexible material (e.g. mineral wool). See Diagram 2.26.

**Note:** A rigid connection between the inner and external wall leaves should be avoided. If a rigid material is used, then it should only be rigidly bonded to one leaf.

Diagram 2.26 External cavity wall at eaves level



## Junctions with separating floors

**2.96** There are important details in Section 3 concerning junctions between wall type 2 and separating floors.

## Wall type 3: masonry between independent panels

**2.97** The resistance to airborne sound depends partly on the type and mass per unit area of the core, and partly on the isolation and mass per unit area of the independent panels.

**Note:** Wall type 3 can give high resistance to the transmission of both airborne sound and impact sound on the wall.

### Construction

**2.98** Three wall type 3 constructions (types 3.1, 3.2 and 3.3) are described in this guidance.

**2.99** The construction consists of either a solid or cavity masonry core wall with independent panels on both sides. These panels and any frame should not be in contact with the core wall.

**2.100** Details of how junctions should be made to limit flanking transmission are also described in this guidance.

### 2.101 Points to watch

#### Do

- Do fill and seal all masonry joints with mortar.
- Do control flanking transmission from walls and floors connected to the separating wall as described in the guidance on junctions.
- Do fix the panels or the supporting frames to the ceiling and floor only.
- Do tape and seal all joints.
- Do ensure that flue blocks will not adversely affect the sound insulation and that a suitable finish is used over the flue blocks (see BS 1289-1:1986 and seek manufacturer's advice).

#### Do not

**Do not fix, tie or connect the free standing panels or the frame to the masonry core.**

## Wall ties in cavity masonry cores

**2.102** The wall ties used to connect the leaves of a cavity masonry core should be tie type A.

## Cavity widths in separating cavity masonry cores

**2.103** Recommended cavity widths are minimum values.

**2.104** Independent panels.

These panels should meet the following specification:

- minimum mass per unit area of panel (excluding any supporting framework)  $20\text{kg/m}^2$ ;

- panels should consist of either
  - at least 2 layers of plasterboard with staggered joints, or
  - a composite panel consisting of 2 sheets of plasterboard separated by a cellular core;
- if the panels are not supported on a frame they should be at least 35mm from the masonry core;
- if the panels are supported on a frame there should be a gap of at least 10mm between the frame and the masonry core.

**2.105 Wall type 3.1** Solid masonry core (dense aggregate concrete block), independent panels on both room faces (see Diagrams 2.27 and 2.28)

- minimum mass per unit area of core 300kg/m<sup>2</sup>;
- minimum core width is determined by structural requirements (see Building Regulation Part A – Structure);
- independent panels on both room faces.

### Example of wall type 3.1

The required mass per unit area would be achieved by using

- 140mm block core
- block density 2200kg/m<sup>3</sup>
- 110mm coursing
- independent panels, each panel of mass per unit area 20kg/m<sup>2</sup>, to be two sheets of plasterboard with joints staggered.

This is an example only. See Annex A for a simplified method of calculating mass per unit area. Alternatively use manufacturer's actual figures where these are available.

Diagram 2.27 **Wall type 3.1 with independent composite panels**

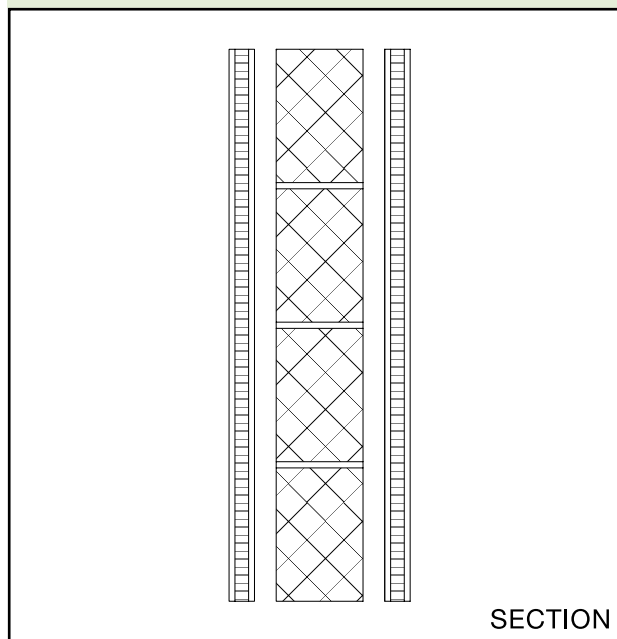
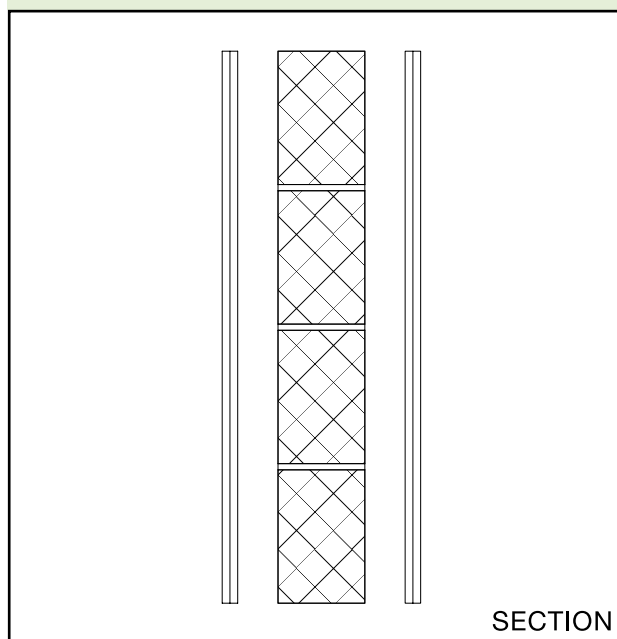


Diagram 2.28 **Wall type 3.1 with independent plasterboard panels**



## 2.106 Wall type 3.2 Solid masonry core (lightweight concrete block), independent panels on both room faces (see Diagram 2.29)

- minimum mass per unit area of core  $150\text{kg/m}^2$ ;
- minimum core width is determined by structural requirements (see Building Regulation Part A – Structure);
- independent panels on both room faces.

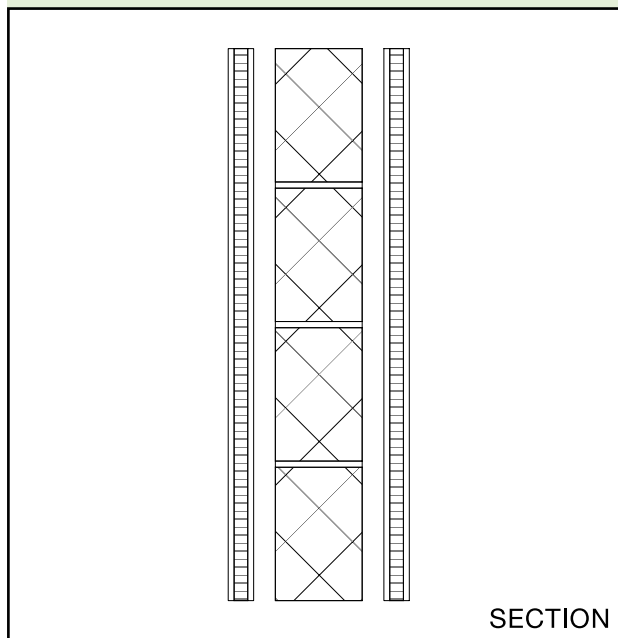
### Example of wall type 3.2

The required mass per unit area would be achieved by using

- 140mm lightweight block core
- block density  $1400\text{kg/m}^3$
- 225mm coursing
- independent panels, each panel of mass per unit area  $20\text{kg/m}^2$ , to be two sheets of plasterboard joined by a cellular core

This is an example only. See Annex A for a simplified method of calculating mass per unit area. Alternatively use manufacturer's actual figures where these are available.

Diagram 2.29 Wall type 3.2 with independent composite panels



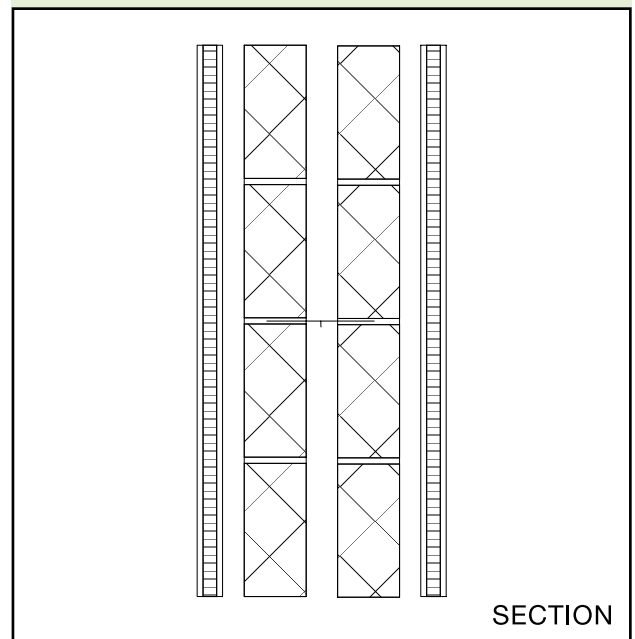
## 2.107 Wall type 3.3 Cavity masonry core (brickwork or blockwork), 50mm cavity, independent panels on both room faces (see Diagram 2.30)

- the core can be of any mass per unit area;
- minimum cavity width of 50mm;
- minimum core width is determined by structural requirements (see Building Regulation Part A – Structure);
- independent panels on both room faces.

### Example of wall type 3.3

- two leaves of concrete block
- each leaf at least 100mm thick
- minimum cavity width of 50mm
- independent panels, each panel of mass per unit area  $20\text{kg/m}^2$ , to be two sheets of plasterboard joined by a cellular core

Diagram 2.30 Wall type 3.3 with independent composite panels



## Junction requirements for wall type 3

### Junctions with an external cavity wall with masonry inner leaf

**2.108** Where the external wall is a cavity wall:

- the outer leaf of the wall may be of any construction; and
- the cavity should be stopped with a flexible closer (see Diagram 2.31) unless the cavity is fully filled with mineral wool or expanded polystyrene beads (seek manufacturer's advice for other suitable materials).

**2.109** Where the inner leaf of an external cavity wall is masonry:

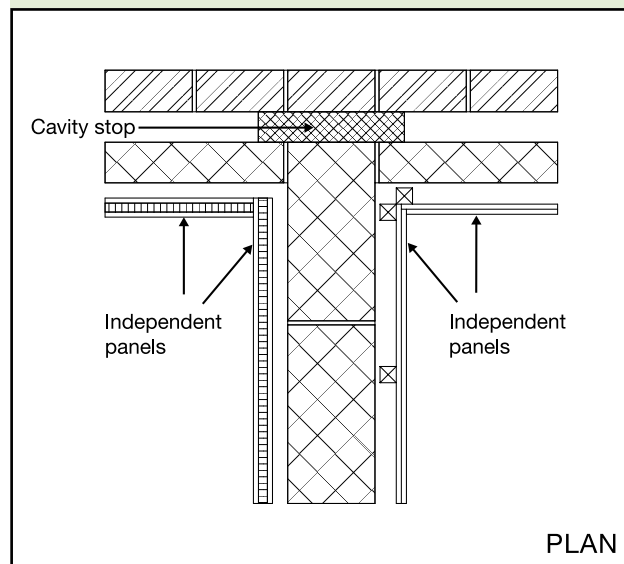
- the inner leaf of the external wall should be bonded or tied to the masonry core;
- the inner leaf of the external wall should be lined with independent panels in the same manner as the separating walls. See Diagram 2.31.

**2.110** Where there is a separating floor the masonry inner leaf of the external wall should have a minimum mass per unit area of at least 120kg/m<sup>2</sup> excluding finish.

**2.111** Where there is no separating floor and the masonry inner leaf of the external wall is lined with independent panels in the same manner as the separating walls, there is no minimum mass requirement on the masonry inner leaf.

**2.112** Where there is no separating floor with separating wall type 3.1 or 3.3, and the masonry inner leaf of the external wall has a mass of at least 120kg/m<sup>2</sup> excluding finish, then the inner leaf of the external wall may be finished with plaster or plasterboard of minimum mass per unit area 10kg/m<sup>2</sup>.

**Diagram 2.31 Wall type 3 – external cavity wall with masonry inner leaf**



### Junctions with an external cavity wall with timber frame inner leaf

**2.113** No guidance available (seek specialist advice).

### Junctions with an external solid masonry wall

**2.114** No guidance available (seek specialist advice).

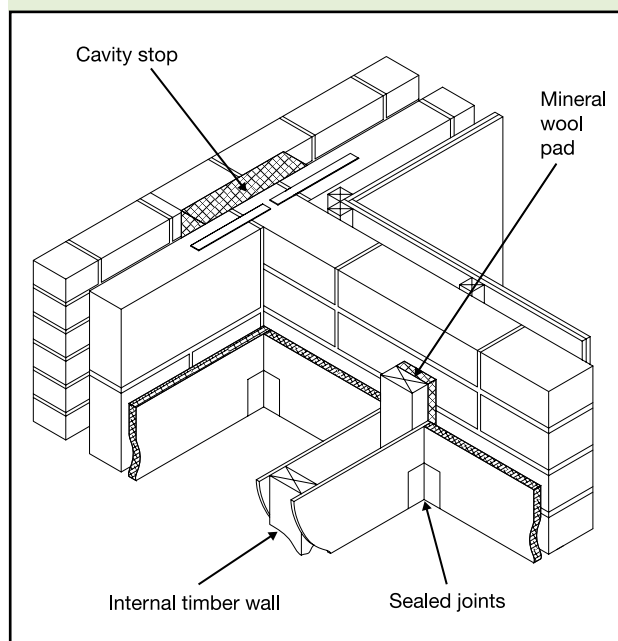
### Junctions with internal framed walls

**2.115** Load-bearing framed internal walls should be fixed to the masonry core through a continuous pad of mineral wool. See Diagram 2.32.

**2.116** Non-load-bearing internal walls should be butted to the independent panels.

**2.117** All joints between internal walls and panels should be sealed with tape or caulked with sealant.

**Diagram 2.32 Wall type 3 – external cavity wall with internal timber wall**



### Junctions with internal masonry walls

**2.118** Internal walls that abut a type 3 separating wall should not be of masonry construction.

### Junctions with internal timber floors

**2.119** If the floor joists are to be supported on the separating wall then they should be supported on hangers and should not be built in. See Diagram 2.33.

**2.120** Spaces between the floor joists should be sealed with full depth timber blocking.

## Junctions with internal concrete floors

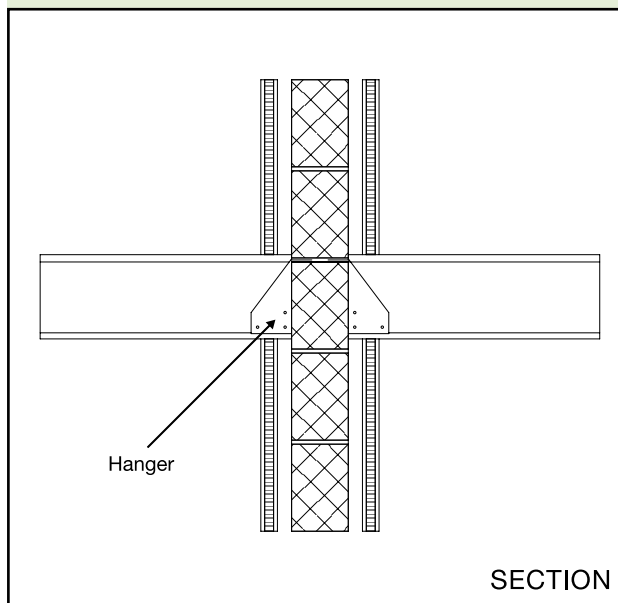
*Wall types 3.1 and 3.2 (solid masonry core)*

**2.121** An internal concrete floor slab may only be carried through a solid masonry core if the floor base has a mass per unit area of at least 365kg/m<sup>2</sup>. See Diagram 2-34.

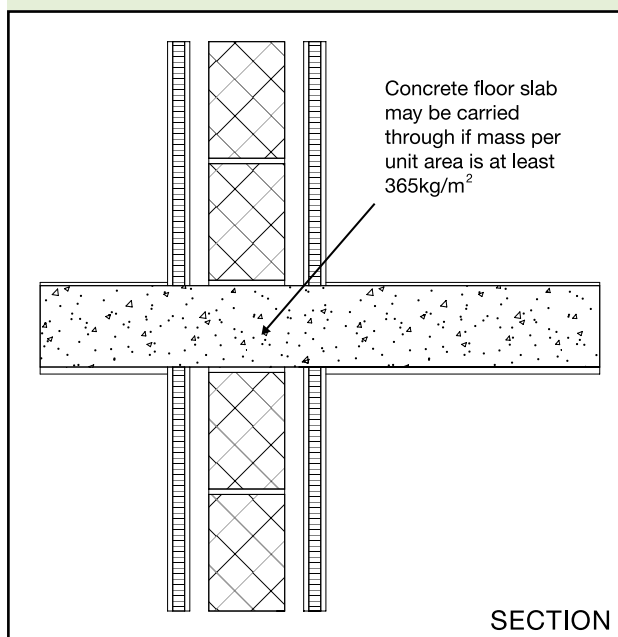
*Wall type 3.3 (cavity masonry core)*

**2.122** Internal concrete floors should generally be built into a cavity masonry core and carried through to the cavity face of the leaf. The cavity should not be bridged.

**Diagram 2.33 Wall type 3 – internal timber floor**



**Diagram 2.34 Wall types 3.1 and 3.2 – internal concrete floor**



## Junctions with timber ground floors

**2.123** If the floor joists are to be supported on the separating wall then they should be supported on hangers and should not be built in.

**2.124** Spaces between the floor joists should be sealed with full depth timber blocking.

**2.125** See Building Regulation Part C – Site preparation and resistance to moisture, and Building Regulation Part L – Conservation of fuel and power.

## Junctions with concrete ground floors

**2.126** The ground floor may be a solid slab, laid on the ground, or a suspended concrete floor.

*Wall type 3.1 and 3.2 (solid masonry core)*

**2.127** A concrete slab floor on the ground may be continuous under the solid masonry core of a type 3.1 or 3.2 separating wall.

**2.128** A suspended concrete floor may only pass under the solid masonry core of a type 3.1 or 3.2 separating wall if the floor has a mass per unit area of at least 365kg/m<sup>2</sup>.

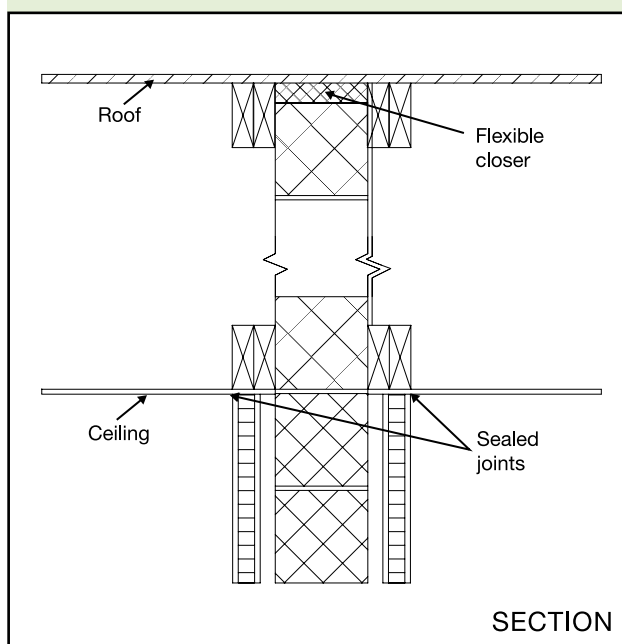
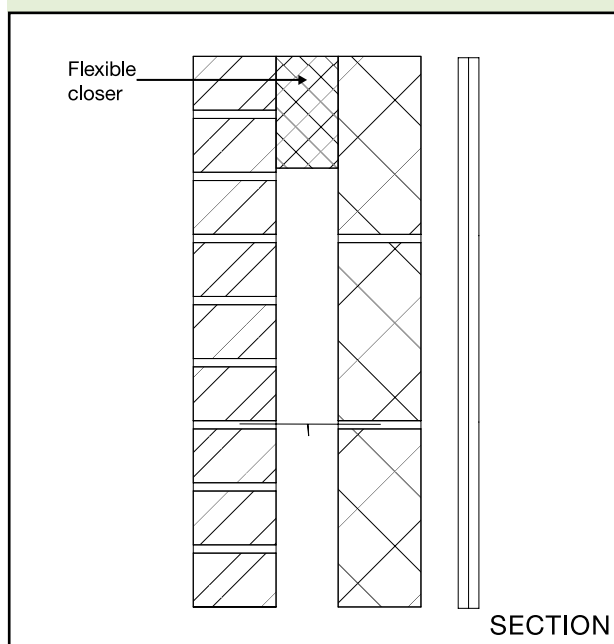
**2.129** Hollow core concrete plank and concrete beams with infilling block floors should not be continuous under the solid masonry core of a type 3.1 or 3.2 separating wall.

*Wall type 3.3 (cavity masonry core)*

**2.130** A concrete slab floor on the ground should not be continuous under the cavity masonry core of a type 3.3 separating wall.

**2.131** A suspended concrete floor should not be continuous under the cavity masonry core of a type 3.3 separating wall and should be carried through to the cavity face of the leaf. The cavity should not be bridged.

**2.132** See Building Regulation Part C – Site preparation and resistance to moisture, and Building Regulation Part L – Conservation of fuel and power.

**Diagram 2.35 Wall types 3.1 and 3.2 – ceiling and roof junction****Diagram 2.36 External cavity wall at eaves level****Junctions with ceiling and roof space**

**2.133** The masonry core should be continuous to the underside of the roof.

**2.134** The junction between the separating wall and the roof should be filled with a flexible closer which is also suitable as a fire stop. See Diagram 2.35.

**2.135** The junction between the ceiling and independent panels should be sealed with tape or caulked with sealant.

**2.136** Where there is an external cavity wall, the cavity should be closed at eaves level with a suitable flexible material (e.g. mineral wool). See Diagram 2.36.

**Note:** A rigid connection between the inner and external wall leaves should be avoided. If a rigid material is used, then it should only be rigidly bonded to one leaf.

**Wall types 3.1 and 3.2 (solid masonry core)**

**2.137** Where the roof or loft space is not a habitable room and there is a ceiling with a minimum mass per unit area  $10\text{kg/m}^2$  and with sealed joints, the independent panels may be omitted in the roof space and the mass per unit area of the separating wall above the ceiling may be a minimum of  $150\text{kg/m}^2$ . See Diagram 2.35.

**2.138** If lightweight aggregate blocks of density less than  $1200\text{kg/m}^3$  are used above ceiling level, then one side should be sealed with cement paint or plaster skim.

**Wall type 3.3 (cavity masonry core)**

**2.139** Where the roof or loft space is not a habitable room and there is a ceiling with a minimum mass per unit area  $10\text{kg/m}^2$  and with sealed joints, the independent panels may be omitted in the roof space but the cavity masonry core should be maintained to the underside of the roof.

**Junctions with separating floors**

**2.140** There are important details in Section 3 concerning junctions between wall type 3 and separating floors.

## Wall type 4: framed walls with absorbent material

**2.141** In this guidance only a timber framed wall is described. For steel framed walls, seek advice from the manufacturer.

**2.142** The resistance to airborne sound depends on the mass per unit area of the leaves, the isolation of the frames, and the absorption in the cavity between the frames.

### Construction

**2.143** The construction consists of timber frames, with plasterboard linings on room surfaces and with absorbent material between the frames.

**2.144** One wall type 4 construction (type 4.1) is described in this guidance.

**2.145** Details of how junctions should be made to limit flanking transmission are also described in this guidance.

**2.146** Points to watch

### 2.147 Wall type 4.1 Double leaf frames with absorbent material (see Diagram 2.37)

- minimum distance between inside lining faces of 200mm;
- plywood sheathing may be used in the cavity as necessary for structural reasons;
- each lining to be two or more layers of plasterboard, each sheet of minimum mass per unit area 10kg/m<sup>2</sup>, with staggered joints;
- absorbent material to be unfaced mineral wool batts or quilt (which may be wire reinforced), minimum density 10kg/m<sup>3</sup>;
- minimum thickness of absorbent material:
  - a. 25mm if suspended in the cavity between frames,
  - b. 50mm if fixed to one frame,
  - c. 25mm per batt (or quilt) if one is fixed to each frame.

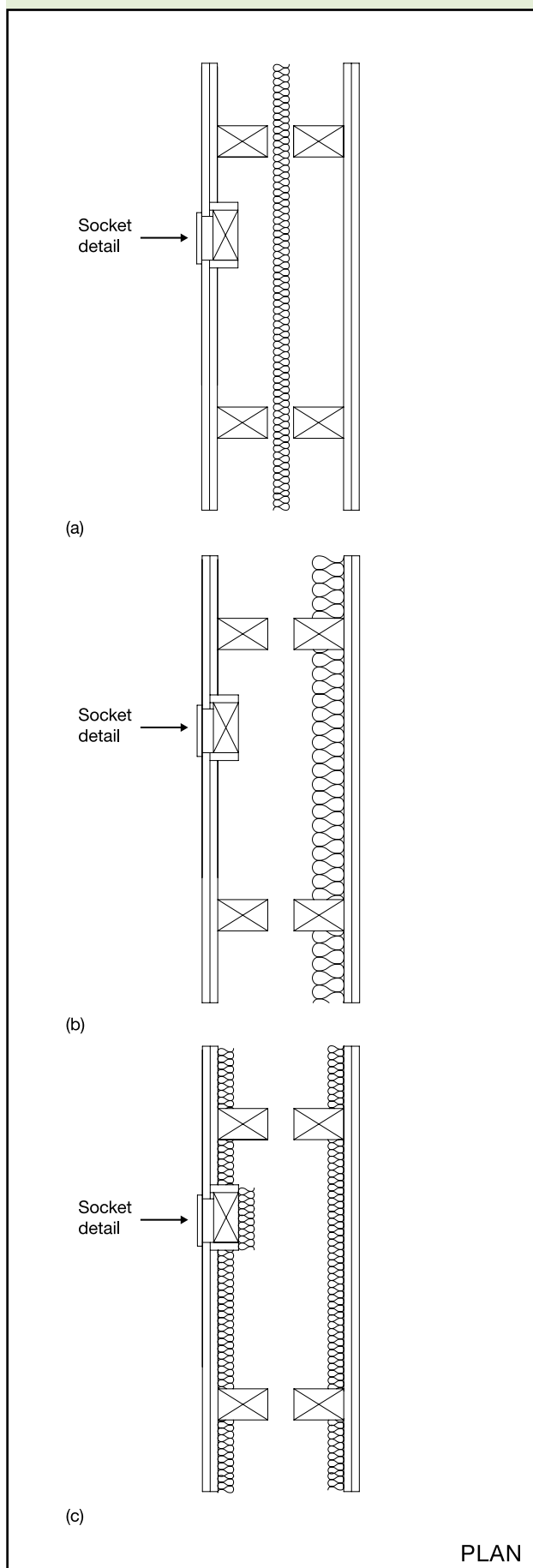
**Note:** A masonry core may be used where required for structural purposes, but the core should be connected to only one frame.

#### Do

- a. Do ensure that where fire stops are needed in the cavity between frames they are either flexible or fixed to only one frame.
- b. Do stagger the position of sockets on opposite sides of the separating wall, and use a similar thickness of cladding behind the socket box.
- c. Do ensure that each layer of plasterboard is independently fixed to the stud frame.
- d. Do control flanking transmission from walls and floors connected to the separating wall as described in the guidance on junctions.

#### Do not

- a. **Where it is necessary to connect the two leaves together for structural reasons, do not use ties of greater cross section than 40mm x 3mm fixed to the studwork at or just below ceiling level and do not set them at closer than 1.2m centres.**
- b. **Do not locate sockets back to back. A minimum edge to edge stagger of 150mm is recommended. Do not chase plasterboard.**

Diagram 2.37 **Wall type 4.1****Junction requirements for wall type 4**

**Junctions with an external cavity wall with masonry inner leaf**

**2.148** No guidance available (seek specialist advice).

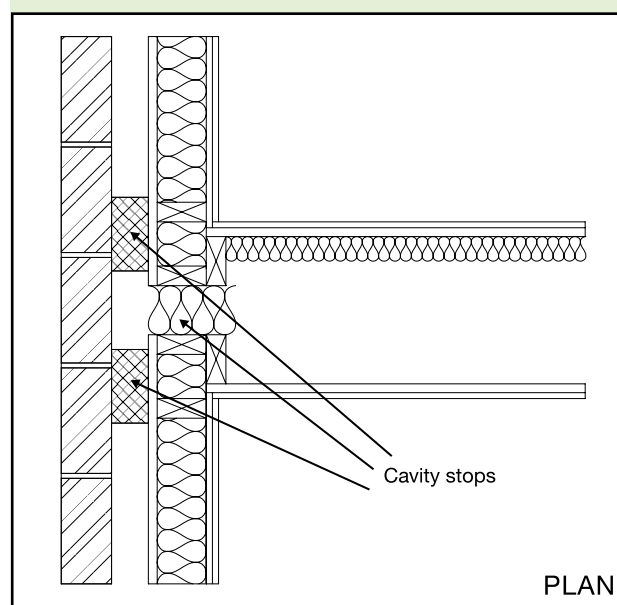
**Junctions with an external cavity wall with timber frame inner leaf**

**2.149** Where the external wall is a cavity wall:

- the outer leaf of the wall may be of any construction; and
- the cavity should be stopped between the ends of the separating wall and the outer leaf with a flexible closer. See Diagram 2.38.

**2.150** The wall finish of the inner leaf of the external wall should be:

- one layer of plasterboard; or
- two layers of plasterboard where there is a separating floor;
- each sheet of plasterboard of minimum mass per unit area  $10\text{kg/m}^2$ ; and
- all joints should be sealed with tape or caulked with sealant.

Diagram 2.38 **Wall type 4 – external cavity wall with timber frame inner leaf**

## **Junctions with an external solid masonry wall**

**2.151** No guidance available (seek specialist advice).

## **Junctions with internal framed walls**

**2.152** There are no restrictions on internal framed walls meeting a type 4 separating wall.

## **Junctions with internal masonry walls**

**2.153** There are no restrictions on internal masonry walls meeting a type 4 separating wall.

## **Junctions with internal timber floors**

**2.154** Block the air paths through the wall into the cavity by using solid timber blockings or continuous ring beam or joists.

## **Junctions with internal concrete floors**

**2.155** No guidance available (seek specialist advice).

## **Junctions with timber ground floors**

**2.156** Block the air paths through the wall into the cavity by using solid timber blockings or a continuous ring beam or joists.

**2.157** See Building Regulation Part C – Site preparation and resistance to moisture, and Building Regulation Part L – Conservation of fuel and power.

## **Junctions with concrete ground floors**

**2.158** The ground floor may be a solid slab, laid on the ground, or a suspended concrete floor. A concrete slab floor on the ground may be continuous under a type 4 separating wall. A suspended concrete floor may only pass under a wall type 4 if the floor has a mass per unit area of at least 365kg/m<sup>2</sup>.

**2.159** See Building Regulation Part C – Site preparation and resistance to moisture, and Building Regulation Part L – Conservation of fuel and power.

## **Junctions with ceiling and roof space**

**2.160** The wall should preferably be continuous to the underside of the roof.

**2.161** The junction between the separating wall and the roof should be filled with a flexible closer.

**2.162** The junction between the ceiling and the wall linings should be sealed with tape or caulked with sealant.

Where the roof or loft space is not a habitable room and there is a ceiling with a minimum mass per unit area 10kg/m<sup>2</sup> and with sealed joints, either:

- a. the linings on each frame may be reduced to two layers of plasterboard, each sheet of minimum mass per unit area 10kg/m<sup>2</sup>; or
- b. the cavity may be closed at ceiling level without connecting the two frames rigidly together and then one frame may be used in the roof space provided there is a lining of two layers of plasterboard, each sheet of minimum mass per unit area 10kg/m<sup>2</sup>, on both sides of the frame.

**2.163** Where there is an external wall cavity, the cavity should be closed at eaves level with a suitable material.

## **Junctions with separating floors**

**2.164** There are important details in Section 3 concerning junctions between wall type 4 and separating floors.

# Section 3: Separating floors and associated flanking constructions for new buildings

## Introduction

**3.1** This Section gives examples of floor types which, if built correctly, should achieve the performance standards set out in Section 0: Performance – Table 1a.

**3.2** The guidance in this section is not exhaustive and other designs, materials or products may be used to achieve the performance standards set out in Section 0: Performance – Table 1a. Advice should be sought from the manufacturer or other appropriate source.

**3.3** The floors are grouped into three main types. See Diagram 3.1.

**3.4 Floor type 1:** *Concrete base with ceiling and soft floor covering*

The resistance to airborne sound depends mainly on the mass per unit area of the concrete base and partly on the mass per unit area of the ceiling. The soft floor covering reduces impact sound at source.

**3.5 Floor type 2:** *Concrete base with ceiling and floating floor*

The resistance to airborne and impact sound depends on the mass per unit area of the concrete base, as well as the mass per unit area and isolation of the floating layer and the ceiling. The floating floor reduces impact sound at source.

**3.6 Floor type 2:** *Floating floor*

Floor type 2 requires one of the floating floors described in this section. The description of floor type 2 contains a suffix (a), (b) or (c) which refers to the floating floor used.

**3.7 Floor type 3:** *Timber frame base with ceiling and platform floor*

The resistance to airborne and impact sound depends on the structural floor base and the isolation of the platform floor and the ceiling. The platform floor reduces impact sound at source.

**3.8 Ceiling treatment**

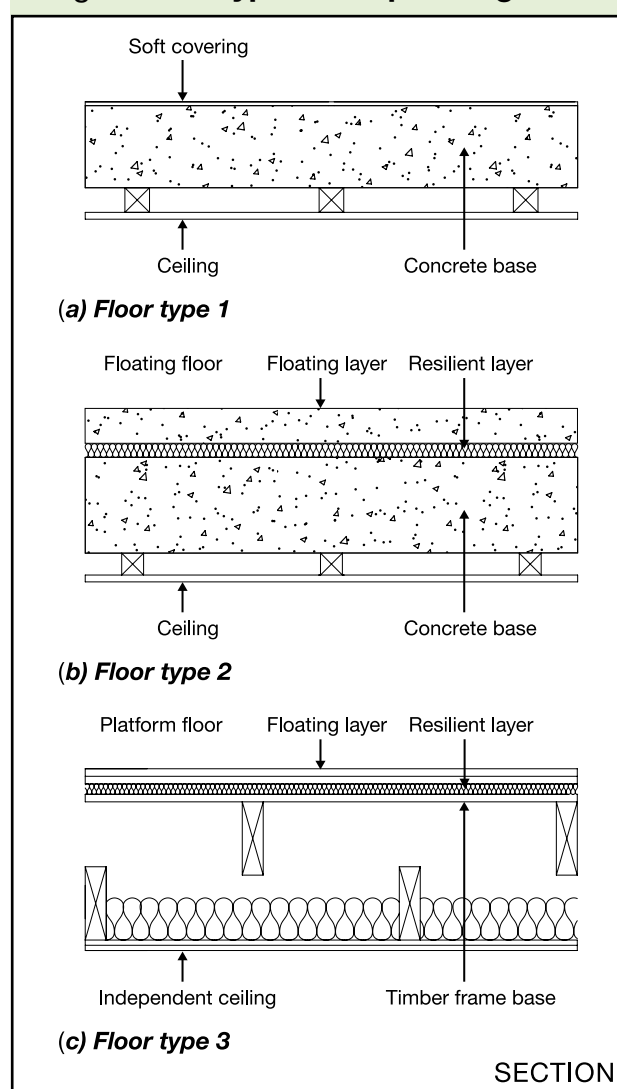
Each floor type requires one of the ceiling treatments described in this section. The description of each floor type contains a suffix A, B or C that refers to the ceiling treatment used.

**3.9** Within each floor type the constructions are ranked, as far as possible, with constructions providing better sound insulation given first.

## Junctions between separating floors and other building elements

**3.10** In order for the floor construction to be fully effective, care should be taken to correctly detail the junctions between the separating floor and other elements such as external walls, separating walls and floor penetrations. Recommendations are also given for the construction of these other elements where it is necessary to control flanking transmission. Notes and diagrams explain the junction details for each of the separating floor types.

Diagram 3.1 Types of separating floor



**3.11** Table 3.1 indicates the inclusion of guidance in this document on the junctions that may occur between each of the separating floor types and various attached building elements.

**Table 3.1 Separating floor junctions reference table**

Building element attached to separating wall	Separating floor type		
	Type 1	Type 2	Type 3
External cavity wall with masonry inner leaf	G	G	G
External cavity wall with timber frame inner leaf	G	G	G
External solid masonry wall	N	N	N
Internal wall – framed	G	G	G
Internal wall – masonry	G	G	N
Floor penetrations	G	G	G
<i>For flats the following may also apply:</i>			
Separating wall type 1 – solid masonry	G	G	G
Separating wall type 2 – cavity masonry	G	G	G
Separating wall type 3 – masonry between independent panels	G	G	G
Separating wall type 4 – framed wall with absorbent material	N	N	G

Key: G = guidance available; N = no guidance available (seek specialist advice)

**Note:**

Where any building element functions as a separating element (e.g. a ground floor that is also a separating floor for a basement flat) then the separating element requirements should take precedence.

## Beam and block floors

**3.12** For beam and block separating floors, seek advice from the manufacturer.

## Mass per unit area of floors

**3.13** The mass per unit area of a floor is expressed in kilograms per square metre ( $\text{kg/m}^2$ ). The mass per unit area of floors should be obtained from manufacturer's data or calculated using the method shown in Annex A.

**3.14** The density of the materials used (and on which the mass per unit area of the floor depends) is expressed in kilograms per cubic metre ( $\text{kg/m}^3$ ).

**3.15** Where appropriate, the mass per unit area of a bonded screed may be included in the calculation of the mass per unit area of the floor.

**3.16** The mass per unit area of a floating screed should not be included in the calculation of the mass per unit area of the floor.

## Ceiling treatments

**3.17** Each floor type should use one of the following three ceiling treatments (A, B or C). See Diagram 3.2.

**3.18** The ceiling treatments are ranked, in order of sound insulation performance from A to C, with constructions providing higher sound insulation given first.

**Note:** Use of a better performing ceiling than that described in the guidance should improve the sound insulation of the floor provided there is no significant flanking transmission.

### 3.19 Ceiling treatment A, independent ceiling with absorbent material

Ceiling treatment A should meet the following specification:

- at least 2 layers of plasterboard with staggered joints;
- minimum total mass per unit area of plasterboard  $20\text{kg/m}^2$ ;
- an absorbent layer of mineral wool (minimum thickness 100mm, minimum density  $10\text{kg/m}^3$ ) laid in the cavity formed above the ceiling.

The ceiling should be supported by one of the following methods:

- **Floor types 1, 2 and 3.** Use independent joists fixed only to the surrounding walls. A clearance of at least 100mm should be left between the top of the plasterboard forming the ceiling and the underside of the base floor.
- **Floor type 3.** Use independent joists fixed to the surrounding walls with additional support provided by resilient hangers attached directly to the floor. A clearance of at least 100mm should be left between the top of the ceiling joists and the underside of the base floor.

**3.20** Points to watch:**Do**

Do seal the perimeter of the independent ceiling with tape or sealant.

**Do not**

**Do not create a rigid or direct connection between the independent ceiling and the floor base.**

**3.21 Ceiling treatment B, plasterboard on proprietary resilient bars with absorbent material**

Ceiling treatment B should meet the following specification:

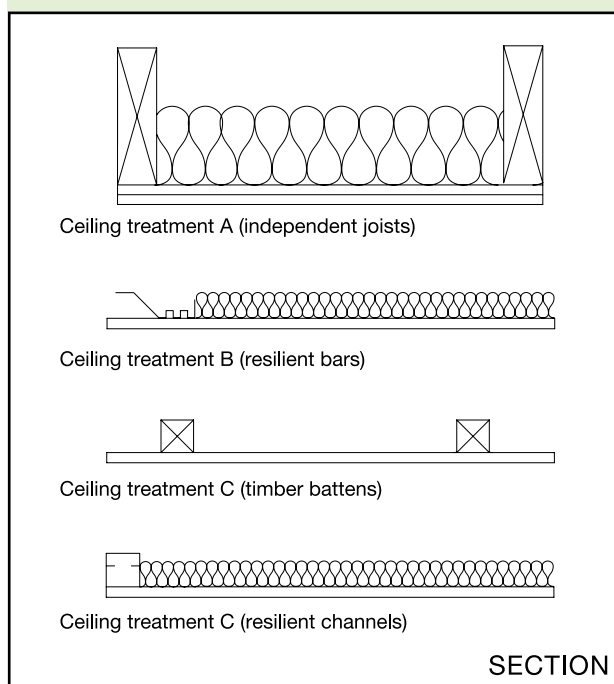
- single layer of plasterboard, minimum mass per unit area of plasterboard  $10\text{kg/m}^2$ ;
- fixed using proprietary resilient metal bars. On concrete floors, these resilient metal bars should be fixed to timber battens. For fixing details, seek advice from the manufacturer;
- an absorbent layer of mineral wool (minimum density  $10\text{kg/m}^3$ ) that fills the ceiling void.

**3.22 Ceiling treatment C, plasterboard on timber battens or proprietary resilient channels with absorbent material**

Ceiling treatment C should meet the following specification:

- single layer of plasterboard, minimum mass per unit area  $10\text{kg/m}^2$ ;
- fixed using timber battens or proprietary resilient channels;
- if resilient channels are used, incorporate an absorbent layer of mineral wool minimum density  $10\text{kg/m}^3$ ) that fills the ceiling void.

**Note:** Electrical cables give off heat when in use and special precautions may be required when they are covered by thermally insulating materials. See BRE BR 262, Thermal Insulation: avoiding risks, section 2.4. Installing recessed light fittings in ceiling treatments A to C can reduce their resistance to the passage of airborne and impact sound.

**Diagram 3.2 Ceiling treatments A, B and C****Floor type 1: concrete base with ceiling and soft floor covering**

**3.23** The resistance to airborne sound depends mainly on the mass per unit area of the concrete base and partly on the mass per unit area of the ceiling. The soft floor covering reduces impact sound at source.

**Constructions**

**3.24** The construction consists of a concrete floor base with a soft floor covering and a ceiling.

**3.25** Two floor type 1 constructions (types 1.1C and 1.2B) are described in this guidance which should be combined with the appropriate ceiling and soft floor covering.

**3.26** Details of how junctions should be made to limit flanking transmission are also described in this guidance.

## 3.27 Points to watch

### Do

- Do fix or glue the soft floor covering to the floor. (N.B. allow for future replacement.)
- Do fill all joints between parts of the floor to avoid air paths.
- Do give special attention to workmanship and detailing at the perimeter and wherever a pipe or duct penetrates the floor in order to reduce flanking transmission and to avoid air paths.
- Do build a separating concrete floor into the walls around its entire perimeter where the walls are masonry.
- Do fill with mortar any gap that may form between the head of a masonry wall and the underside of the concrete floor.
- Do control flanking transmission from walls connected to the separating floor as described in the guidance on junctions.

### Do not

- Do not allow the floor base to bridge a cavity in a cavity masonry wall.
- Do not use non-resilient floor finishes that are rigidly connected to the floor base.

## 3.28 Soft floor covering

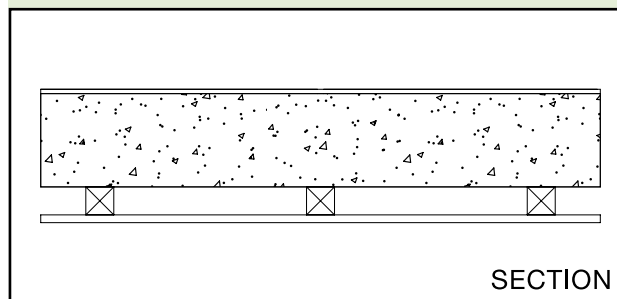
The soft floor covering should meet the following specification:

- any resilient material, or material with a resilient base, with an overall uncompressed thickness of at least 4.5mm; or
- any floor covering with a weighted reduction in impact sound pressure level ( $\Delta L_w$ ) of not less than 17dB when measured in accordance with BS EN ISO 140-8:1998 and calculated in accordance with BS EN ISO 717-2:1997.

**3.29 Floor type 1.1C** *Solid concrete slab (cast in situ, with or without permanent shuttering), soft floor covering, ceiling treatment C (see Diagram 3.3)*

- minimum mass per unit area of 365kg/m<sup>2</sup> (including shuttering only if it is solid concrete or metal) and including any bonded screed;
- soft floor covering essential;
- ceiling treatment C (or better) essential.

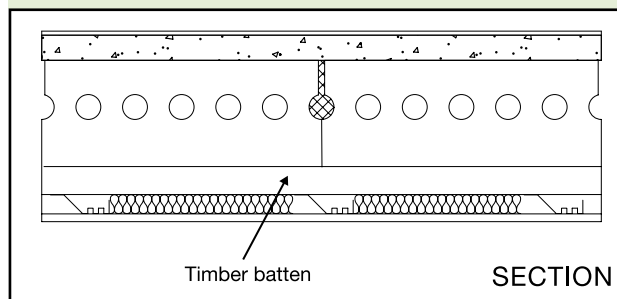
**Diagram 3.3 Floor type 1.1C – floor type 1.1 with ceiling treatment C**



**3.30 Floor Type 1.2B** *Concrete planks (solid or hollow), soft floor covering, ceiling treatment B (see Diagram 3.4)*

- minimum mass per unit area of planks and any bonded screed of 365kg/m<sup>2</sup>;
- use a regulating floor screed;
- all floor joints fully grouted to ensure air tightness;
- soft floor covering essential;
- ceiling treatment B (or better) essential.

**Diagram 3.4 Floor type 1.2B – floor type 1.2 with ceiling treatment B**



## Junction requirements for floor type 1

### Junctions with an external cavity wall with masonry inner leaf

**3.31** Where the external wall is a cavity wall:

- the outer leaf of the wall may be of any construction; and
- the cavity should be stopped with a flexible closer (see Diagram 3.5) ensuring adequate drainage, unless the cavity is fully filled with mineral wool or expanded polystyrene beads (seek manufacturer's advice for other suitable materials).

**3.32** The masonry inner leaf of an external cavity wall should have a mass per unit area of at least 120kg/m<sup>2</sup> excluding finish.

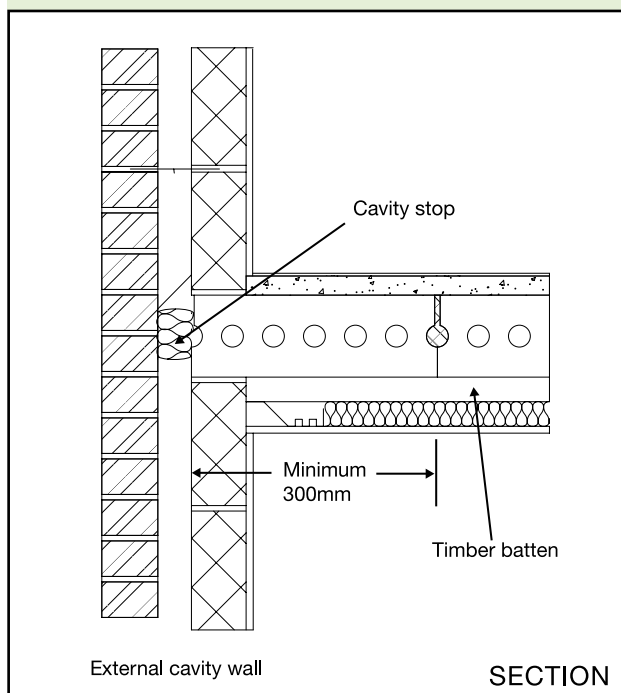
**3.33** The floor base (excluding any screed) should be built into a cavity masonry external wall and carried through to the cavity face of the inner leaf. The cavity should not be bridged.

*Floor type 1.2B*

**3.34** Where floor type 1.2B is used and the planks are parallel to the external wall the first joint should be a minimum of 300mm from the cavity face of the inner leaf. See Diagram 3.5.

**3.35** See details in Section 2 concerning the use of wall ties in external masonry cavity walls.

**Diagram 3.5 Floor type 1.2B – external cavity wall with masonry inner leaf**



## Junctions with an external cavity wall with timber frame inner leaf

**3.36** Where the external wall is a cavity wall:

- the outer leaf of the wall may be of any construction; and
- the cavity should be stopped with a flexible closer;
- the wall finish of the inner leaf of the external wall should be two layers of plasterboard, each sheet of plasterboard to be of minimum mass per unit area  $10\text{kg/m}^2$ , and all joints should be sealed with tape or caulked with sealant.

## Junctions with an external solid masonry wall

**3.37** No guidance available (seek specialist advice).

## Junctions with internal framed walls

**3.38** There are no restrictions on internal framed walls meeting a type 1 separating floor.

## Junctions with internal masonry walls

**3.39** The floor base should be continuous through, or above, an internal masonry wall.

**3.40** The mass per unit area of any load-bearing internal wall or any internal wall rigidly connected to a separating floor should be at least  $120\text{kg/m}^2$  excluding finish.

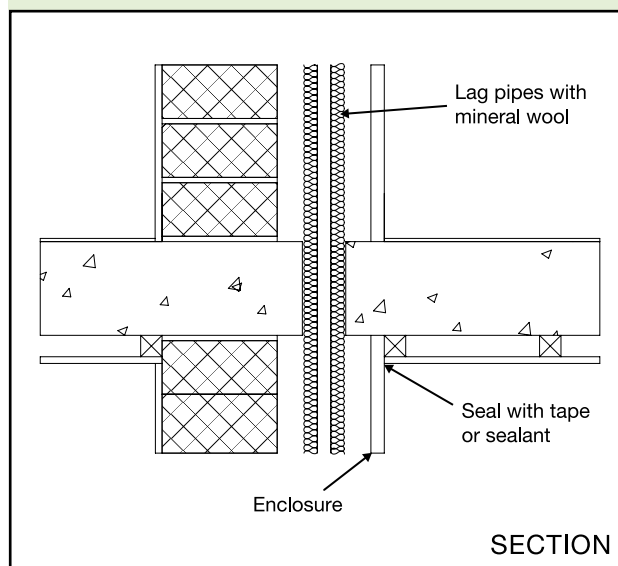
## Junctions with floor penetrations (excluding gas pipes)

**3.41** Pipes and ducts that penetrate a floor separating habitable rooms in different flats should be enclosed for their full height in each flat. See Diagram 3-6.

**3.42** The enclosure should be constructed of material having a mass per unit area of at least  $15\text{kg/m}^2$ . Either line the enclosure or wrap the duct or pipe within the enclosure with 25mm unfaced mineral fibre.

**3.43** Penetrations through a separating floor by ducts and pipes should have fire protection to satisfy Building Regulation Part B – Fire safety. Fire stopping should be flexible and prevent rigid contact between the pipe and floor.

**Diagram 3.6 Floor type 1 – floor penetrations**



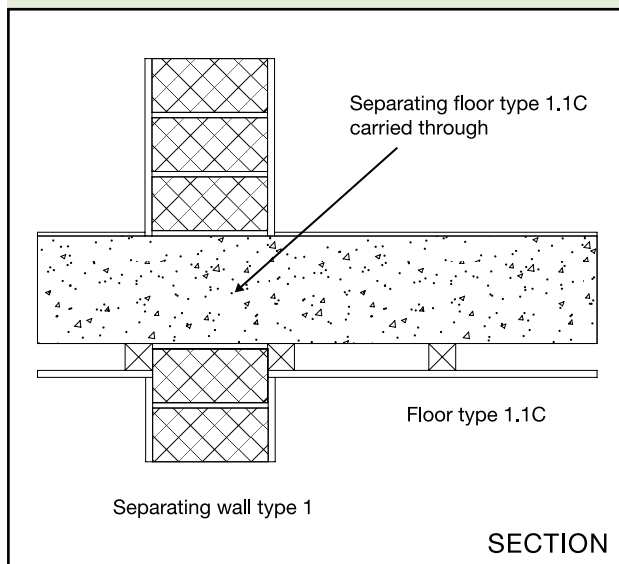
**Note:** There are requirements for ventilation of ducts at each floor where they contain gas pipes. Gas pipes may be contained in a separate ventilated duct or they can remain unenclosed. Where a gas service is installed, it shall comply with relevant codes and standards to ensure safe and satisfactory operation. See The Gas Safety (Installation and Use) Regulations 1998, SI 1998 No.2451.

For flats where there are separating walls the following may also apply:

## Junctions with separating wall type 1 – solid masonry

Floor type 1.1C

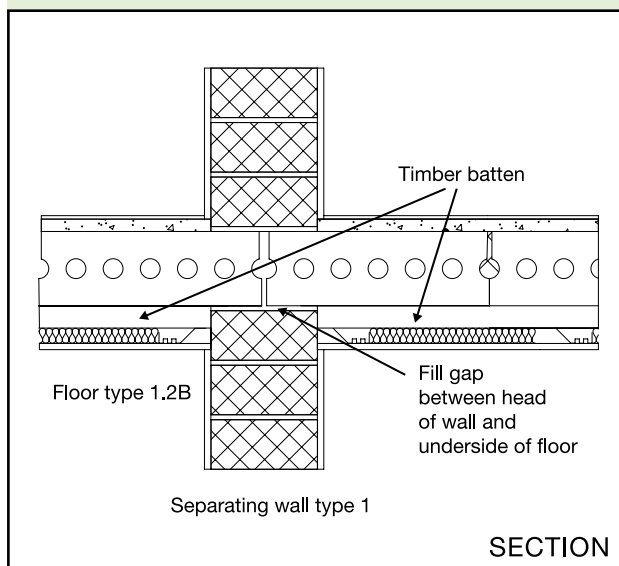
**Diagram 3.7 Floor type 1.1C – wall type 1**



**3.44** A separating floor type 1.1C base (excluding any screed) should pass through a separating wall type 1. See Diagram 3.7.

Floor type 1.2B

**Diagram 3.8 Floor type 1.2B – wall type 1**



**3.45** A separating floor type 1.2B base (excluding any screed) should not be continuous through a separating wall type 1. See Diagram 3.8.

## Junctions with separating wall type 2 – cavity masonry

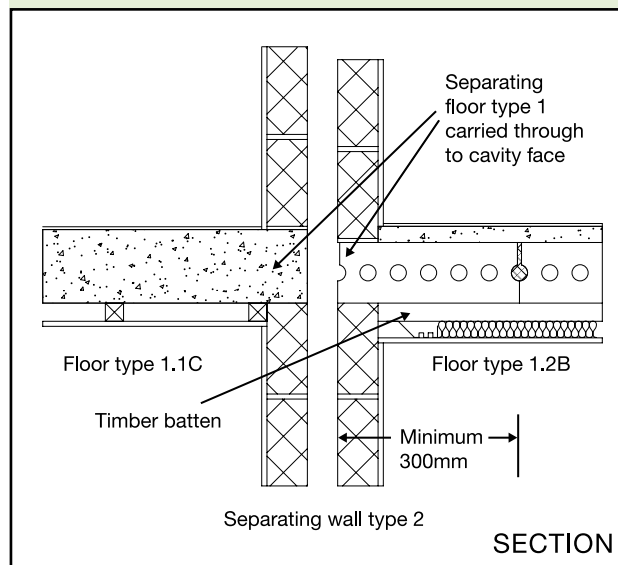
**3.46** The mass per unit area of any leaf that is supporting or adjoining the floor should be at least 120kg/m<sup>2</sup> excluding finish.

**3.47** The floor base (excluding any screed) should be carried through to the cavity face of the leaf. The wall cavity should not be bridged. See Diagram 3.9.

Floor type 1.2B

**3.48** Where floor type 1.2B is used and the planks are parallel to the separating wall the first joint should be a minimum of 300mm from the inner face of the adjacent cavity leaf. See Diagram 3.9.

**Diagram 3.9 Floor types 1.1C and 1.2B – wall type 2**

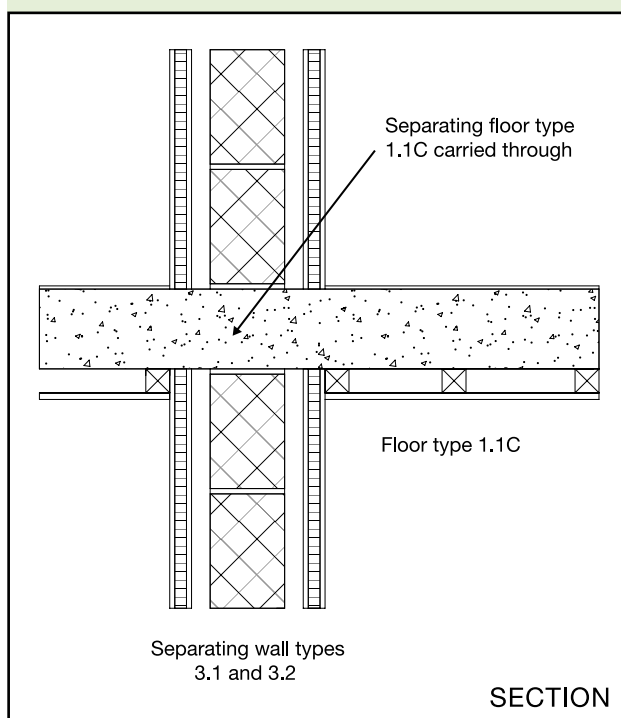


## Junctions with separating wall type 3 – masonry between independent panels

### Junctions with separating wall type 3.1 and 3.2 (solid masonry core)

Floor type 1.1C

**3.49** A separating floor type 1.1C base (excluding any screed) should pass through separating wall types 3.1 and 3.2. See Diagram 3.10.

Diagram 3.10 **Floor type 1.1C – wall types 3.1 and 3.2****Floor type 2: concrete base with ceiling and floating floor**

**3.56** The resistance to airborne and impact sound depends on the mass per unit area of the concrete base, as well as the mass per unit area and isolation of the floating layer and the ceiling. The floating floor reduces impact sound at source.

**Constructions**

**3.57** The construction consists of a concrete floor base with a floating floor and a ceiling. The floating floor consists of a floating layer and a resilient layer.

**3.58** Two floor type 2 constructions (types 2.1C and 2.2B) are described in this guidance, which should be combined with the appropriate ceiling and any one of the three floating floor options (a), (b) or (c).

**3.59** Details of how junctions should be made to limit flanking transmission are also described in this guidance.

**Limitations**

**3.60** Where resistance to airborne sound only is required the full construction should still be used.

**3.61** Points to watch

*Floor type 1.2B*

**3.50** A separating floor type 1.2B base (excluding any screed) should not be continuous through a separating wall type 3.

**3.51** Where separating wall type 3.2 is used with floor type 1.2B and the planks are parallel to the separating wall the first joint should be a minimum of 300mm from the centreline of the masonry core.

**Junctions with separating wall type 3.3 (cavity masonry core)**

**3.52** The mass per unit area of any leaf that is supporting or adjoining the floor should be at least 120kg/m<sup>2</sup> excluding finish.

**3.53** The floor base (excluding any screed) should be carried through to the cavity face of the leaf of the core. The cavity should not be bridged.

*Floor type 1.2B*

**3.54** Where floor type 1.2B is used and the planks are parallel to the separating wall the first joint should be a minimum of 300mm from the inner face of the adjacent cavity leaf of the masonry core.

**Junctions with separating wall type 4 – timber frames with absorbent material**

**3.55** No guidance available (seek specialist advice).

**Do**

- Do fill all joints between parts of the floor to avoid air paths.
- Do give special attention to workmanship and detailing at the perimeter and wherever a pipe or duct penetrates the floor in order to reduce flanking transmission and to avoid air paths.
- Do build a separating concrete floor base into the walls around its entire perimeter where the walls are masonry.
- Do fill with mortar any gap that may form between the head of a masonry wall and the underside of the concrete floor.
- Do control flanking transmission from walls connected to the separating floor as described in the guidance on junctions.

**Do not**

**Do not allow the floor base to bridge a cavity in a cavity masonry wall.**

## Floating floors (floating layers and resilient layers)

**3.62** The floating floor consists of a floating layer and resilient layer. See Diagram 3.11.

**3.63** Points to watch

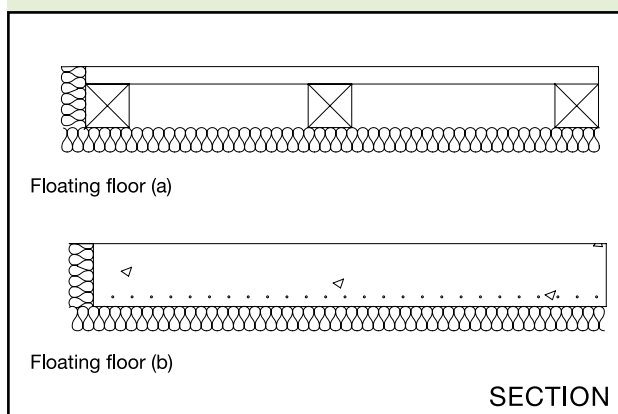
### Do

- Do leave a small gap (as advised by the manufacturer) between the floating layer and wall at all room edges and fill with a flexible sealant.
- Do leave a small gap (approx. 5mm) between skirting and floating layer and fill with a flexible sealant.
- Do lay resilient materials in rolls or sheets with lapped joints or with joints tightly butted and taped.
- Do use paper facing on the upper side of fibrous materials to prevent screed entering the resilient layer.

### Do not

- Do not bridge between the floating layer and the base or surrounding walls (e.g. with services or fixings that penetrate the resilient layer).**
- Do not let the floating screed create a bridge (for example through a gap in the resilient layer) to the concrete floor base or surrounding walls.**

Diagram 3.11 Floating floors (a) and (b)



### 3.64 Floating floor (a) Timber raft floating layer with resilient layer

Floating floor (a) should meet the following specification:

- timber raft of board material (with bonded edges, e.g. tongued and grooved) of minimum

mass per unit area 12kg/m<sup>2</sup>, fixed to 45mm x 45mm battens;

- timber raft to be laid loose on the resilient layer, battens should not be laid along any joints in the resilient layer;
- resilient layer of mineral wool with density 36kg/m<sup>3</sup> and minimum thickness 25mm. The resilient layer may be paper faced on the underside.

### 3.65 Floating floor (b) Sand cement screed floating layer with resilient layer

Floating floor (b) should meet the following specification:

- floating layer of 65mm sand cement screed or a suitable proprietary screed product with a mass per unit area of at least 80kg/m<sup>2</sup>. Ensure that the resilient layer is protected while the screed is being laid. A 20–50mm wire mesh may be used for this purpose;
- resilient layer consisting of either:
  - a layer of mineral wool of minimum thickness 25mm with density 36kg/m<sup>3</sup>, paper faced on the upper side to prevent the screed entering the resilient layer, or
  - an alternative type of resilient layer which meets the following two requirements:
    - maximum dynamic stiffness (measured according to BS EN 29052-1:1992) of 15MN/m<sup>3</sup>, and
    - minimum thickness of 5mm under the load specified in the measurement procedure of BS EN 29052-1:1992, 1.8kPa to 2.1kPa.

**Note:** For proprietary screed products, seek advice from the manufacturer.

### 3.66 Floating floor (c) Performance based approach

Floating floor (c) should meet the following specification:

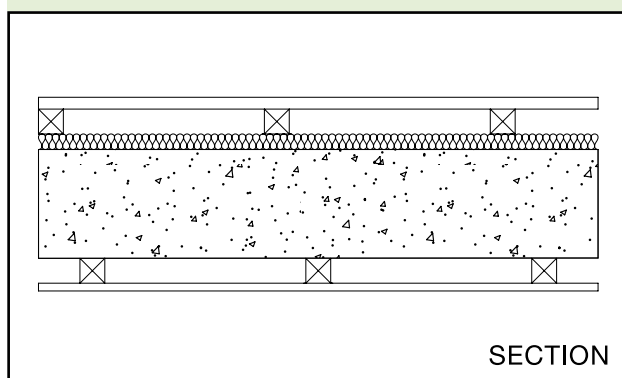
- rigid boarding above a resilient and/or damping layer(s); with
- weighted reduction in impact sound pressure level ( $\Delta L_w$ ) of not less than 29dB when measured according to BS EN ISO 140-8:1998 and rated according to BS EN ISO 717-2:1997. (See Annex B: Supplementary guidance on acoustic measurement standards.) The performance value  $\Delta L_w$  should be achieved when the floating floor is both loaded and unloaded as described in BS EN ISO 140-8:1998 for category II systems.

**Note:** For details on the performance and installation of proprietary floating floors, seek advice from the manufacturer.

**3.67 Floor type 2.1C** *Solid concrete slab (cast in-situ, with or without permanent shuttering), floating floor, ceiling treatment C (see Diagrams 3.12 and 3.13)*

- minimum mass per unit area of 300kg/m<sup>2</sup> (including shuttering only if it is solid concrete or metal), and including any bonded screed;
- regulating floor screed optional;
- floating floor (a), (b) or (c) essential;
- ceiling treatment C (or better) essential.

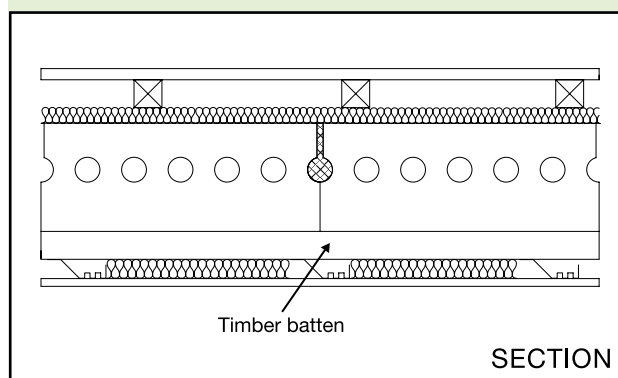
**Diagram 3.12 Floor type 2.1C(a) – floor type 2.1 with ceiling treatment C and floating floor (a)**



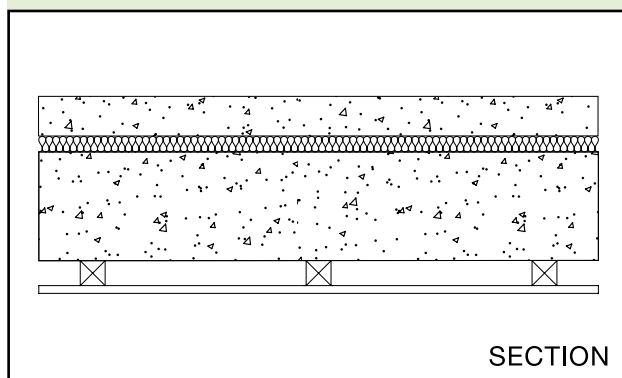
**3.68 Floor type 2.2B** *Concrete planks (solid or hollow), floating floor, ceiling treatment B (see Diagrams 3.14 and 3.15)*

- minimum mass per unit area of planks and any bonded screed of 300g/m<sup>2</sup>;
- use a regulating floor screed;
- all floor joints fully grouted to ensure air tightness;
- floating floor (a), (b) or (c) essential;
- ceiling treatment B (or better) essential.

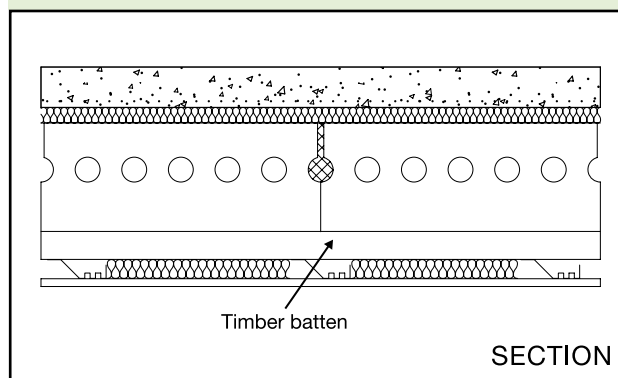
**Diagram 3.14 Floor type 2.2B(a) – floor type 2.2 with ceiling treatment B and floating floor (a)**



**Diagram 3.13 Floor type 2.1C(b) – floor type 2.1 with ceiling treatment C and floating floor (b)**



**Diagram 3.15 Floor type 2.2B(b) – floor type 2.2 with ceiling treatment B and floating floor (b)**



## Junction requirements for floor type 2

### Junctions with an external cavity wall with masonry inner leaf

**3.69** Where the external wall is a cavity wall:

- the outer leaf of the wall may be of any construction; and
- the cavity should be stopped with a flexible closer (see Diagram 3.16) ensuring adequate drainage, unless the cavity is fully filled with mineral wool or expanded polystyrene beads (seek manufacturer's advice for other suitable materials).

**3.70** The masonry inner leaf of an external cavity wall should have a mass per unit area of at least  $120\text{kg/m}^2$  excluding finish.

**3.71** The floor base (excluding any screed) should be built into a cavity masonry external wall and carried through to the cavity face of the inner leaf. The cavity should not be bridged.

#### Floor 2.2B

**3.72** Where floor 2.2B is used and the planks are parallel to the external wall the first joint should be a minimum of 300mm from the cavity face of the inner leaf. See Diagram 3.16.

**3.73** See details in Section 2 concerning the use of wall ties in external masonry cavity walls.

### Junctions with an external cavity wall with timber frame inner leaf

**3.74** Where the external wall is a cavity wall:

- the outer leaf of the wall may be of any construction;
- the cavity should be stopped with a flexible closer; and
- the wall finish of the inner leaf of the external wall should be two layers of plasterboard, each sheet of plasterboard to be of minimum mass per unit area  $10\text{kg/m}^2$ , and all joints should be sealed with tape or caulked with sealant.

### Junctions with an external solid masonry wall

**3.75** No guidance available (seek specialist advice).

### Junctions with internal framed walls

**3.76** There are no restrictions on internal framed walls meeting a type 2 separating floor.

### Junctions with internal masonry walls

**3.77** The floor base should be continuous through, or above an internal masonry wall.

**3.78** The mass per unit area of any load-bearing internal wall or any internal wall rigidly connected to a separating floor should be at least  $120\text{kg/m}^2$  excluding finish.

### Junctions with floor penetrations (excluding gas pipes)

**3.79** Pipes and ducts that penetrate a floor separating habitable rooms in different flats should be enclosed for their full height in each flat. See Diagram 3.17.

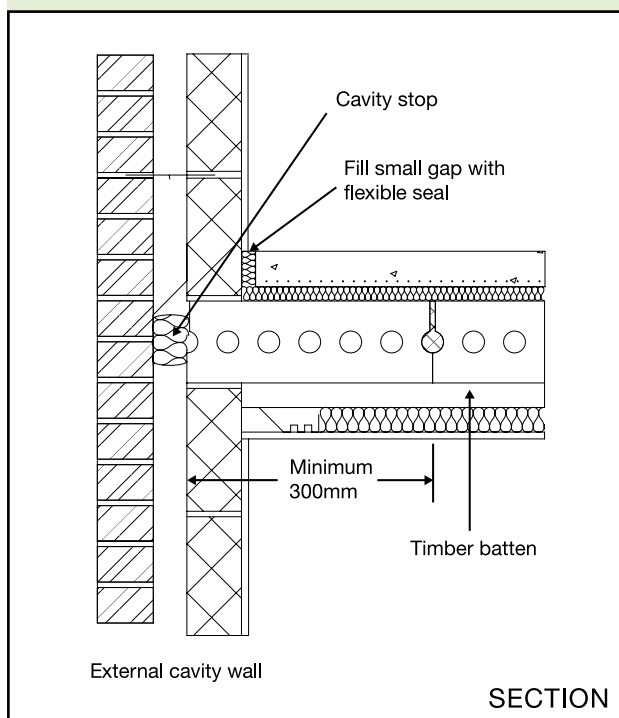
**3.80** The enclosure should be constructed of material having a mass per unit area of at least  $15\text{kg/m}^2$ . Either line the enclosure, or wrap the duct or pipe within the enclosure, with 25mm unfaced mineral wool.

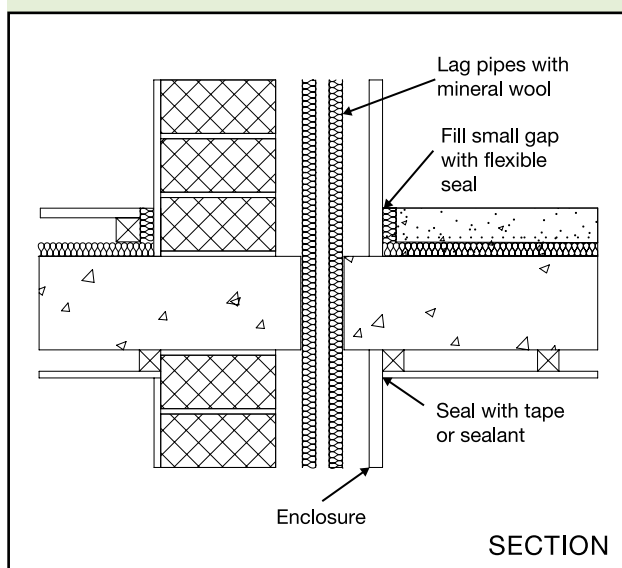
**3.81** Leave a small gap (approx. 5mm) between the enclosure and floating layer and seal with sealant or neoprene. Where floating floor (a) or (b) is used the enclosure may go down to the floor base, but ensure that the enclosure is isolated from the floating layer.

**3.82** Penetrations through a separating floor by ducts and pipes should have fire protection to satisfy Building Regulation Part B – Fire safety. Fire stopping should be flexible and also prevent rigid contact between the pipe and floor.

**Note:** There are requirements for ventilation of ducts at each floor where they contain gas pipes. Gas pipes may be contained in a separate ventilated duct or they can remain unenclosed. Where a gas service is installed, it shall comply with relevant codes and standards to ensure safe and satisfactory operation. See The Gas Safety (Installation and Use) Regulations 1998, SI 1998/2451.

**Diagram 3.16 Floor type 2 – external cavity wall with masonry internal leaf**



**Diagram 3.17 Floor type 2 – floor penetrations**

For flats where there are separating walls the following may also apply:

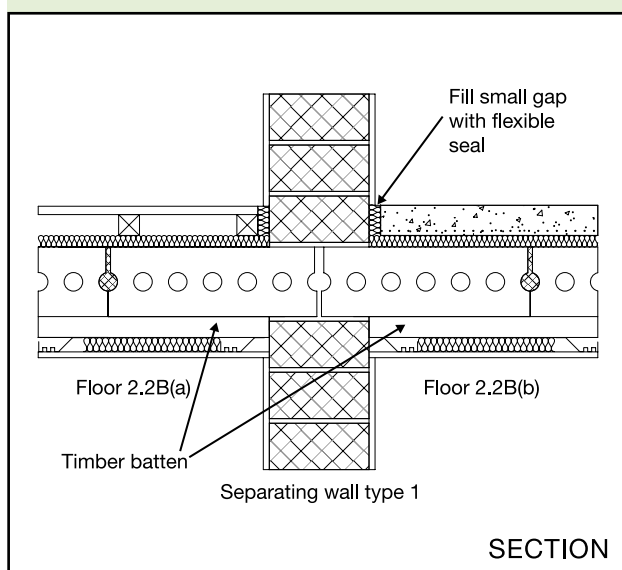
#### Junctions with a separating wall type 1 – solid masonry

##### Floor type 2.1C

**3.83** A separating floor type 2.1C base (excluding any screed) should pass through a separating wall type 1.

##### Floor type 2.2B

**3.84** A separating floor type 2.2B base (excluding any screed) should not be continuous through a separating wall type 1. See Diagram 3.18.

**Diagram 3.18 Floor types 2.2B(a) and 2.2B(b) – wall type 1**

#### Junctions with a separating wall type 2 – cavity masonry

**3.85** The floor base (excluding any screed) should be carried through to the cavity face of the leaf. The cavity should not be bridged.

##### Floor type 2.2B

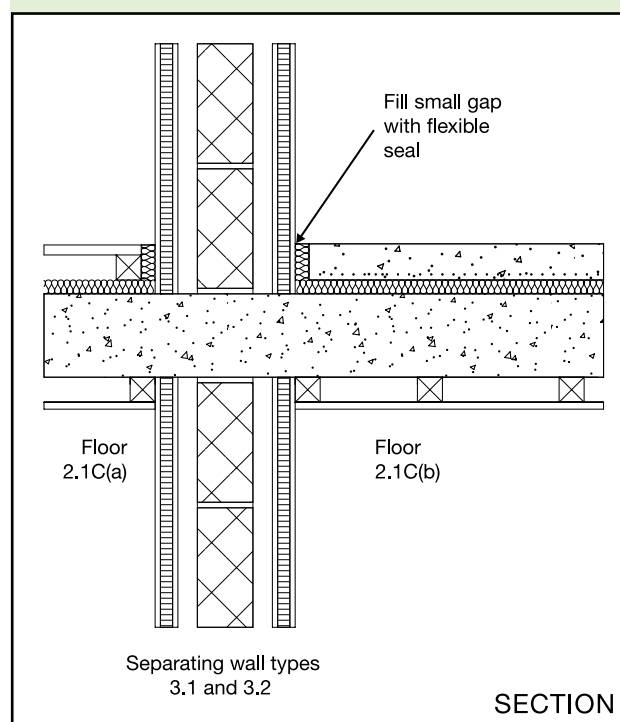
**3.86** Where floor type 2.2B is used and the planks are parallel to the separating wall the first joint should be a minimum of 300mm from the cavity face of the leaf.

#### Junctions with a separating wall type 3 – masonry between independent panels

##### Junctions with separating wall type 3.1 and 3.2 (solid masonry core)

##### Floor type 2.1C

**3.87** A separating floor type 2.1C base (excluding any screed) should pass through separating wall types 3.1 and 3.2. See Diagram 3.19.

**Diagram 3.19 Floor type 2.1C – wall types 3.1 and 3.2**

##### Floor type 2.2B

**3.88** A separating floor type 2.2B base (excluding any screed) should not be continuous through a separating wall type 3.

**3.89** Where separating wall type 3.2 is used with floor type 2.2B and the planks are parallel to the separating wall the first joint should be a minimum of 300mm from the centreline of the masonry core.

## Junctions with separating wall type 3.3 (cavity masonry core)

**3.90** The mass per unit area of any leaf that is supporting or adjoining the floor should be at least 120kg/m<sup>2</sup> excluding finish.

**3.91** The floor base (excluding any screed) should be carried through to the cavity face of the leaf of the core. The cavity should not be bridged.

### Floor type 2.2B

**3.92** Where floor type 2.2B is used and the planks are parallel to the separating wall the first joint should be a minimum of 300mm from the inner face of the adjacent cavity leaf of the masonry core.

## Junctions with separating wall type 4 – timber frames with absorbent material

**3.93** No guidance available (seek specialist advice).

## Floor type 3: timber frame base with ceiling and platform floor

**3.94** The resistance to airborne and impact sound depends on the structural floor base and the isolation of the platform floor and the ceiling. The platform floor reduces impact sound at source.

### Construction

**3.95** The construction consists of a timber frame structural floor base with a deck, platform floor and ceiling treatment A. The platform floor consists of a floating layer and a resilient layer.

**3.96** One floor type 3 construction (type 3.1A) is described in this guidance.

**3.97** Details of how junctions should be made to limit flanking transmission are also described in this guidance.

### Limitations

**3.98** Where resistance to airborne sound only is required the full construction should still be used.

## 3.99 Points to watch

### Do

- Do give special attention to workmanship and detailing at the perimeter and wherever the floor is penetrated, to reduce flanking transmission and to avoid air paths.
- Do control flanking transmission from walls connected to the separating floor as described in the guidance on junctions.

### Platform floor

- Do use the correct density of resilient layer and ensure it can carry the anticipated load.
- Do use an expanded or extruded polystyrene strip (or similar resilient material) around the perimeter which is approx. 4mm higher than the upper surface of the floating layer to ensure that during construction a gap is maintained between the wall and the floating layer. This gap may be filled with a flexible sealant.
- Do lay resilient materials in sheets with joints tightly butted and taped.

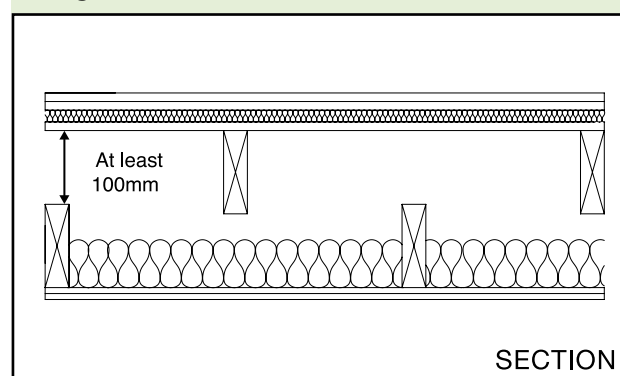
### Do not

**Do not bridge between the floating layer and the base or surrounding walls (e.g. with services or fixings that penetrate the resilient layer).**

## 3.100 Floor type 3.1A Timber frame base with ceiling treatment A and platform floor (see Diagram 3.20)

- timber joists with a deck;
- the deck should be of any suitable material with a minimum mass per unit area of 20kg/m<sup>2</sup>;
- platform floor (including resilient layer) essential;
- ceiling treatment A essential.

Diagram 3.20 Floor type 3.1A



**3.101 Platform floor**

The floating layer should be:

- a minimum of two layers of board material;
- minimum total mass per unit area 25kg/m<sup>2</sup>;
- each layer of minimum thickness 8mm;
- fixed together (e.g. spot bonded with a resilient adhesive or glued/screwed) with joints staggered.

The floating layer should be laid loose on a resilient layer.

**Example 1**

- 18mm timber or wood based board
- tongued and grooved edges and glued joints
- spot bonded to a substrate of 19mm plasterboard with joints staggered
- minimum total mass per unit area 25kg/m<sup>2</sup>

**Example 2**

- two layers of cement bonded particle board with staggered joints
- total thickness 24mm
- boards glued and screwed together
- minimum total mass per unit area 25kg/m<sup>2</sup>

**3.102 Resilient layer**

The resilient layer specification is:

- mineral wool, minimum thickness 25mm, density 60 to 100kg/m<sup>3</sup>;
- the mineral wool may be paper faced on the underside.

**Note:** The lower figure of density for the resilient layer gives a higher resistance to impact sound but a 'softer' floor. In such cases additional support can be provided around the perimeter of the floor by using a timber batten with a foam strip along the top attached to the wall.

**Junction requirements for floor type 3****Junctions with an external cavity wall with masonry inner leaf**

**3.103** Where the external wall is a cavity wall:

- a. the outer leaf of the wall may be of any construction; and

- b. the cavity should be stopped with a flexible closer unless the cavity is fully filled with mineral wool or expanded polystyrene beads (seek manufacturer's advice for other suitable materials).

**3.104** The masonry inner leaf of a cavity wall should be lined with an independent panel as described for wall type 3.

**3.105** The ceiling should be taken through to the masonry. The junction between the ceiling and the independent panel should be sealed with tape or caulked with sealant.

**3.106** Use any normal method of connecting floor base to wall but block air paths between floor and wall cavities.

**3.107** Where the mass per unit area of the inner leaf is greater than 375kg/m<sup>2</sup> the independent panels are not required.

**3.108** See details in Section 2 concerning the use of wall ties in external masonry cavity walls.

**Junctions with an external cavity wall with timber frame inner leaf**

**3.109** Where the external wall is a cavity wall:

- a. the outer leaf of the wall may be of any construction; and
- b. the cavity should be stopped with a flexible closer.

**3.110** The wall finish of the inner leaf of the external wall should be:

- a. two layers of plasterboard;
- b. each sheet of plasterboard of minimum mass per unit area 10kg/m<sup>2</sup>; and
- c. all joints should be sealed with tape or caulked with sealant.

**3.111** Use any normal method of connecting floor base to wall. Where the joists are at right angles to the wall, spaces between the floor joists should be sealed with full depth timber blocking.

**3.112** The junction between the ceiling and wall lining should be sealed with tape or caulked with sealant.

**Junctions with an external solid masonry wall**

**3.113** No guidance available (seek specialist advice).

**Junctions with internal framed walls**

**3.114** Where the joists are at right angles to the wall, spaces between the floor joists should be sealed with full depth timber blocking.

**3.115** The junction between the ceiling and the internal framed wall should be sealed with tape or caulked with sealant.

**Junctions with internal masonry walls**

**3.116** No guidance available (seek specialist advice).

## Junctions with floor penetrations (excluding gas pipes)

**3.117** Pipes and ducts that penetrate a floor separating habitable rooms in different flats should be enclosed for their full height in each flat. See Diagram 3.21.

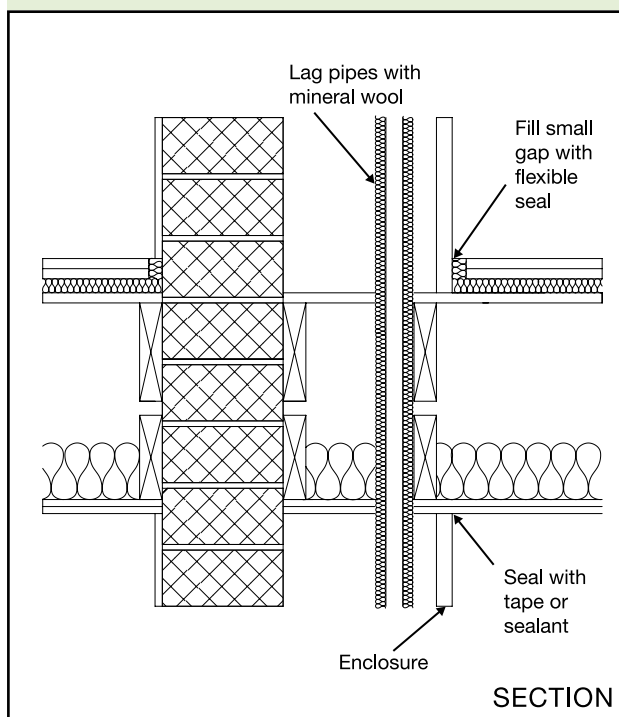
**3.118** The enclosure should be constructed of material having a mass per unit area of at least  $15\text{kg/m}^2$ . Either line the enclosure, or wrap the duct or pipe within the enclosure, with 25mm unfaced mineral wool.

**3.119** Leave a small gap (approx. 5mm) between enclosure and floating layer and seal with sealant or neoprene. The enclosure may go down to the floor base, but ensure that the enclosure is isolated from the floating layer.

**3.120** Penetrations through a separating floor by ducts and pipes should have fire protection to satisfy Building Regulation Part B – Fire safety. Fire stopping should be flexible and also prevent rigid contact between the pipe and floor.

**Note:** There are requirements for ventilation of ducts at each floor where they contain gas pipes. Gas pipes may be contained in a separate ventilated duct or they can remain unenclosed. Where a gas service is installed, it shall comply with relevant codes and standards to ensure safe and satisfactory operation. See The Gas Safety (Installation and Use) Regulations 1998, SI 1998/2451.

**Diagram 3.21 Floor type 3 – floor penetrations**



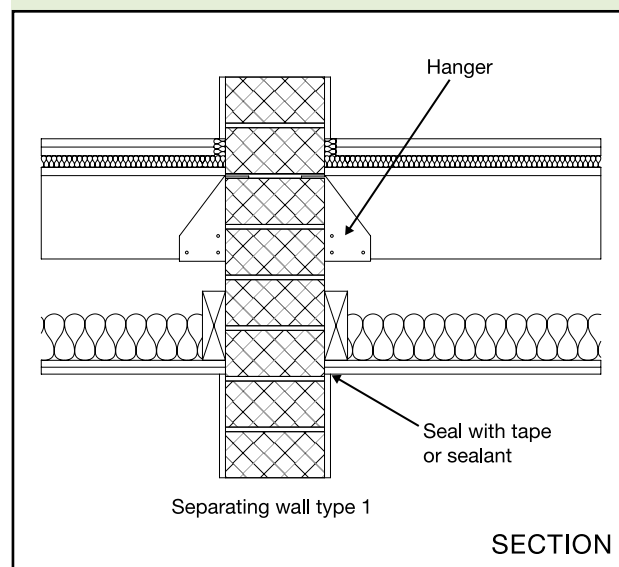
*For flats where there are separating walls the following may also apply:*

## Junctions with a separating wall type 1 – solid masonry

**3.121** If floor joists are to be supported on the separating wall then they should be supported on hangers and should not be built in. See Diagram 3.22.

**3.122** The junction between the ceiling and wall should be sealed with tape or caulked with sealant.

**Diagram 3.22 Floor type 3 – wall type 1**



## Junctions with a separating wall type 2 – cavity masonry

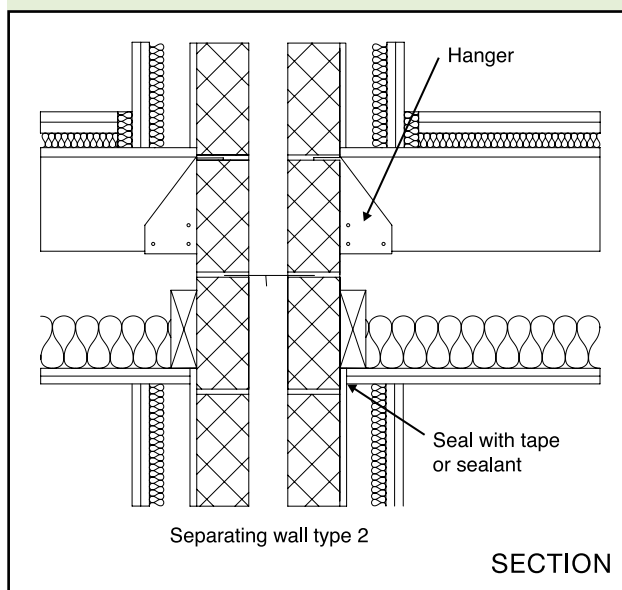
**3.123** If floor joists are to be supported on the separating wall then they should be supported on hangers and should not be built in. See Diagram 3.23.

**3.124** The adjacent leaf of a cavity separating wall should be lined with an independent panel as described in wall type 3.

**3.125** The ceiling should be taken through to the masonry. The junction between the ceiling and the independent panel should be sealed with tape or caulked with sealant.

**3.126** Where the mass per unit area of the adjacent leaf is greater than  $375\text{kg/m}^2$  the independent panels are not required.

Diagram 3.23 Floor type 3 – wall type 2



### Junctions with a separating wall type 3 – masonry between independent panels

**3.127** If floor joists are to be supported on the separating wall then they should be supported on hangers and should not be built in.

**3.128** The ceiling should be taken through to the masonry. The junction between the ceiling and the independent panel should be sealed with tape or caulked with sealant.

### Junctions with a separating wall type 4 – timber frames with absorbent material

**3.129** Where the joists are at right angles to the wall, spaces between the floor joists should be sealed with full depth timber blocking.

**3.130** The junction of the ceiling and wall lining should be sealed with tape or caulked with sealant.

# Section 4: Dwelling-houses and flats formed by material change of use

## Introduction

**4.1** This Section gives guidance on dwelling-houses and flats formed by material change of use. For rooms for residential purposes formed by material change of use see Section 6.

**4.2** It may be that an existing wall, floor or stair in a building that is to undergo a material change of use will achieve the performance standards set out in Section 0: Performance – Table 1a without the need for remedial work. This would be the case if the construction was generally similar (including flanking constructions) to one of the constructions in Sections 2 and 3 (e.g. concerning the mass requirement, the structure under consideration should be within 15% of the mass per unit area of a construction listed in the relevant section).

**4.3** In other circumstances it may be possible to use the guidance in Section 2 or 3 (including flanking constructions) to determine the appropriate remedial treatment which will result in the construction achieving the performance standards in Section 0: Performance – Table 1a.

**4.4** For situations where it is uncertain whether the existing construction achieves the performance standards set out in Section 0: Performance – Table 1a, this section describes one wall treatment, two floor treatments and one stair treatment as shown in Diagram 4.1. These constructions can be used to increase the sound insulation.

**4.5** The guidance in this section is not exhaustive and other designs, materials or products may be used to achieve the performance standards set out in Section 0: Performance – Table 1a. Advice should be sought from the manufacturer or other appropriate source.

### **4.6 Wall treatment 1** *Independent panel(s) with absorbent material*

The resistance to airborne sound depends on the form of existing construction, the mass of the independent panel(s), the isolation of the panel(s) and the absorbent material.

### **4.7 Floor treatment 1** *Independent ceiling with absorbent material*

The resistance to airborne and impact sound depends on the combined mass of the existing floor and the independent ceiling, the absorbent material, the isolation of the independent ceiling and the airtightness of the whole construction.

### **4.8 Floor treatment 2** *Platform floor with absorbent material*

The resistance to airborne and impact sound depends on the total mass of the floor, the effectiveness of the resilient layer and the absorbent material.

### **4.9 Stair treatment 1** *Stair covering and independent ceiling with absorbent material*

To be used where a timber stair performs a separating function. The resistance to airborne sound depends mainly on the mass of the stair, the mass and isolation of any independent ceiling and the airtightness of any cupboard or enclosure under the stairs. The stair covering reduces impact sound at source.

**4.10** In all cases it may be necessary to control flanking transmission in order to achieve the performance standards set out in Section 0: Performance – Table 1a. See Section 4: Junction requirements for material change of use.

**4.11** Special attention needs to be given to situations where flanking walls or floors are continuous across separating walls or floors as a result of the conversion work. In such instances additional treatments may be required to control flanking transmission along these continuous elements. Specialist advice may be needed.

**4.12** Significant differences may frequently occur between the construction and layout of each converted unit in a development. Building control bodies should have regard to the guidance in Section 1 when deciding on the application of pre-completion testing to material change of use.

**4.13** For some historic buildings undergoing a material change of use, it may not be practical to improve the sound insulation to the performance standards set out in Section 0: Performance – Table 1a. In such cases refer to Section 0: Performance, paragraph 0.7.

**4.14** Wall and floor treatments will impose additional loads on the existing structure. The structure should be assessed to ensure that the additional loading can be carried safely, with appropriate strengthening applied where necessary.

**4.15** Floor or wall penetrations, such as ducts or pipes, passing through separating elements in conversions can reduce the level of sound insulation. Guidance on the treatment of floor penetrations is given below.

## Work to existing construction

**4.16** Before a floor treatment is applied appropriate remedial work to the existing construction should be undertaken as described in paragraphs 4.17 and 4.18.

**4.17** If the existing floor is timber then gaps in floor boarding should be sealed by overlaying with hardboard or filled with sealant.

- a. Where floor boards are to be replaced, boarding should have a minimum thickness of 12mm, and mineral wool (minimum thickness 100mm, minimum density  $10\text{kg/m}^3$ ) should be laid between the joists in the floor cavity.
- b. If the existing floor is concrete and the mass per unit area of the concrete floor is less than  $300\text{kg/m}^2$ , or is unknown, then the mass of the floor should be increased to at least  $300\text{kg/m}^2$ . Any air gaps through a concrete floor should be sealed. A regulating screed may also be required.
- c. If there is an existing lath and plaster ceiling it should be retained as long as it satisfies Building Regulation Part B – Fire safety.
- d. Where the existing ceiling is not lath and plaster it should be upgraded as necessary to provide at least two layers of plasterboard with joints staggered, total mass per unit area  $20\text{kg/m}^2$ .

**4.18** Extensive remedial work to reduce flanking transmission may also be necessary to achieve the performance standards set out in Section 0: Performance – Table 1a. This may involve wall linings, see Section 4: Junction requirements for material change of use, paragraphs 4.43 and 4.44.

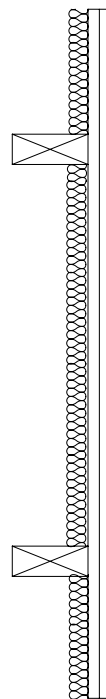
## Corridor walls and doors

**4.19** The separating walls described in this section should be used between dwelling-houses, or flats formed by material change of use, and corridors in order to control flanking transmission and to provide the required sound insulation. However, it is likely that the sound insulation will be reduced by the presence of a door.

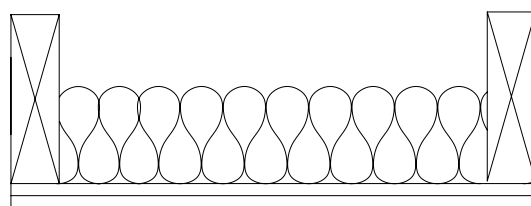
**4.20** Ensure that any door has good perimeter sealing (including the threshold where practical) and a minimum mass per unit area of  $25\text{kg/m}^2$  or a minimum sound reduction index of  $29\text{dB } R_w$  (measured according to BS EN ISO 140-3:1995 and rated according to BS EN ISO 717-1:1997). The door should also satisfy the Requirements of Building Regulation Part B – Fire safety.

**4.21** Noisy parts of the building should preferably have a lobby, double door or high performance doorset to contain the noise. Where this is not possible, nearby flats should have similar protection. However, there should be a sufficient number of them that are suitable for disabled access, see Building Regulations Part M – Access and facilities for disabled people.

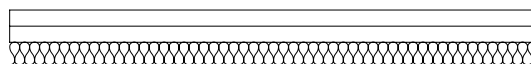
Diagram 4.1 Treatments for material change of use



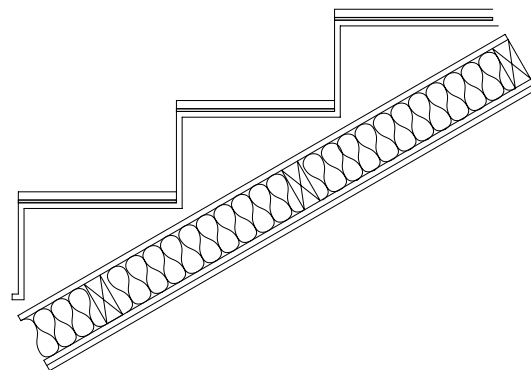
Wall treatment 1



Floor treatment 1



Floor treatment 2



Stair treatment 1

## Wall treatment 1: independent panel(s) with absorbent material

**4.22** The resistance to airborne sound depends on the form of existing construction, the mass of independent panel(s), the isolation of the panel(s) and the absorbent material.

### Construction

**4.23** The independent panel may be used on one side of the existing wall only where the existing wall is masonry, and has a thickness of at least 100mm and is plastered on both faces. With other types of existing wall the independent panels should be built on both sides.

### 4.24 Independent panel(s) with absorbent material (see Diagram 4.2)

- minimum mass per unit area of panel (excluding any supporting framework)  $20\text{kg/m}^2$ ;
- each panel should consist of at least two layers of plasterboard with staggered joints;
- if the panels are free-standing they should be at least 35mm from masonry core;
- if the panels are supported on a frame there should be a gap of at least 10mm between the frame and the face of the existing wall;
- mineral wool, minimum density  $10\text{kg/m}^3$  and minimum thickness 35mm, in the cavity between the panel and the existing wall.

### 4.25 Points to watch:

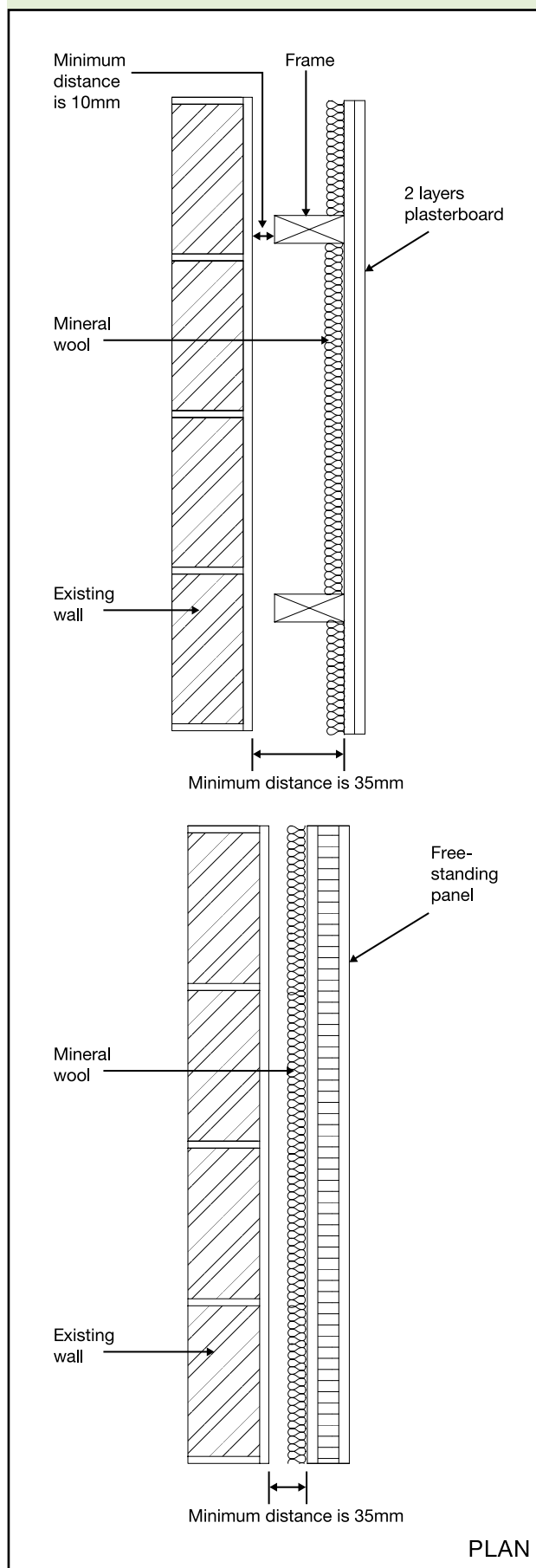
#### Do

- Do ensure that the independent panel and its supporting frame are not in contact with the existing wall.
- Do seal the perimeter of the independent panel with tape or sealant.

#### Do not

**Do not tightly compress the absorbent material as this may bridge the cavity.**

Diagram 4.2 Wall treatment 1



## Floor treatment 1: independent ceiling with absorbent material

**4.26** The resistance to airborne and impact sound depends on the combined mass of the existing floor and the independent ceiling, the absorbent material, the isolation of the independent ceiling and the airtightness of the whole construction.

**4.27** Independent ceiling with absorbent material (see Diagram 4.3)

- at least 2 layers of plasterboard with staggered joints, minimum total mass per unit area  $20\text{kg/m}^2$ ;
- an absorbent layer of mineral wool laid on the ceiling, minimum thickness 100mm, minimum density  $10\text{kg/m}^3$ .

The ceiling should be supported by one of the following methods:

- independent joists fixed only to the surrounding walls. A clearance of at least 25mm should be left between the top of the independent ceiling joists and the underside of the existing floor construction; or
- independent joists fixed to the surrounding walls with additional support provided by resilient hangers attached directly to the existing floor base.

**Note:** This construction involves a separation of at least 125mm between the upper surface of the independent ceiling and the underside of the existing floor construction. However, structural considerations determining the size of ceiling joists will often result in greater separation. Care should be taken at the design stage to ensure that adequate ceiling height is available in all rooms to be treated.

**4.28** Where a window head is near to the existing ceiling, the new independent ceiling may be raised to form a pelmet recess. See Diagram 4.4.

**4.29** For the junction detail between floor treatment 1 and wall treatment 1, see Diagram 4.5.

**4.30** Points to watch:

### Do

- Do remember to apply appropriate remedial work to the existing construction.
- Do seal the perimeter of the independent ceiling with tape or sealant.

### Do not

- Do not create a rigid or direct connection between the independent ceiling and the floor base.
- Do not tightly compress the absorbent material as this may bridge the cavity.

Diagram 4.3 Floor treatment 1

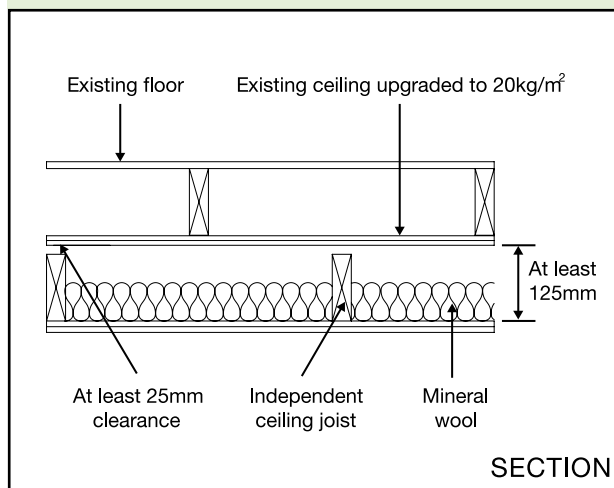


Diagram 4.4 Floor treatment 1 – high window head detail

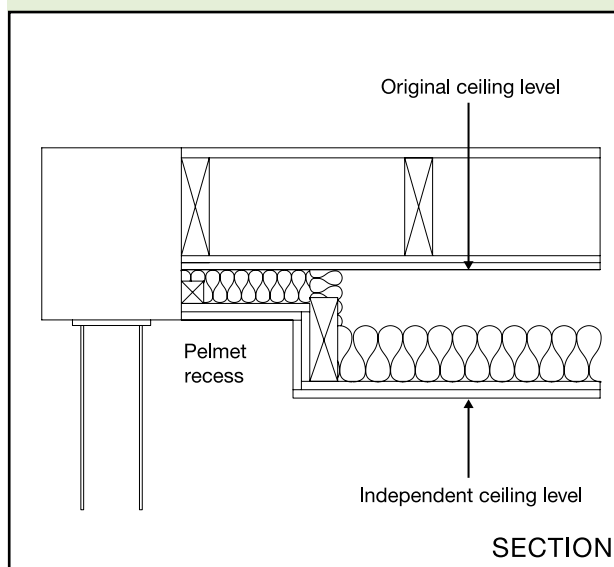
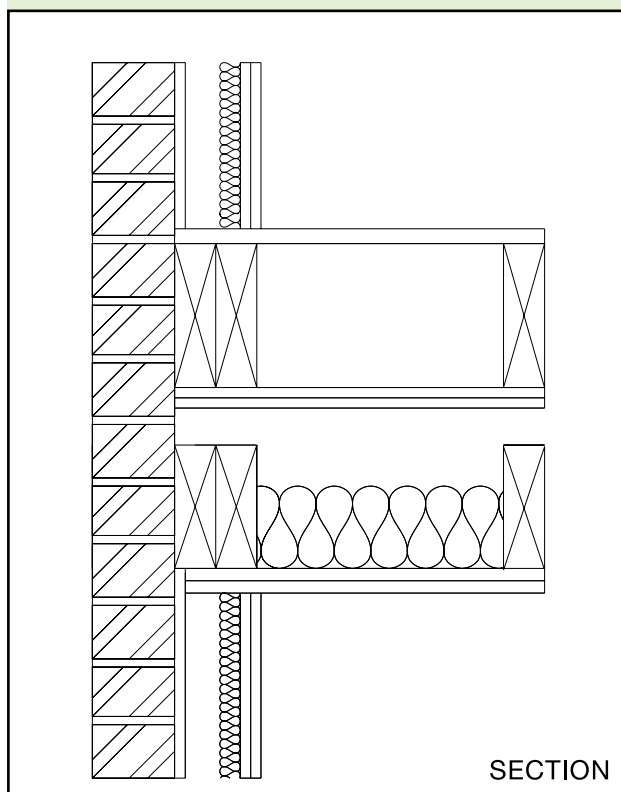


Diagram 4.5 **Floor treatment 1 – wall treatment 1**



**Note:** The lower figure of density for the resilient layer gives the best insulation but a 'softer' floor. In such cases additional support can be provided around the perimeter of the floor by using a timber batten with a foam strip along the top attached to the wall.

**4.33** For the junction detail between floor treatment 2 and wall treatment 1, see Diagram 4.7.

**4.34** Points to watch:

**Do**

- Do remember to apply appropriate remedial work to the existing construction.
- Do use the correct density of resilient layer and ensure it can carry the anticipated load.
- Do allow for movement of materials e.g. expansion of chipboard after laying (to maintain isolation).
- Do carry the resilient layer up at all room edges to isolate the floating layer from the wall surface.
- Do leave a small gap (approx. 5mm) between skirting and floating layer and fill with a flexible sealant.
- Do lay resilient materials in sheets with joints tightly butted and taped.
- Do seal the perimeter of any new ceiling with tape or sealant.

**Do not**

**Do not bridge between the floating layer and the base or surrounding walls (e.g. with services or fixings that penetrate the resilient layer).**

## Floor treatment 2: platform floor with absorbent material

**4.31** The resistance to airborne and impact sound depends on the total mass of the floor, the effectiveness of the resilient layer and the absorbent material.

### 4.32 Platform floor with absorbent material (see Diagram 4.6)

Where this treatment is used to improve an existing timber floor, a layer of mineral wool (minimum thickness 100mm, minimum density 10kg/m<sup>3</sup>) should be laid between the joists in the floor cavity.

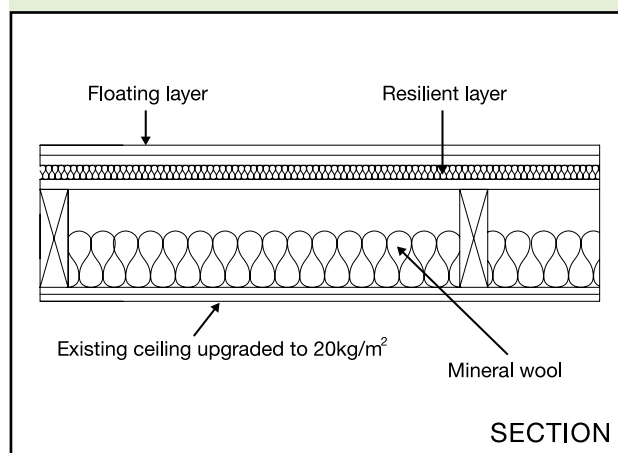
The floating layer should be:

- a minimum of two layers of board material;
- minimum total mass per unit area 25kg/m<sup>2</sup>;
- each layer of minimum thickness 8mm;
- fixed together (e.g. spot bonded or glued/screwed) with joints staggered.

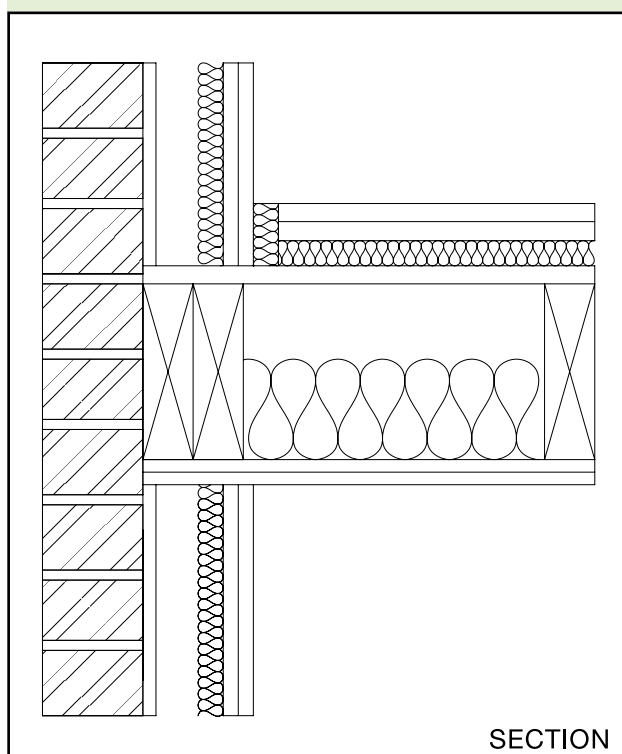
The floating layer should be laid loose on a resilient layer. The resilient layer specification is:

- mineral wool, minimum thickness 25mm, density 60 to 100kg/m<sup>3</sup>;
- the mineral wool may be paper faced on the underside.

Diagram 4.6 **Floor treatment 2**



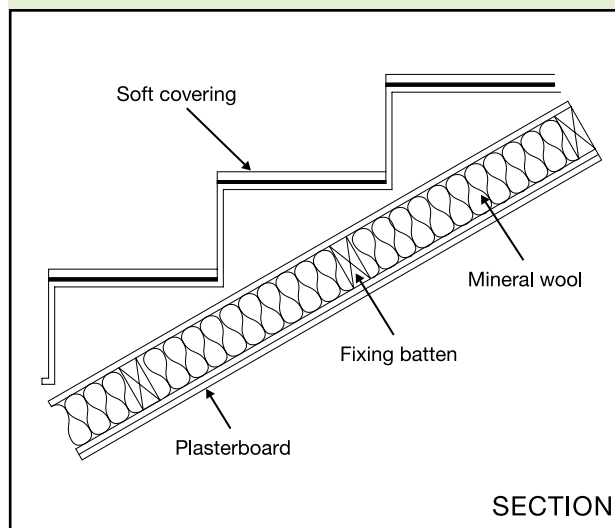
**Diagram 4.7 Floor treatment 2 – wall treatment 1**



Where there is no cupboard under the stair construct an independent ceiling below the stair (see Floor treatment 1).

**4.38** For fire protection where a staircase performs a separating function refer to Building Regulation Part B – Fire safety.

**Diagram 4.8 Stair treatment**



## Stair treatment: stair covering and independent ceiling with absorbent material

**4.35** Stairs are subject to the same sound insulation requirements as floors where they perform a separating function.

**4.36** The resistance to airborne sound depends mainly on the mass of the stair, the mass and isolation of any independent ceiling and the airtightness of any cupboard or enclosure under the stairs. The stair covering reduces impact sound at source.

### **4.37 Stair covering and independent ceiling with absorbent material**

Lay soft covering of at least 6mm thickness over the stair treads. Ensure it is securely fixed (e.g. glued) so it does not become a safety hazard.

If there is a cupboard under all, or part, of the stair:

- line the underside of the stair within the cupboard with plasterboard of minimum mass per unit area  $10\text{kg/m}^2$  and an absorbent layer of mineral wool (minimum density  $10\text{kg/m}^3$ ), within the space above the lining; and
- build cupboard walls from two layers of plasterboard (or equivalent), each sheet of minimum mass per unit area  $10\text{kg/m}^2$ ; and
- use a small, heavy, well fitted door for the cupboard.

## Junction requirements for material change of use

### Junctions with abutting construction

**4.39** For floating floors, carry the resilient layer up at all room edges to isolate the floating layer from the wall surface.

**4.40** For floating floors, leave a small gap (approx. 5mm) between the skirting and floating layer and fill with a flexible sealant.

**4.41** The perimeter of any new ceiling should be sealed with tape or caulked with sealant.

**4.42** Relevant junction details are shown in Diagrams 4.5 and 4.7.

### Junctions with external or load-bearing walls

**4.43** Where there is significant flanking transmission along adjoining walls then improved sound insulation can be achieved by lining all adjoining masonry walls with either

- an independent layer of plasterboard; or
- a laminate of plasterboard and mineral wool. For other drylining laminates, seek advice from the manufacturer.

**4.44** Where the adjoining masonry wall has a mass per unit area greater than  $375\text{kg/m}^2$  then such lining may not be necessary, as it may not give a significant improvement.

**Note:** Specialist advice may be needed on the diagnosis and control of flanking transmission.

## Junctions with floor penetrations

**4.45** Piped services (excluding gas pipes) and ducts which pass through separating floors in conversions should be surrounded with sound absorbent material for their full height and enclosed in a duct above and below the floor.

### Do

- Do seal the joint between casings and ceiling with tape or sealant.
- Do leave a nominal gap (approx. 5mm) between the casing and any floating layer and fill with sealant.

## Construction

**4.46** Pipes and ducts that penetrate a floor separating habitable rooms in different flats should be enclosed for their full height in each flat.

**4.47** The enclosure should be constructed of material having a mass per unit area of at least 15kg/m<sup>2</sup>.

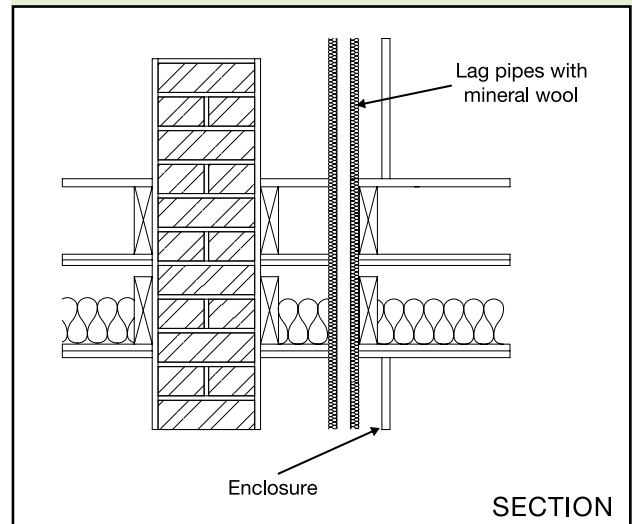
**4.48** Either line the enclosure, or wrap the duct or pipe within the enclosure, with 25mm unfaced mineral wool.

**4.49** The enclosure may go down to the floor base if floor treatment 2 is used but ensure isolation from the floating layer.

**4.50** Penetrations through a separating floor by ducts and pipes should have fire protection to satisfy Building Regulation Part B – Fire safety. Fire stopping should be flexible and also prevent rigid contact between the pipe and floor.

**Note:** There are requirements for ventilation of ducts at each floor where they contain gas pipes. Gas pipes may be contained in a separate ventilated duct or they can remain unducted. Where a gas service is installed, it shall comply with relevant codes and standards to ensure safe and satisfactory operation. See The Gas Safety (Installation and Use) Regulations 1998, SI 1998/2451.

Diagram 4.9 Floor penetrations



# Section 5: Internal walls and floors for new buildings

## Introduction

**5.1** This Section gives examples of internal wall and floor constructions that meet the laboratory sound insulation values set out in Section 0: Performance – Table 2.

**5.2** These constructions have been designed to give insulation against airborne sound. For internal floors, insulation against impact sound could be improved by adding a soft covering (e.g. carpet).

**5.3** They are grouped in four main types as shown below.

**5.4 Internal wall type A or B:** *Timber or metal frame*

The resistance to airborne sound depends on the mass per unit area of the leaves, the cavity width, frame material and the absorption in the cavity between the leaves.

**5.5 Internal wall type C or D:** *Concrete or aircrete block*

The resistance to airborne sound depends mainly on the mass per unit area of the wall.

**5.6 Internal floor type A or B:** *Concrete planks or concrete beams with infilling blocks*

The resistance to airborne sound depends on the mass per unit area of the concrete base or concrete beams and infilling blocks. A soft covering will reduce impact sound at source.

**5.7 Internal floor type C:** *Timber or metal joist*

The resistance to airborne sound depends on the structural floor base, the ceiling and the absorbent material. A soft covering will reduce impact sound at source.

**5.8** For both internal walls and internal floors the constructions are ranked, as far as possible, with constructions giving better sound insulation given first.

## Doors

**5.9** Lightweight doors with poor perimeter sealing provide a lower standard of sound insulation than walls. This will reduce the effective sound insulation of the internal wall. Ways of improving sound insulation include ensuring that there is good perimeter sealing or by using a doorset.

**5.10** See Building Regulation Part F – Ventilation and Part J – Combustion appliances and fuel storage systems.

## Layout

**5.11** If the stair is not enclosed, then the potential sound insulation of the internal floor will not be achieved; nevertheless, the internal floor should still satisfy Requirement E2.

**5.12** It is good practice to consider the layout of rooms at the design stage to avoid placing noise sensitive rooms next to rooms in which noise is generated. Guidance on layout is provided in BS 8233:1999 Sound Insulation and Noise Reduction for Buildings. Code of Practice.

## Junction requirements for internal walls

**5.13** Section 3: Separating Floors contains important guidance on junctions of separating floors with internal walls.

**5.14** Fill all gaps around internal walls to avoid air paths between rooms.

## Junction requirements for internal floors

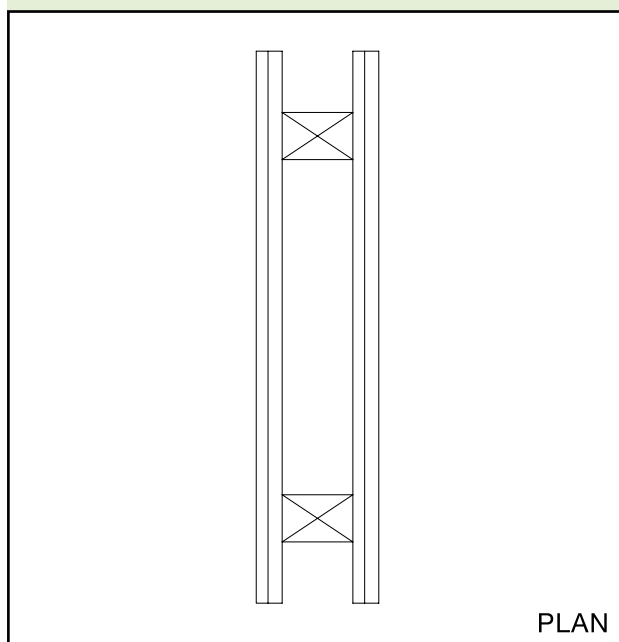
**5.15** Section 2: Separating Walls contains important guidance on junctions of separating walls with internal floors.

**5.16** Fill all gaps around internal floors to avoid air paths between rooms.

**5.17 Internal wall type A:** *Timber or metal frames with plasterboard linings on each side of frame (see Diagram 5.1)*

- each lining to be two or more layers of plasterboard, each sheet of minimum mass per unit area 10kg/m<sup>2</sup>;
- linings fixed to timber frame with a minimum distance between linings of 75mm, or metal frame with a minimum distance between linings of 45mm;
- all joints well sealed.

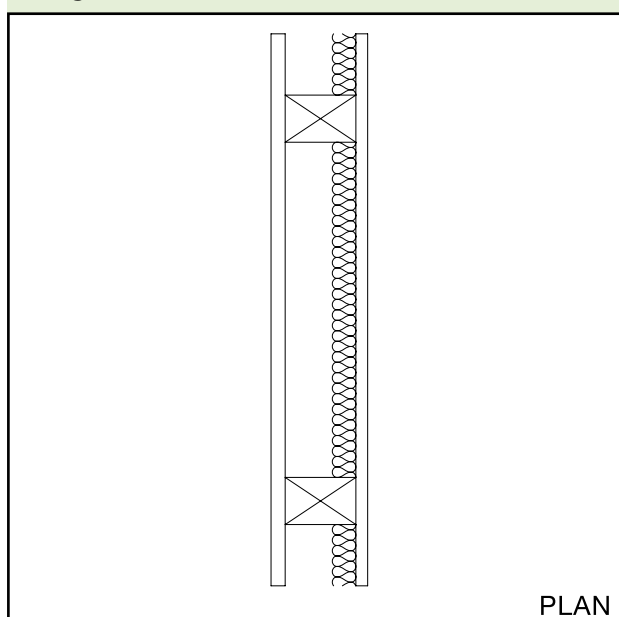
Diagram 5.1 Internal wall type A



**5.18 Internal wall type B:** *Timber or metal frames with plasterboard linings on each side of frame and absorbent material (see Diagram 5.2)*

- single layer of plasterboard of minimum mass per unit area  $10\text{kg/m}^2$ ;
- linings fixed to timber frame with a minimum distance between linings of  $75\text{mm}$ , or metal frame with a minimum distance between linings of  $45\text{mm}$ ;
- an absorbent layer of unfaced mineral wool batts or quilt (minimum thickness  $25\text{mm}$ , minimum density  $10\text{kg/m}^3$ ) which may be wire reinforced, suspended in the cavity;
- all joints well sealed.

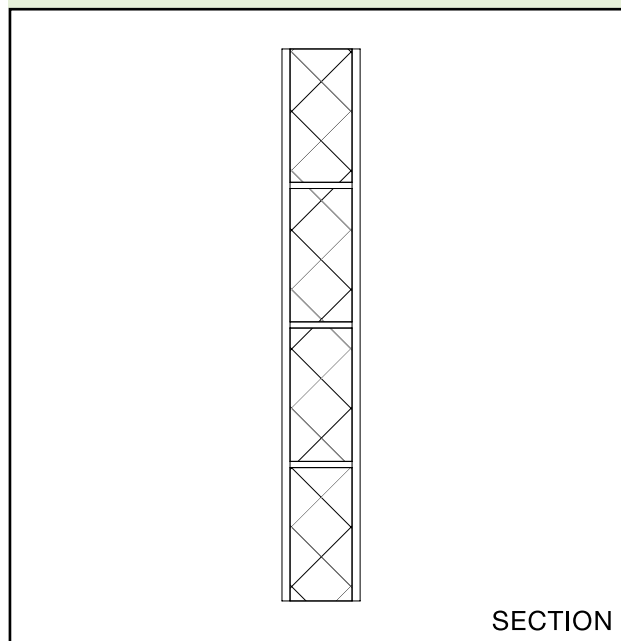
Diagram 5.2 Internal wall type B



**5.19 Internal wall type C:** *Concrete block wall, plaster or plasterboard finish on both sides (see Diagram 5.3)*

- minimum mass per unit area, excluding finish  $120\text{kg/m}^2$ ;
- all joints well sealed;
- plaster or plasterboard finish on both sides.

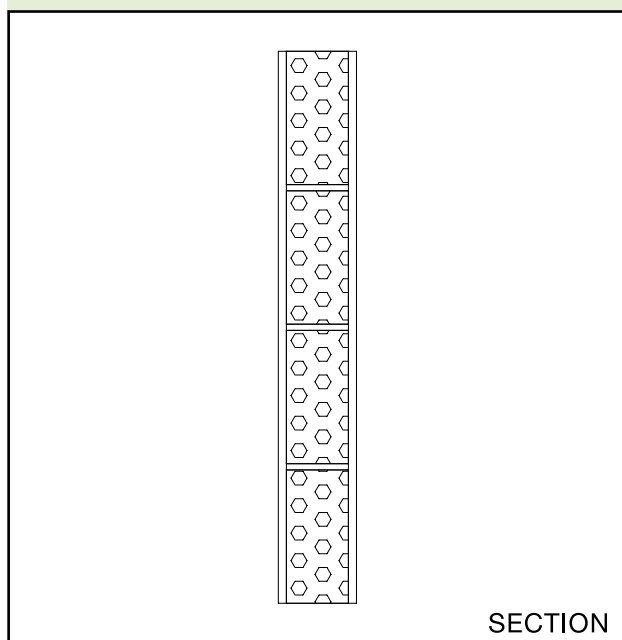
Diagram 5.3 Internal wall type C



**5.20 Internal wall type D:** *Aircrete block wall, plaster or plasterboard finish on both sides (see Diagram 5.4)*

- for plaster finish, minimum mass per unit area, including finish  $90\text{kg/m}^2$ ;
- for plasterboard finish, minimum mass per unit area, including finish  $75\text{kg/m}^2$ ;
- all joints well sealed;
- internal wall type D should only be used with the separating walls described in this Approved Document where there is no minimum mass requirement on the internal masonry walls. See guidance in Section 2;
- internal wall type D should not be used as a load-bearing wall connected to a separating floor, or be rigidly connected to the separating floors described in this Approved Document. See guidance in Section 3.

Diagram 5.4 Internal wall type D

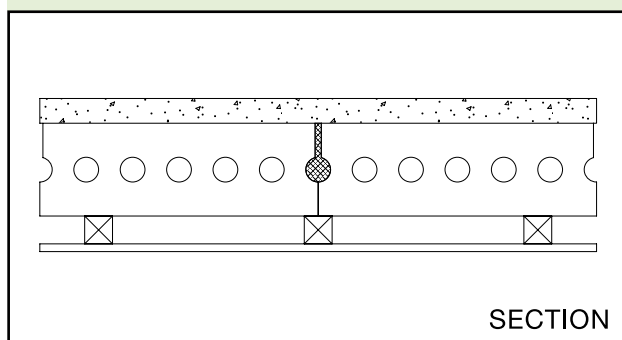


### 5.21 Internal floor type A: Concrete planks (see Diagram 5.5)

- minimum mass per unit area 180kg/m<sup>2</sup>;
- regulating screed optional;
- ceiling finish optional.

**Note:** Insulation against impact sounds can be improved by adding a soft covering (e.g. carpet).

Diagram 5.5 Internal floor type A

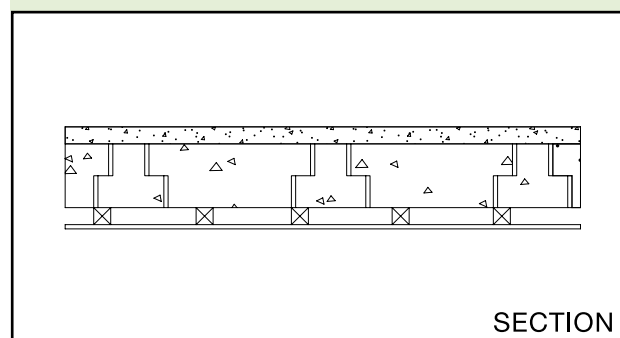


### 5.22 Internal floor type B: Concrete beams with infilling blocks, bonded screed and ceiling (see Diagram 5.6)

- minimum mass per unit area of beams and blocks 220kg/m<sup>2</sup>;
- bonded screed required. Sand cement screeds should have a minimum thickness of 40mm. For proprietary bonded screed products, seek manufacturer's advice on the appropriate thickness;
- ceiling finish required. Use ceiling treatment C or better from Section 3.

**Note:** Insulation against impact sounds can be improved by adding a soft covering (e.g. carpet).

Diagram 5.6 Internal floor type B

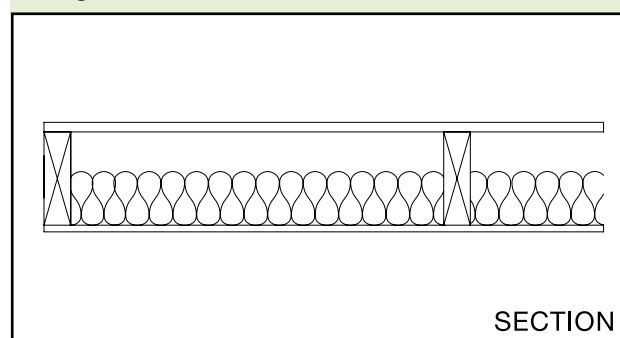


### 5.23 Internal floor type C: Timber or metal joist, with wood-based board and plasterboard ceiling, and absorbent material (see Diagram 5.7)

- floor surface of timber- or wood-based board, minimum mass per unit area 15kg/m<sup>2</sup>;
- ceiling treatment of single layer of plasterboard, minimum mass per unit area 10kg/m<sup>2</sup>, fixed using any normal fixing method;
- an absorbent layer of mineral wool (minimum thickness 100mm, minimum density 10kg/m<sup>3</sup>) laid in the cavity.

**Note:** Insulation against impact sounds can be improved by adding a soft covering (e.g. carpet).

Diagram 5.7 Internal floor type C



**Note:** Electrical cables give off heat when in use and special precautions may be required when they are covered by thermally insulating materials. See BRE BR 262, Thermal Insulation: avoiding risks, Section 2.4.

# Section 6: Rooms for residential purposes

## Introduction

**6.1** Rooms for residential purposes are defined in Regulation 2 of the Building Regulations 2010. This definition is reproduced after the Requirements in this Approved Document.

**6.2** This Section gives examples of wall and floor types, which, if built correctly, should meet the performance standards set out in Section 0: Performance – Table 1b.

**6.3** The guidance in this section is not exhaustive and other designs, materials or products may be used to achieve the performance standards set out in Section 0: Performance – Table 1b. Advice should be sought from the manufacturer or other appropriate source.

## Separating walls in new buildings containing rooms for residential purposes

**6.4** Of the separating walls described in Section 2 the following types are most suitable for use in new buildings containing rooms for residential purposes:

*Wall type 1. Solid masonry*

- Wall type 1.1, Dense aggregate concrete block, plaster on both room faces;
- Wall type 1.2, Dense aggregate concrete in situ, plaster on both room faces;
- Wall type 1.3, Brick, plaster on both room faces.

**Note:** Plasterboard may be used as an alternative wall finish, provided a sheet of minimum mass per unit area 10kg/m<sup>2</sup> is used on each room face.

*Wall type 3. Masonry between independent panels*

- Wall type 3.1, Solid masonry core (dense aggregate concrete block), independent panels on both room faces.
- Wall type 3.2, Solid masonry core (lightweight concrete block), independent panels on both room faces.

**Note:** Wall types 2 and 4 can be used provided that care is taken to maintain isolation between the leaves. Specialist advice may be needed.

## Corridor walls and doors

**6.5** Separating walls described in 6.4 should be used between rooms for residential purposes and corridors in order to control flanking transmission and to provide the required sound insulation between the dwelling and the corridor. However, it is likely that the sound insulation will be reduced by the presence of a door.

**6.6** Ensure any door has good perimeter sealing (including the threshold where practical) and a minimum mass per unit area of 25kg/m<sup>2</sup>.

Alternatively, use a doorset with a minimum sound reduction index of 29dB  $R_w$  (measured in the laboratory according to BS EN ISO 140-3:1995 and rated according to BS EN ISO 717-1:1997). The door should also satisfy the Requirements of Building Regulation Part B – Fire safety.

**6.7** Noisy parts of the building (e.g. function rooms or bars) should preferably have a lobby, double door or high performance doorset to contain the noise. Where this is not possible, nearby rooms for residential purposes should have similar protection. However, do ensure that there are doors that are suitable for disabled access, see Building Regulations Part M – Access and facilities for disabled people.

## Separating floors in new buildings containing rooms for residential purposes

**6.8** Of the separating floors described in Section 3 the following types are most suitable for use in new buildings containing rooms for residential purposes:

*Floor type 1. Concrete base with soft covering*

- Floor type 1.1C Solid concrete slab (cast in situ, with or without permanent shuttering), soft floor covering, ceiling treatment C.
- Floor type 1.2B Concrete planks (solid or hollow), soft floor covering, ceiling treatment B.

**Note:** Floor types 2 and 3 can be used provided that floating floors and ceilings are not continuous between rooms for residential purposes. Specialist advice may be needed.

## Rooms for residential purposes resulting from a material change of use

**6.9** It may be that an existing wall, floor or stair in a building that is to undergo a material change of use will achieve the performance standards set out in Section 0: Performance – Table 1b without the need for remedial work. This would be the case if the construction was similar (including flanking constructions) to one of the constructions in paragraphs 6.4 and 6.8 (e.g. for solid walls and floors the mass requirement should be within 15% of the mass per unit area of a construction listed in the relevant section).

**6.10** For situations where it cannot be shown that the existing construction will achieve the performance standards set out in Section 0: Performance – Table 1b, Section 4 describes wall, floor and stair treatments to improve the level of sound insulation in dwellings formed by material change of use. These treatments may be used in buildings containing rooms for residential purposes. Specialist advice may be needed.

## Junction details

**6.11** In order for the construction to be fully effective, care should be taken to detail correctly the junctions between the separating wall and other elements, such as floors, roofs, external walls and internal walls.

**6.12** In the case of new buildings containing rooms for residential purposes, refer to the guidance in Sections 2 and 3 which describes the junction and flanking details for each of the new build separating wall and floor types.

**6.13** When rooms for residential purposes are formed by material change of use, refer to the notes and diagrams in Section 4 that describe the junction and flanking details for the wall and floor treatments.

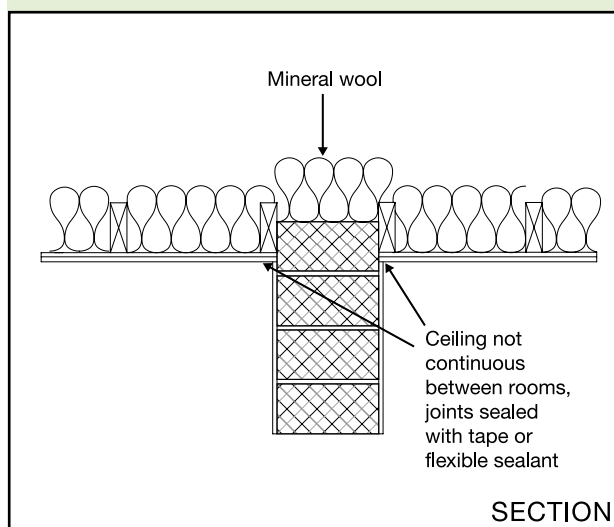
**6.14** In the case of the junction between a solid masonry separating wall type 1 and the ceiling void and roof space, the solid wall need not be continuous to the underside of the structural floor or roof provided that:

- there is a ceiling consisting of two or more layers of plasterboard, of minimum total mass per unit area  $20\text{kg/m}^2$ ;
- there is a layer of mineral wool (minimum thickness 200mm, minimum density  $10\text{kg/m}^3$ ) in the roof void;
- the ceiling is not perforated.

The ceiling joists and plasterboard sheets should not be continuous between rooms for residential purposes. See Diagram 6.1.

**6.15** This ceiling void and roof space detail can only be used where the Requirements of Building Regulations Part B – Fire safety can also be satisfied. The Requirements of Building Regulations Part L – Conservation of fuel and power should also be satisfied.

Diagram 6.1 **Ceiling void and roof space (only applicable to rooms for residential purposes)**



## Room layout and building services design considerations

**6.16** Internal noise levels are affected by room layout, building services and sound insulation.

**6.17** The layout of rooms should be considered at the design stage to avoid placing noise sensitive rooms next to rooms in which noise is generated.

**6.18** Additional guidance is provided in BS 8233:1999 Sound insulation and noise reduction for buildings. Code of practice and sound control for homes. See Annex D: References.

# Section 7: Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes

## Introduction

**7.1** This Section describes how to determine the amount of additional absorption to be used in corridors, hallways, stairwells and entrance halls that give access to flats and rooms for residential purposes.

**7.2** For the purposes of this Section, a corridor or hallway is a space for which the ratio of the longest to the shortest floor dimension is greater than three.

**7.3** For the purposes of this Section, an entrance hall is a space for which the ratio of the longest to the shortest floor dimension is three or less.

**7.4** When an entrance hall, corridor, hallway or stairwell opens directly into another of these spaces, the guidance should be followed for each space individually.

**7.5** The choice of absorptive material should meet the Requirements of Building Regulation Part B – Fire safety.

**7.6** Two methods are described to satisfy Requirement E3, Method A and Method B.

**7.7 Method A:** Cover a specified area with an absorber of an appropriate class that has been rated according to BS EN ISO 11654:1997 Acoustics. Sound absorbers for use in buildings. Rating of sound absorption.

**7.8 Method B:** Determine the minimum amount of absorptive material using a calculation procedure in octave bands. Method B is intended only for corridors, hallways and entrance halls as it is not well suited to stairwells.

**7.9** Where additional guidance is required, specialist advice should be sought at an early stage

## Method A

**7.10** For entrance halls, corridors or hallways, cover an area equal to or greater than the floor area, with a Class C absorber or better. It will normally be convenient to cover the ceiling area with the additional absorption.

**7.11** For stairwells or a stair enclosure, calculate the combined area of the stair treads, the upper surface of the intermediate landings, the upper surface of the landings (excluding ground floor) and the ceiling area on the top floor. Either cover at least an area equal to this calculated area with a Class D absorber, or cover an area equal to at least 50% of this calculated area with a Class C absorber or better. The absorptive material should be equally distributed between all floor levels. It will normally be convenient to cover the underside of intermediate landings, the underside of the other landings, and the ceiling area on the top floor.

**7.12** Method A can generally be satisfied by the use of proprietary acoustic ceilings. However, the absorptive material can be applied to any surface that faces into the space.

## Method B

**7.13** In comparison with Method A, Method B takes account of the existing absorption provided by all surfaces. In some cases, Method B should allow greater flexibility in meeting Requirement E3 and require less additional absorption than Method A.

**7.14** For an absorptive material of surface area,  $S$  in  $m^2$ , and sound absorption coefficient,  $\alpha$  the absorption area  $A$  is equal to the product of  $S$  and  $\alpha$ .

**7.15** The total absorption area,  $A_T$ , in square metres is defined as the hypothetical area of a totally absorbing surface, which if it were the only absorbing element in the space would give the same reverberation time as the space under consideration.

**7.16** For  $n$  surfaces in a space, the total absorption area,  $A_T$ , can be found using the following equation.

$$A_T = \alpha_1 S_1 + \alpha_2 S_2 + \dots + \alpha_n S_n$$

**7.17** For entrance halls, provide a minimum of  $0.20m^2$  total absorption area per cubic metre of the volume. The additional absorptive material should be distributed over the available surfaces.

**7.18** For corridors or hallways, provide a minimum of  $0.25m^2$  total absorption area per cubic metre of the volume. The additional absorptive material should be distributed over one or more of the surfaces.

**7.19** Absorption areas should be calculated for each octave band. Requirement E3 will be satisfied when the appropriate amount of absorption area is provided for each octave band between 250Hz and 4000Hz inclusively.

**7.20** Absorption coefficient data (to two decimal places) should be taken from the following:

- For specific products, use laboratory measurements of absorption coefficient data determined using BS EN 20354:1993 Acoustics. Measurement of sound absorption in a reverberation room. The measured third octave band data should be converted to practical sound absorption coefficient data,  $\alpha_p$  in octave bands, according to BS EN ISO 11654:1997 Acoustics. Sound absorbers for use in buildings. Rating of sound absorption.

- For generic materials, use Table 7.1. This contains typical absorption coefficient data for common materials used in buildings. These data may be supplemented by published octave band data for other generic materials.

**7.21** In Method B, each calculation step is to be rounded to two decimal places.

**Table 7.1 Absorption coefficient data for common materials in buildings**

Material	Sound absorption coefficient, $\alpha$ in octave frequency bands (Hz)				
	250	500	1000	2000	4000
Fair-faced concrete or plastered masonry	0.01	0.01	0.02	0.02	0.03
Fair-faced brick	0.02	0.03	0.04	0.05	0.07
Painted concrete block	0.05	0.06	0.07	0.09	0.08
Windows, glass façade	0.08	0.05	0.04	0.03	0.02
Doors (timber)	0.10	0.08	0.08	0.08	0.08
Glazed tile/marble	0.01	0.01	0.01	0.02	0.02
Hard floor coverings (e.g. lino, parquet) on concrete floor	0.03	0.04	0.05	0.05	0.06
Soft floor coverings (e.g. carpet) on concrete floor	0.03	0.06	0.15	0.30	0.40
Suspended plaster or plasterboard ceiling (with large air space behind)	0.15	0.10	0.05	0.05	0.05

## Report format

**7.22** Evidence that Requirement E3 has been satisfied should be presented, for example on a drawing or in a report, which should include:

- A description of the enclosed space (entrance hall, corridor, stairwell etc.)
- The approach used to satisfy Requirement E3, Method A or B.
  - With Method A, state the absorber class and the area to be covered.
  - With Method B, state the total absorption area of additional absorptive material used to satisfy the requirement.
- Plans indicating the assignment of the absorptive material in the enclosed space.

## Worked example

### 7.23 Example: Entrance hall

The entrance hall has dimensions 3.0m (width) x 4.0m (length) x 2.5m (height). The concrete floor is covered with carpet, the walls are painted concrete blocks and there are four timber doors (1.0m x 2.4m).

To satisfy Requirement E3, either use:

- Method A: Cover at least  $3.0 \times 4.0 = 12\text{m}^2$  with a Class C absorber or better, or
- Method B: Provide a minimum of  $0.2\text{m}^2$  absorption area per cubic metre of the volume.

**7.24** Method B is described in steps 1 to 8 in Table 7.2. In this example, the designer considers that covering the entire ceiling is a convenient way to provide the additional absorption. The aim of the calculation is to determine the absorption coefficient,  $\alpha_{\text{ceiling}}$ , needed for the entire ceiling.

**7.25** In this example, the absorption coefficients from Method B indicate that a Class D absorber could be used to cover the ceiling. This can be compared against the slightly higher absorption requirement of Method A, which would have used a Class C absorber or better to cover the ceiling.

**Table 7.2 Example calculation for an entrance hall (Method B)**

**Step 1** Calculate the surface area related to each absorptive material (i.e. for the floor, walls, doors and ceiling).

Surface	Surface finish	Area (m <sup>2</sup> )
Floor	Carpet on concrete base	12.00
Doors	Timber	9.60
Walls (excluding door area)	Concrete block, painted	25.40
Ceiling	To be determined from this calculation	12.00

**Step 2** Obtain values of absorption coefficients for the carpet, painted concrete block walls and the timber doors. In this case, the values are taken from Table 7.1.

Surface	Area (m <sup>2</sup> )	Absorption coefficient ( $\alpha$ ) in octave frequency bands				
		250Hz	500Hz	1000Hz	2000Hz	4000Hz
Floor	12.00	0.03	0.06	0.15	0.30	0.40
Doors	9.60	0.10	0.08	0.08	0.08	0.08
Walls	25.40	0.05	0.06	0.07	0.09	0.08
Ceiling	12.00	To be determined from this calculation				

**Step 3** Calculate the absorption area (m<sup>2</sup>) related to each absorptive surface (i.e. for the floor, walls and doors) in octave frequency bands (Absorption area = surface area x absorption coefficient).

Surface	Absorption area (m <sup>2</sup> )				
	250Hz	500Hz	1000Hz	2000Hz	4000Hz
Floor	0.36 (12.00 x 0.03)	0.72	1.80	3.60	4.80
Doors	0.96 (9.60 x 0.10)	0.77	0.77	0.77	0.77
Walls	1.27 (25.40 x 0.05)	1.52	1.78	2.29	2.03

**Step 4** Calculate the sum of the absorption areas (m<sup>2</sup>) obtained in Step 3.

	250Hz	500Hz	1000Hz	2000Hz	4000Hz
Total absorption area (m <sup>2</sup> )	2.59 (0.36 + 0.96 + 1.27)	3.01	4.35	6.66	7.60

**Step 5** Calculate the total absorption area ( $A_T$ ) required for the entrance hall. The volume is 30m<sup>3</sup> and therefore  $0.2 \times 30.0 = 6.0$  m<sup>2</sup> of absorption area is required.

$A_T$ (m <sup>2</sup> )	6.00
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**Step 6** Calculate additional absorption area ( $A$ ) to be provided by ceiling (m<sup>2</sup>). If any values of minimum absorption area are negative, e.g. see 2000Hz and 4000Hz, then there is sufficient absorption from the other surfaces to meet the requirement without any additional absorption in this octave band (Additional absorption =  $A_T$  – total absorption area (from Step 5)).

	250Hz	500Hz	1000Hz	2000Hz	4000Hz
Additional absorption area (m <sup>2</sup> )	3.41 (6.00 – 2.59)	2.99	1.65	-0.66	-1.60
N.B. negative values indicate that no additional absorption is necessary.					

**Step 7** Calculate required absorption coefficient ( $\alpha$ ) to be provided by ceiling (Required absorption coefficient  $\alpha$  = Additional absorption area / area of ceiling).

	250Hz	500Hz	1000Hz	2000Hz	4000Hz
Required absorption coefficient, $\alpha$	0.28 (3.41 ÷ 12.0)	0.25	0.14	Any value	Any value

**Step 8** Identify a ceiling product from manufacturer's laboratory measurement data that provides absorption coefficients that exceed the values calculated in Step 7.

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## Section 8: Acoustic conditions in schools

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**8.1** In the Secretary of State's view the normal way of satisfying Requirement E4 will be to meet the values for sound insulation, reverberation time and internal ambient noise which are given in Building Bulletin 93. *Acoustic design of schools: performance standards* available on the internet at [www.gov.uk](http://www.gov.uk).

# Annex A: Method for calculating mass per unit area

## A1 Wall mass

**A1.1** Where a mass is specified it is expressed as mass per unit area in kilograms per square metre (kg/m<sup>2</sup>).

**A1.2** The mass may be obtained from the manufacturer or it may be calculated by the method given in this annex. To calculate the mass per unit area of a masonry leaf use the formula below. This formula is not exact but is sufficient for this purpose.

## A2 Formula for calculation of wall leaf mass per unit area

**A2.1** Mass per unit area of a brick/block leaf = mass of co-ordinating area / co-ordinating area

$$= \frac{M_B + \rho_m (Td(L + H - d) + V)}{LH} \text{ kg/m}^2$$

where

- $M_B$  is brick/block mass (kg) at appropriate moisture content
- $\rho_m$  is density of mortar (kg/m<sup>3</sup>) at appropriate moisture content
- $T$  is the brick/block thickness without surface finish (m)
- $d$  is mortar thickness (m)
- $L$  is co-ordinating length (m)
- $H$  is co-ordinating height (m)
- $V$  is volume of any frog/void filled with mortar (m<sup>3</sup>)

**Note:** This formula provides the mass per unit area of the block/brick construction without surface finish.

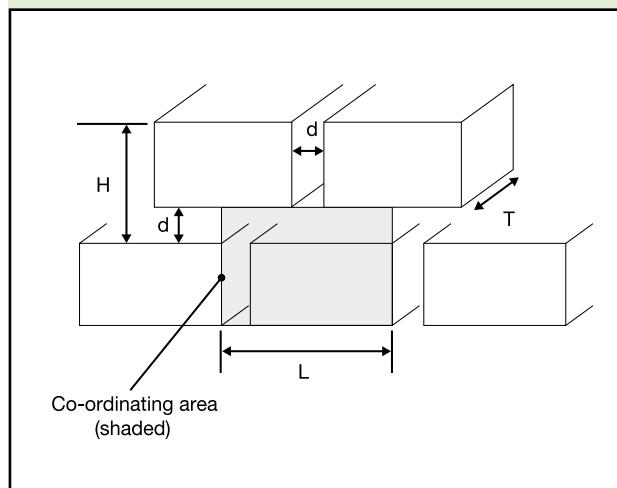
**Note:** See Diagram A.1 for block and mortar dimensions.

**A2.2** When calculating the mass per unit area for bricks and blocks use the density at the appropriate moisture content from Table 3.2, CIBSE Guide A (1999).

**A2.3** For cavity walls the mass per unit area of each leaf is calculated and added together.

**A2.4** Where surface finishes are used the mass per unit area of the finish is added to the mass per unit area of the wall

Diagram A.1 Block and mortar dimensions



## A3 Simplified equations

**A3.1** Two examples are given (see Table A.1 and A.2) using the equation in A2.1. For each of these examples a simplified equation is obtained for that type of construction.

Table A.1 Blocks laid flat

Example of single leaf wall, blocks laid flat

- $d = 0.010\text{m}$
- $T = 0.215\text{m}$
- $L = 0.450\text{m}$
- $H = 0.110\text{m}$
- $V = 0\text{m}^3$
- $\rho_m = 1800\text{kg/m}^3$
- No surface finish

$$\text{Mass per unit area} = 20.2M_B + 43.0\text{kg/m}^2$$

Substituting for  $M_B$  in this formula gives the following values:

Block mass, $M_B$ (kg)	Mass per unit area (kg/m <sup>2</sup> )
6	164
8	205
10	245
12	285
14	326
16	366
18	407

**Table A.2 Blocks laid on edge**

Example of single leaf wall, blocks laid on edge

- $d = 0.010\text{m}$
- $T = 0.100\text{m}$
- $L = 0.450\text{m}$
- $H = 0.225\text{m}$
- $V = 0\text{m}^3$
- $\rho_m = 1800\text{kg/m}^3$
- No surface finish

Single leaf wall:

$$\text{Mass per unit area} = 9.9M_B + 11.8\text{kg/m}^2$$

Cavity wall:

$$\text{Mass per unit area} = 19.8M_B + 23.6\text{kg/m}^2$$

Substituting for  $M_B$  in this formula gives the following values:

Block mass, $M_B$ (kg)	Mass per unit area ( $\text{kg/m}^2$ )	
	Single leaf	Cavity
6	71	142
8	91	182
10	111	222
12	131	261
14	150	301
16	170	340
18	190	380

## A4 Mass per unit area of surface finishes

**A4.1** The mass per unit area of surface finishes should be obtained from manufacturer's data.

## A5 Mass per unit area of floors

**A5.1** The mass of a solid and homogeneous floor (without hollows, beams or ribs) can be calculated from:

$$M_F = \rho_c \times T$$

where,

$M_F$  is mass per unit area of floor ( $\text{kg/m}^2$ )

$\rho_c$  is density of concrete ( $\text{kg/m}^3$ )

$T$  is thickness of floor (m)

**A5.2** The mass of a beam and block floor can be calculated from:

$$M_F = (M_{\text{beam},1\text{m}} + M_{\text{block},1\text{m}}) / L_B$$

where

$M_F$  is mass per unit area of floor ( $\text{kg/m}^2$ )

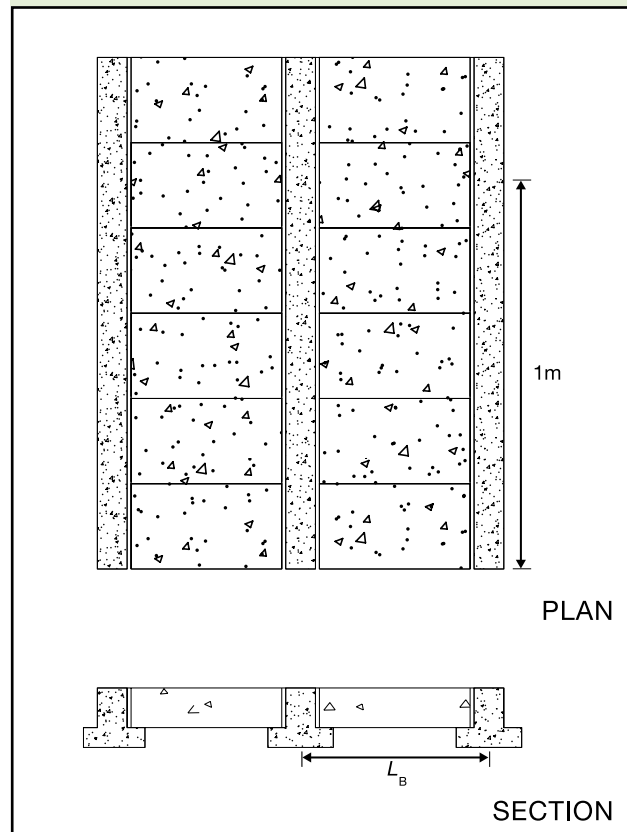
$M_{\text{beam},1\text{m}}$  is the mass of a 1m length of beam (kg)

$M_{\text{block},1\text{m}}$  is the mass of a 1m length of blocks (kg)

$L_B$  is the distance between the beam centre lines, i.e. the repetition interval (m)

**Note:** See Diagram A.2 for beam and block floor dimensions.

**Diagram A.2 Beam and block floor dimensions**



**A5.3** For other floor types (including floors with variable thickness), seek advice from the manufacturer on mass per unit area and performance.

# Annex B: Procedures for sound insulation testing

## B1 Introduction

**B1.1** Section B.2 of this Annex describes the sound insulation testing procedure approved by the Secretary of State for the purposes of Regulation 41(2)(a) of the Building Regulations and Regulation 20(1) of the Approved Inspectors Regulations. The approved procedure is that set out in Section B.2 and the Standards referred to in that Section.

**B1.2** Section B.3 of this Annex provides guidance on laboratory testing in connection with achieving compliance with Requirement E2 in Schedule 1 to the Building Regulations, and in connection with evaluation of components to be used in constructions subject to Requirement E1.

**B1.3** Section B.4 of this Annex gives guidance on test reports.

**B1.4** The person carrying out the building work should arrange for sound insulation testing to be carried out by a test body with appropriate third party accreditation. Test bodies conducting testing should preferably have UKAS accreditation (or a European equivalent) for field measurements. The ODPM also regards members of the ANC Registration Scheme as suitably qualified to carry out pre-completion testing. The measurement instrumentation used should have a valid, traceable certificate of calibration, and should have been tested within the past two years.

## B2 Field measurement of sound insulation of separating walls and floors for the purposes of Regulation 41 and Regulation 20(1) and (5)

### Introduction

**B2.1** Sound insulation testing for the purposes of Regulation 41 of the Building Regulations and Regulation 20(1) and (5) of the Approved Inspectors Regulations 2010, must be done in accordance with: BS EN ISO 140-4:1998; BS EN ISO 140-7:1998; BS EN ISO 717-1:1997; BS EN ISO 717-2:1997; BS EN 20354:1993. When calculating sound insulation test results, no rounding should occur in any calculation until required by the relevant Standards, the BS EN ISO 140 series and the BS EN ISO 717 series.

### Airborne sound insulation of a separating wall or floor

**B2.2** The airborne sound insulation of a separating wall or floor should be measured in accordance with BS EN ISO 140-4:1998. All measurements and calculations should be carried out using one-third octave frequency bands. Performance should be rated in terms of the weighted standardised level difference,  $D_{nT,w}$ , and spectrum adaptation term,  $C_{tr}$ , in accordance with BS EN ISO 717-1:1997.

### Measurements using a single sound source

**B2.3** For each source position, the average sound pressure level in the source and receiving rooms is measured in one-third octave bands using either fixed microphone positions (and averaging these values on an energy basis) or a moving microphone.

**B2.4** For the source room measurements, the difference between the average sound pressure levels in adjacent one-third octave bands should be no more than 6dB. If this condition is not met, the source spectrum should be adjusted and the source room measurement repeated. If the condition is met, the average sound pressure level in the receiving room, and hence a level difference, should be determined.

**B2.5** It is essential that all measurements made in the source and receiving rooms to determine a level difference should be made without moving the sound source or changing the output level of the sound source, once its spectrum has been correctly adjusted (where necessary).

**B2.6** The sound source should now be moved to the next position in the source room and the above procedure repeated to determine another level difference. At least two positions should be used for the source. The level differences obtained from each source position should be arithmetically averaged to determine the level difference,  $D$  as defined in BS EN ISO 140-4:1998.

### Measurements using multiple sound sources operating simultaneously

**B2.7** For multiple sound sources operating simultaneously, the average sound pressure level in the source and receiving rooms is measured in one-third octave bands using either fixed microphone positions (and averaging these values on an energy basis) or a moving microphone.

**B2.8** For the source room measurements, the difference between the average sound pressure levels in adjacent one-third octave bands should be no more than 6dB. If this condition is not met, the source spectrum should be adjusted and the source room measurement repeated. If the condition is met, determine the average level in the receiving room, and hence the level difference,  $D$  as defined in BS EN ISO 140-4:1998.

### Impact sound transmission of a separating floor

**B2.9** The impact sound transmission of a separating floor should be measured in accordance with BS EN ISO 140-7:1998. All measurements and calculations should be carried out using one-third-octave frequency bands. Performance should be rated in terms of the weighted standardised impact sound pressure level,  $L'_{nT,w}$  in accordance with BS EN ISO 717-2:1997.

## Measurement of reverberation time

**B2.10** BS EN ISO 140-4:1998 and BS EN ISO 140-7:1998 refer to the ISO 354 (BS EN 20354:1993) method for measuring reverberation time. However, for the approved procedure, the guidance in BS EN ISO 140-7:1998 relating to the source and microphone positions, and the number of decay measurements required, should be followed.

## Room requirements

**B2.11** Section 1 gives guidance on the room types that should be used for testing. These rooms should have volumes of at least 25m<sup>3</sup>. If this is not possible then the volumes of the rooms used for testing should be reported.

## Tests between rooms

**B2.12** Tests should be conducted in completed but unfurnished rooms or available spaces in the case of properties sold before fitting out; see Section 1.

**B2.13** Impact sound insulation tests should be conducted on a floor without a soft covering (e.g. carpet, foam backed vinyl) except in the case of (a) separating floor type 1, as described in this Approved Document, or (b) a concrete structural floor base which has a soft covering as an integral part of the floor.

**B2.14** If a soft covering has been installed on any other type of floor, it should be taken up. If that is not possible, at least half of the floor should be exposed and the tapping machine should be placed only on the exposed part of the floor.

**B2.15** When measuring airborne sound insulation between a pair of rooms of unequal volume, the sound source should be in the larger room.

**B2.16** Doors and windows should be closed.

**B2.17** Kitchen units, cupboards etc. on all walls should have their doors open and be unfilled.

## Measurement precision

**B2.18** Sound pressure levels should be measured to 0.1dB precision.

**B2.19** Reverberation times should be measured to 0.01s precision.

## Measurements using a moving microphone

**B2.20** At least two positions should be used.

**B2.21** For measurements of reverberation time, discrete positions should be used rather than a moving microphone.

# B3 Laboratory measurements

## Introduction

**B3.1** Pre-completion testing for the purposes of Regulation 41 and Regulation 20(1) and (5) involves field testing on separating walls and floors (see Section 1 and Annex B: B2). However, there are applications for laboratory tests to determine the performance of: floor coverings; floating floors; wall ties; resilient layers; internal walls and floors;

and flanking laboratory tests to indicate the performance of novel constructions.

**B3.2** When calculating sound insulation test results, no rounding should occur in any calculation until required by the relevant Standards, i.e. the BS EN ISO 140 series and the BS EN ISO 717 series.

## Tests on floor coverings and floating floors

**B3.3** Floor coverings and floating floors should be tested in accordance with BS EN ISO 140-8:1998 and rated in accordance with BS EN ISO 717-2:1997. The test floor should have a thickness of 140mm.

**B3.4** It should be noted that text has been omitted from BS EN ISO 140-8:1998. For the purposes of this Approved Document, Section 6.2.1 of BS EN ISO 140-8:1998 should be disregarded, and Section 5.3.3 of BS EN ISO 140-7:1998, respectively, referred to instead.

**B3.5** BS EN ISO 140-8:1998 refers to the ISO 354 (BS EN 20354:1993) method for measuring reverberation time, but the guidance in BS EN ISO 140-8:1998 relating to the source and microphone positions, and the number of decay measurements required, should be followed.

**B3.6** When assessing category II test specimens (as defined in BS EN ISO 140-8:1998) for use with separating floor type 2, the performance value ( $\Delta L_w$ ) should be achieved when the floating floor is both loaded and unloaded. The loaded measurements should use a uniformly distributed load of 20–25kg/m<sup>2</sup> with at least one weight per square metre of the flooring area, as described in BS EN ISO 140-8:1998.

## Dynamic stiffness of resilient layers

**B3.7** Dynamic stiffness of resilient layers should be measured in accordance with BS EN 29052-1:1992. The test method using sinusoidal signals should be used. No pre-compression should be applied to the test specimens before the measurements.

## Dynamic stiffness of wall ties

**B3.8** Dynamic stiffness of wall ties should be measured in accordance with BRE Information Paper IP 3/01.

## Airborne sound insulation of internal wall and floor elements

**B3.9** The airborne sound insulation of internal wall or floor elements in a laboratory should be measured in accordance with BS EN ISO 140-3:1995, and the performance rated in accordance with BS EN ISO 717-1:1997 to determine the weighted sound reduction index,  $R_w$ .

## Measurements in a flanking laboratory

**B3.10** Tests of sound transmission in a flanking laboratory include both direct and flanking paths, and are a useful means of assessing the likely field performance of novel constructions.

**B3.11** It is not possible to demonstrate compliance with Requirement E1 using test results from a flanking laboratory.

#### Flanking laboratory: design

**B3.12** Construction details of a suitable laboratory can be obtained from the Acoustics Centre, BRE, Garston, Watford WD25 9XX.

**Note:** A CEN standard for the laboratory measurement of flanking transmission between adjoining rooms is currently under development.

#### Flanking laboratory: indicative airborne sound insulation values

**B3.13** When a test construction has airborne sound insulation of at least  $49\text{dB } D_{nT,w} + C_{tr}$  when measured in a flanking laboratory using the procedure given in Annex B: B2, this can be taken as indicative that the same construction (i.e. identical in all significant details) may achieve at least  $45\text{dB } D_{nT,w} + C_{tr}$  when built in the field. See paragraph B3.11.

#### Flanking laboratory: indicative impact sound insulation values

**B3.14** When a test construction has impact sound insulation no more than  $58\text{dB } L'_{nT,w}$  when measured in a flanking laboratory using the procedure given in Annex B: B2, this can be taken as indicative that the same construction (i.e. identical in all significant details) may achieve no more than  $62\text{dB } L'_{nT,w}$  when built in the field. See paragraph B3.11.

## B4 Information to be included in test reports

### Field test reports

**B4.1** Paragraph 1.41 of this Approved Document sets out the manner of recording the results of testing done for the purposes of Regulation 41 or Regulation 20(1) and (5), approved by the Secretary of State under those Regulations.

Although not required, it may be useful to have a description of the building including:

1. sketches showing the layout and dimensions of rooms tested;
2. description of separating walls, external walls, separating floors, and internal walls and floors including details of materials used for their construction and finishes;
3. mass per unit area in  $\text{kg/m}^2$  of separating walls, external walls, separating floors, and internal walls and floors;
4. dimensions of any step and/or stagger between rooms tested;
5. dimensions and position of any windows or doors in external walls.

### Laboratory test reports for internal walls and floors

**B4.2** Test reports should include the following information.

1. Organisation conducting test, including:
  - a. name and address;
  - b. third party accreditation number (e.g. UKAS or European equivalent);
  - c. Name(s) of person(s) in charge of test.
2. Name(s) of client(s).
3. Date of test.
4. Brief details of test, including:
  - a. equipment;
  - b. test procedures.
5. Full details of the construction under test and the mounting conditions.
6. Results of test shown in tabular and graphical form for one-third octave bands according to the relevant part of the BS EN ISO 140 series and BS EN ISO 717 series, including:
  - a. single-number quantity and the spectrum adaptation terms;
  - b. data from which the single-number quantity is calculated.

# Annex C: Glossary

The definitions given below are for the purposes of this document only, and are not intended to be rigorous. Fuller definitions of the various acoustical terms are to be found in the relevant British Standards listed in Annex D.

## Absorption

Conversion of sound energy to heat, often by the use of a porous material.

## Absorption coefficient

A quantity characterising the effectiveness of a sound absorbing surface. The proportion of sound energy absorbed is given as a number between zero (for a fully reflective surface) and one (for a fully absorptive surface). Note that sound absorption coefficients determined from laboratory measurements may have values slightly larger than one. See BS EN 20354:1993.

## Absorptive material

Material that absorbs sound energy.

## Airborne sound

Sound propagating through the air.

## Airborne sound insulation

Sound insulation that reduces transmission of airborne sound between buildings or parts of buildings.

## Air path

A direct or indirect air passage from one side of a structure to the other.

## Caulking

Process of sealing joints.

## Cavity stop

A proprietary product or material such as mineral wool used to close the gap in a cavity wall.

## $C_{tr}$

The correction to a sound insulation quantity (such as  $D_{nT,w}$ ) to take account of a specific sound spectrum. See BS EN ISO 717-1:1997.

## dB

(See decibel)

## Decibel (dB)

The unit used for many acoustic quantities to indicate the level with respect to a reference level.

## Density

Mass per unit volume, expressed in kilograms per cubic metre ( $\text{kg/m}^3$ ).

## Direct transmission

The process in which sound that is incident on one side of a building element is radiated by the other side.

## $D_{nT}$

The difference in sound level between a pair of rooms, in a stated frequency band, corrected for the reverberation time. See BS EN ISO 140-4:1998.

## $D_{nT,w}$

A single-number quantity which characterises the airborne sound insulation between rooms. See BS EN ISO 717-1:1997.

## $D_{nT,w} + C_{tr}$

A single-number quantity which characterises the airborne sound insulation between rooms using noise spectrum no. 2 as defined in BS EN ISO 717-1:1997. See BS EN ISO 717-1:1997.

## Dynamic stiffness

A parameter used to describe the ability of a resilient material or wall tie to transmit vibration. Specimens with high dynamic stiffness (dynamically 'stiff') transmit more vibration than specimens with low dynamic stiffness (dynamically 'soft'). See BS EN 29052-1:1992 for resilient materials. See BRE Information Paper IP 3/01 for wall ties.

## Flanking element

Any building element that contributes to sound transmission between rooms in a building that is not a separating floor or separating wall.

## Flanking transmission

Sound transmitted between rooms via flanking elements instead of directly through separating elements or along any path other than the direct path.

## Floating floor

A floating floor consists of a floating layer and resilient layer (see also resilient layer and floating layer).

## Floating layer

A surface layer that rests on a resilient layer and is therefore isolated from the base floor and the surrounding walls (see also resilient layer).

## Framed wall

A partition consisting of board or boards connected to both sides of a wood or metal frame.

## Frequency

The number of pressure variations (or cycles) per second that gives a sound its distinctive tone. The unit of frequency is the Hertz (Hz).

## Frequency band

A continuous range of frequencies between stated upper and lower limits (see also octave band and one-third octave band).

## Hertz (Hz)

The unit of the frequency of a sound (formerly called cycles per second).

## Impact sound

Sound resulting from direct impact on a building element.

## Impact sound insulation

Sound insulation which reduces impact sound transmission from direct impacts such as footsteps on a building element.

**Independent ceiling**

A ceiling which is fixed independently of a separating floor or an internal floor (see separating floor and internal floor).

**Internal floor**

Any floor that is not a separating floor (see separating floor).

**Intermediate landing**

A landing between two floors (see also landing).

**Internal wall**

Any wall that does not have a separating function.

**Isolation**

The absence of rigid connections between two or more parts of a structure.

**Landing**

A platform or part of floor structure at the end of a flight of stairs or ramp.

 **$L'_{nT}$** 

The impact sound pressure level in a stated frequency band, corrected for the reverberation time. See BS EN ISO 140-7:1998.

 **$L'_{nT,w}$** 

A single-number quantity used to characterise the impact sound insulation of floors. See BS EN ISO 717-2:1997.

**Mass per unit area**

Mass per unit area is expressed in terms of kilograms per square metre ( $\text{kg/m}^2$ ).

**Noise**

Noise is unwanted sound.

**Octave band**

A frequency band in which the upper limit of the band is twice the frequency of the lower limit.

**One-third octave band**

A frequency band in which the upper limit of the band is  $2^{1/3}$  times the frequency of the lower limit.

 **$R_w$** 

A single-number quantity which characterises the airborne sound insulation of a material or building element in the laboratory. See BS EN ISO 717-1:1997.

**Resilient layer**

A layer that isolates a floating layer from a base floor and surrounding walls.

**Reverberation**

The persistence of sound in a space after a sound source has been stopped.

**Reverberation time**

The time, in seconds, taken for the sound to decay by 60dB after a sound source has been stopped.

**Separating floor**

Floor that separates flats or rooms for residential purposes.

**Separating wall**

Wall that separates adjoining dwelling-houses, flats or rooms for residential purposes.

**Sound pressure level**

A quantity related to the physical intensity of a sound.

**Sound reduction index ( $R$ )**

A quantity, measured in a laboratory, which characterises the sound insulating properties of a material or building element in a stated frequency band. See BS EN ISO 140-3:1995.

**Spectrum**

The composition of a particular sound in terms of separate frequency bands.

**Structure-borne sound**

Sound which is carried via the structure of a building.

**UKAS**

United Kingdom Accreditation Service.

 **$\Delta L_w$** 

The measured improvement of impact sound insulation resulting from the installation of a floor covering or floating floor on a test floor in a laboratory. See BS EN ISO 717-2:1997.

# Annex D: References

## D1 STANDARDS

### BS Series

#### BS 1243:1978

Metal ties for cavity wall construction. AMD 3651 1981, AMD 4024 1982.

(Withdrawn and superseded by BS EN 845-1:2000 Specification for ancillary components for masonry. Ties tension straps, hangers and brackets. AMD 14736 2003.)

#### BS 1289-1:1986

Flue blocks and masonry terminals for gas appliances. Specification for precast concrete flue blocks and terminals. AMD 9853 1998. (Withdrawn and superseded by BS EN 1858:2003 Chimneys. Components. Concrete flue blocks.)

#### BS 5628-3:2001

Code of practice for use of masonry. Materials and components, design and workmanship.

#### BS 8233:1999

Sound Insulation and noise reduction for buildings. Code of practice.

### BS EN Series

#### BS EN 20354:1993

Acoustics. Measurement of sound absorption in a reverberation room. AMD 7781 1993, AMD 9974 1998. (Withdrawn and superseded by BS EN ISO 354:2003 Acoustics. Measurement of Sound absorption in a reverberation room. AMD 14766 2003.)

#### BS EN 29052-1:1992

Acoustics. Method for the determination of dynamic stiffness. Materials used under floating floors in dwellings.

### BS EN ISO Series

#### BS EN ISO 140-3:1995

Acoustics. Measurement of sound insulation in buildings and of building elements. Laboratory measurement of airborne sound insulation of building elements. AMD 15277 2005. (Also known as BS 2750-3:1995.)

#### BS EN ISO 140-4:1998

Acoustics. Measurement of sound insulation in buildings and of building elements. Field measurements of airborne sound insulation between rooms.

#### BS EN ISO 140-6:1998

Acoustics. Measurement of sound insulation in buildings and of building elements. Laboratory measurements of impact sound insulation of floors.

#### BS EN ISO 140-7:1998

Acoustics. Measurement of sound insulation in buildings and of building elements. Field measurements of impact sound insulation of floors.

#### BS EN ISO 140-8:1998

Acoustics. Measurement of sound insulation in buildings and of building elements. Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor.

#### BS EN ISO 717-1:1997

Acoustics. Rating of sound insulation in buildings and of building elements. Airborne sound insulation.

#### BS EN ISO 717-2:1997

Acoustics. Rating of sound insulation in buildings and of building elements. Impact sound insulation.

#### BS EN ISO 11654:1997

Acoustics. Sound absorbers for use in buildings. Rating of sound absorption.

## D2 GUIDANCE

### BRE

Information Paper IP 3/01 *Dynamic stiffness of wall ties used in masonry cavity walls: measurement procedure*, 2001. ISBN 1 86081 461 1

Information Paper IP 4/01 *Reducing impact and structure borne sound in buildings*, 2001. ISBN 1 86081 462 X

Information Paper IP 14/02 *Dealing with poor sound insulation between new dwellings*, 2002. ISBN 1 86081 549 0

Report BR 262 *Thermal insulation: avoiding risks*, 2002, ISBN 1 86081 515 4

Report BR 238 *Sound Control for Homes*, 1993. ISBN 0 85125 559 0. Joint publication with CIRIA Report 127 ISBN 0 86017 362 3. Note: some of the information within this document has been superseded.

### CIBSE

Guide A *Environmental design*, 6th edition, 1999. ISBN 0 90095 396 9

### Department for Education and Skills (DfES)

Building Bulletin 93 *Acoustic design of schools: performance standards*, 2015. [www.gov.uk](http://www.gov.uk).

## D3 LEGISLATION

### HSE

L24 *The Workplace (Health, Safety and Welfare) Regulations 1992. Approved Code of Practice and Guidance*, 1992. ISBN 0 71760 413 6

Building Act 1984, Chapter 55.

Construction Products Regulations 1991, SI 1991/1620.

Construction Products (Amendment) Regulations  
1994, SI 1994/3051.

Construction Products Directive (89/106/EEC).

The Gas Safety (Installation and Use) Regulations  
1998, SI 1998/2451.

CE marking Directive (93/68/EEC).

# Annex E: Design details approved by Robust Details Ltd

Robust Details Ltd is a non-profit distributing company, limited by guarantee, set up by the house-building industry. Its objectives are broadly to identify, arrange testing and, if satisfied, approve and publish design details that, if correctly implemented in separating structures, should achieve compliance with Requirement E1. It also carries out checks on the performance achieved in practice.

The robust design details are available in a handbook, which may be purchased from Robust Details Ltd. The company can be contacted at: PO Box 7289, Milton Keynes, Bucks, MK14 6ZQ; telephone 0870 240 8210; fax 0870 240 8203; e-mail [administration@robustdetails.com](mailto:administration@robustdetails.com); website [www.robustdetails.com](http://www.robustdetails.com)

Although the design details are in the public domain, their use in building work is not authorised unless the builder has registered the particular use of the relevant design detail or details with Robust Details Ltd and obtained a unique number or numbers from the company. Each unique number identifies a house or flat in which one or more of the design details are being used.

The system of unique numbers makes possible an essential part of Robust Details Ltd's procedures for ensuring that design details it has approved deliver reasonable sound insulation performance in practice. Robust Details Ltd carries out a programme of checks on a proportion of cases where approved design details are used.

Under Regulation 41(4) of the Building Regulations 2010 and Regulation 20(1) of the Building (Approved Inspector, etc.) Regulations 2010, the requirement for appropriate sound insulation testing imposed by Regulations 41 and 20(1) does not apply to parts of the building which would otherwise be subject to the testing requirement where all the following apply:

- a. the building work consists of the erection of a new dwelling-house (i.e. a semi-detached or terraced house) or a building containing flats;
- b. the person carrying out the building work notifies the building control body before the start of building work on site that, in a specified part or parts of the building, he is using one or more specified design details from those approved by Robust Details Ltd. In a case where building control is being carried out by the local authority, the notification must be given not later than the date on which notice of commencement of construction is given under Regulation 16(1) of the Building Regulations 2010;

- c. the notification specifies the unique number or numbers issued by Robust Details Ltd in respect of the specified use of the design detail or details;
- d. the building work carried out in respect of the part or parts of the building identified in the notification is in accordance with the design detail or details specified in the notification.

If the notification is late, or if it does not specify the relevant part or parts, the design detail or details in question and the unique number or numbers, the part or parts of the building in question *are subject to sound insulation testing under Regulation 41 or 20(1) and (5) in the usual way.*

If the notification is itself valid but the work is not carried out in accordance with the design detail or details, the relevant separating structures become subject to sound insulation testing under Regulation 41 or 20(1) and (5). It would be open to the builder to take remedial action such that the building control body was satisfied that the work had been brought into compliance with the specified detail or details. *With that exception, testing under Regulation 41 or 20(1) and (5) would be needed on all structures that have been subject to a valid notification under Regulation 41(4) or 20(1) and (5) but which in the opinion of the building control body have not then been constructed in accordance with the specified detail or details.*

It should be noted that the compliance of work with a robust detail, in circumstances where the correct procedures have been followed to attract exemption from PCT, is not a 'deemed to satisfy' condition. The underlying requirement remains to achieve compliance with Part E1. The guidance in Approved Document E is that compliance will usually be established by the measured performance of the structure. Therefore it would be open to anyone, e.g. a homeowner, who considered that a party structure does not comply with Part E1, to seek to establish that by the carrying out of tests. It would **not** be a defence for the builder to show that he had correctly carried out a design detail approved by Robust Details Ltd, if the structure's measured performance were shown not to meet the performance standards in Approved Document E.

The Building Regulations 2010

## Ventilation



### APPROVED DOCUMENT

#### F1 Means of ventilation

**2010 edition**  
incorporating 2010 and  
2013 amendments

## MAIN CHANGES IN THE VENTILATION REQUIREMENTS FOR BUILDINGS IN 2010

1. This edition of Approved Document F, *Ventilation*, replaces the 2006 edition and comes into force on 1 October 2010.
2. The following are the main changes to the legal requirements in the Building Regulations 2010 and the Building (Approved Inspectors etc) Regulations 2010, and in the technical guidance in Approved Document F.

### Changes in the legal requirements

3. All fixed mechanical ventilation systems, where they can be tested and adjusted, shall be commissioned and a commissioning notice given to the Building Control Body.
4. For mechanical ventilation systems installed in new dwellings, air flow rates shall be measured on site and a notice given to the Building Control Body. This shall apply to intermittently-used extract fans and cooker hoods, as well as continuously running systems.
5. The owner shall be given sufficient information about the ventilation system and its maintenance requirements so that the ventilation system can be operated to provide adequate air flow.

### Changes in the technical guidance

6. Ventilation provisions have been increased for dwellings with a design air permeability tighter than or equal to  $5 \text{ m}^3/(\text{h.m}^2)$  at 50 Pa.
7. For passive stack ventilators, the stack diameter has been increased to 125 mm for all room types. Use of passive stack ventilation in inner wet rooms has been clarified.
8. The guidance for ventilation when a kitchen or bathroom in an existing dwelling is refurbished has been clarified.
9. Reference is made to a new *Domestic ventilation compliance guide* for guidance on installing, inspecting, testing and commissioning ventilation systems in dwellings. Guidance in Appendices D and E of the 2006 edition of Approved Document F, on installing passive stack ventilators and fans in dwellings, can now be found in Section 2 of the new guide.

## MAIN CHANGES MADE BY THE FURTHER 2010 AMENDMENTS

This 2010 edition incorporates changes to reflect the renumbering of regulations in the Building Regulations 2010 and Building (Approved inspectors etc) Regulations 2010. There have been no changes to the requirements in Part F of Schedule 1 to the Building Regulations, but please note the simpler definition of 'room for residential purposes'.

## MAIN CHANGES MADE BY THE 2013 AMENDMENTS

These changes, which apply only to England\*, update the guidance on materials and workmanship.

\*This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No 2) Order 2009.

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# Section 1: Introduction

## What is an Approved Document?

**1.1** This document has been approved by the Secretary of State to provide practical guidance on ways of complying with the requirements in Part F of Schedule 1 to, and regulations 39, 42 and 44 (in so far as it relates to fixed systems for mechanical ventilation) of, the Building Regulations 2010 (SI 2010/2214) for England and Wales, and regulations 20(1) and 20(6) (in so far as it relates to fixed systems for mechanical ventilation) of the Building (Approved Inspectors etc) Regulations 2010 (SI 2010/2215) for England and Wales. The Building Regulations 2010 and the Building (Approved Inspectors etc) Regulations 2010 are referred to throughout the remainder of this document as ‘the Building Regulations’ and ‘the Approved Inspectors Regulations’ respectively.

**1.2** The intention of issuing Approved Documents is to provide guidance about compliance with specific aspects of building regulations in some of the more common building situations. They set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirement(s) of building regulations to which they refer.

**1.3** If guidance in an Approved Document is followed there will be a presumption of compliance with the requirement(s) covered by the guidance. However, this presumption can be overturned, so simply following guidance does not guarantee compliance; for example, if the particular case is unusual in some way, then ‘normal’ guidance may not be applicable. It is also important to note that there may well be other ways of achieving compliance with the requirements. **There is therefore no obligation to adopt any particular solution contained in this Approved Document if you would prefer to meet the relevant requirement in some other way. Persons intending to carry out building work should always check with their *Building Control Body*, either the local authority or an approved inspector, that their proposals comply with building regulations.**

**1.4** It is important to note that this Approved Document, as well as containing guidance, also contains extracts from the Regulations. Such regulatory text must be complied with as stated. The guidance contained in this Approved Document relates only to the particular requirements of building regulations that the document addresses (set out in Section 2). However, building work may be subject to more than one requirement of building regulations. In such cases the work will also have to comply with any other applicable requirements of building regulations.

**1.5** There are Approved Documents that give guidance on each of the Parts of Schedule 1 and on regulation 7. A full list of these is provided at the back of this document.

## Consideration of technical risk

**1.6** The construction of new buildings, and building work to existing buildings, must satisfy all the technical requirements set out in the Building Regulations. When considering the incorporation of ventilation measures in dwellings, attention should also be paid in particular to the need to comply with Part B (fire safety), Part C (site preparation and resistance to contaminants and moisture), Part E (resistance to the passage of sound), Part L (conservation of fuel and power), Part J (combustion appliances and fuel storage systems) and Part P (electrical safety), as well as Part F. The adoption of any particular ventilation measure should not involve unacceptable technical risk of, for instance, creating a cold bridge. Designers and builders should refer to the relevant Approved Documents and to other generally available good practice guidance to help minimise these risks.

## How to use this Approved Document

**1.7** This Approved Document is subdivided into eight sections as detailed below.

This **introductory** section sets out the general context in which the guidance in the Approved Document must be considered.

**Section 2** sets out the relevant legal requirements as published in the Building Regulations.

**Section 3** contains key terms and general guidance on the types of building work covered by Approved Documents, how to deal with ‘special’ areas of buildings that contain dwellings, procedures for notifying work, materials and workmanship, certification and standards, and health and safety issues.

**Section 4** details the principles of ventilation and its control.

**Section 5** details the guidance for ventilation of dwellings.

**Section 6** details the guidance for ventilation of buildings other than dwellings.

**Section 7** details the guidance for ventilation of existing buildings.

**Section 8** lists standards and other publications referred to in the text.

**Note.** A reference to a publication is likely to be made for one of two main reasons: either the publication contains additional or more comprehensive technical detail, which it

would be impractical to include in full in the Approved Document but which is needed to fully explain ways of meeting the requirements; or it is a source of more general information. The reference will be to a specified edition of the document. The Approved Document may be amended from time to time to include new references or to refer to revised editions where this aids compliance.

**1.8** In this document the following conventions have been adopted to assist understanding and interpretation:

- a. Regulations extracted from the Building Regulations or the Approved Inspectors Regulations as amended are printed against a green background. There is a legal obligation to comply with the requirements in these regulations. In contrast, the technical guidance in the Approved Document shows one or more ways of complying with ventilation requirements in typical situations.
- b. Key terms are defined in paragraph 3.1 and are printed in ***bold italic text***.
- c. Additional commentary in *italic text* appears after some numbered paragraphs. This commentary is intended to assist understanding of the preceding paragraph or sub-paragraph, or to direct readers to sources of additional information, but is not part of the technical guidance itself.

## Where you can get further help

**1.9** If you do not understand the technical guidance or other information set out in this Approved Document and the additional detailed technical references to which it directs you, there are a number of routes through which you can seek further assistance:

- the CLG website: [www.communities.gov.uk](http://www.communities.gov.uk);
- the Planning Portal website: [www.planningportal.gov.uk](http://www.planningportal.gov.uk);
- if you are the person undertaking the building work you can seek assistance either from your local authority building control service or from your approved inspector (depending on which building control service you are using, or intend to use, to certify compliance of your work with the requirements of the Building Regulations);
- businesses registered with a competent person self-certification scheme may be able to get technical advice from their scheme operator;
- if your query is of a highly technical nature you may wish to seek the advice of a specialist, or industry technical body, in the area of concern.

## Responsibility for compliance

**1.10** It is important to remember that if you are the person (e.g. designer, builder, installer) carrying out building work to which any requirement of building regulations applies you have a responsibility to ensure that the work complies with any such requirement. The building owner may also have a responsibility for ensuring compliance with building regulation requirements and could be served with an enforcement notice in cases of non-compliance.

## Section 2: The Requirements

**2.1** This Approved Document, which takes effect on 1 October 2010, deals with the requirements of Part F: *Ventilation* of Schedule 1 to, and regulations 39, 42 and 44 (in so far as it relates to fixed systems for mechanical ventilation) of, the Building Regulations, as amended. It also deals with regulations 20(1) and 20(6) (in so far as it relates to fixed systems for mechanical ventilation) of the Approved Inspectors Regulations, as amended.

<i>Requirement</i>	<i>Limits on application</i>
<p><b>Means of ventilation</b></p> <p><b>F1(1).</b> There shall be adequate means of ventilation provided for people in the building.</p> <p><b>(2).</b> Fixed systems for mechanical ventilation and any associated controls must be commissioned by testing and adjusting as necessary to secure that the objective referred to in sub-paragraph (1) is met.</p>	<p>Requirement F1 does not apply to a building or space within a building:</p> <p>a. into which people do not normally go; or</p> <p>b. which is used solely for storage; or</p> <p>c. which is a garage used solely in connection with a single dwelling.</p>
<p><b>Requirements in the Building Regulations 2010</b></p> <p><b>Information about ventilation</b></p> <p>39.—(1) This regulation applies where Part F1(1) of Schedule 1 imposes a requirement in relation to building work.</p> <p>(2) The person carrying out the work shall not later than five days after the work has been completed give sufficient information to the owner about the building's ventilation system and its maintenance requirements so that the ventilation system can be operated in such a manner as to provide adequate means of ventilation.</p> <p><b>Mechanical ventilation air flow rate testing</b></p> <p>42.—(1) This regulation applies where paragraph F1(1) of Schedule 1 imposes a requirement in relation to the creation of a new dwelling by building work.</p> <p>(2) The person carrying out the work shall, for the purpose of ensuring compliance with paragraph F1(1) of Schedule 1—</p> <p>(a) ensure that testing of the mechanical ventilation air flow rate is carried out in accordance with a procedure approved by the Secretary of State; and</p> <p>(b) give notice of the results of the testing to the local authority.</p> <p>(3) The notice referred to in paragraph (2)(b) shall—</p> <p>(a) record the results and the data upon which they are based in a manner approved by the Secretary of State; and</p> <p>(b) be given to the local authority not later than five days after the final test is carried out.</p> <p><b>Commissioning</b></p> <p>44.—(1) This regulation applies to building work in relation to which paragraph F1(2) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed system for mechanical ventilation or any associated controls where testing and adjustment is not possible.</p> <p>(2) This regulation applies to building work in relation to which paragraph L1(b) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed building service where testing and adjustment is not possible or would not affect the energy efficiency of that fixed building service.</p> <p>(3) Where this regulation applies the person carrying out the work shall, for the purpose of complying with paragraph F1(2) or L1(b) of Schedule 1, give to the local authority a notice confirming that the fixed building services have been commissioned in accordance with a procedure approved by the Secretary of State.</p> <p>(4) The notice shall be given to the local authority –</p> <p>(a) not later than the date on which the notice required by regulation 16(4) is required to be given; or</p> <p>(b) where the regulation does not apply, not more than 30 days after the completion of the work.</p>	

**Requirements in the Building (Approved Inspectors) Regulations 2010.****Application of Provisions of the Principle Regulations.**

20.—(1) Regulation 20 (provisions applicable to self-certification schemes), 27 CO<sub>2</sub> emission rate calculations), 29 (energy performance certificates), 37 (wholesome water consumption calculation), 41 (sound insulation testing), 42 (mechanical ventilation air flow rate testing), 43 (pressure testing) and 44 (commissioning) of the Principal Regulations apply in relation to building work which is the subject of an initial notice as if references to the local authority were references to the approved inspector.

(6) Regulation 44 of the Principal Regulations applies in relation to building work which is the subject of an initial notice as if for paragraph (4) there were substituted—

“(4) The notice shall be given to the approved inspector—

- (a) subject to sub-paragraphs (b) and (c), not later than five days after completion of the work to which the initial notice relates;
- (b) where regulation 17 of the Building (Approved Inspectors etc.) Regulations 2010 applies, not later than the date on which the initial notice ceases to be in force or, if earlier, the end of the period referred to in sub-paragraph (a);
- (c) where regulation 20 applies by virtue of regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010, not later than the date on which the notice or certificate required by that regulation must be given.”.

## LIMITATION ON REQUIREMENTS

**2.2** In accordance with regulation 8 of the Building Regulations, the requirements in Parts A to D, F to K and N and P (except for paragraphs G2, H2 and J7) of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings).

**2.3** Paragraph G2 is excluded as it deals with water efficiency and paragraphs H2 and J7 are excluded from regulation 8 because they deal directly with prevention of the contamination of water. Parts E and M (which deal, respectively, with resistance to the passage of sound and access to and use of buildings) are excluded from regulation 8 because they address the welfare and convenience of building users. Part L is excluded from regulation 8 because it addresses the conservation of fuel and power.

## Section 3: General guidance

### Key terms

**3.1** The following are key terms used in this document:

**Air permeability** is the physical property used to measure the airtightness of the building fabric. It is defined as air leakage rate per hour per square metre of envelope area at a test reference pressure differential across the building envelope of 50 Pascal (50 N/m<sup>2</sup>). The design air permeability is the target value set at the design stage.

**Airtightness** is a general descriptive term for the resistance of the building envelope to **infiltration** with ventilators closed. The greater the airtightness at a given pressure difference across the envelope, the lower the **infiltration**.

**Automatic control** is where a ventilation device is opened and closed or switched on and off or its performance is adjusted by a mechanical or electronic controller which responds to a relevant stimulus. That stimulus is usually related to the humidity of the air in a room, pollutant levels (e.g. carbon dioxide concentration in a room), occupancy of the space (e.g. using a passive infra-red motion detector) or pressure difference across the device (e.g. due to the wind outside).

**Background ventilator** is a small **ventilation opening** designed to provide controllable **whole building ventilation**. See Diagram 1.

**Basement** (in relation to dwellings) is a dwelling, or a usable part of a dwelling (i.e. a **habitable room**), that is situated partly or entirely below ground level. Note that a **cellar** is distinct from a basement in that it is used only for storage, heating plant or purposes other than habitation.

**Bathroom** is a room containing a bath or shower and, in addition, can also include **sanitary accommodation**.

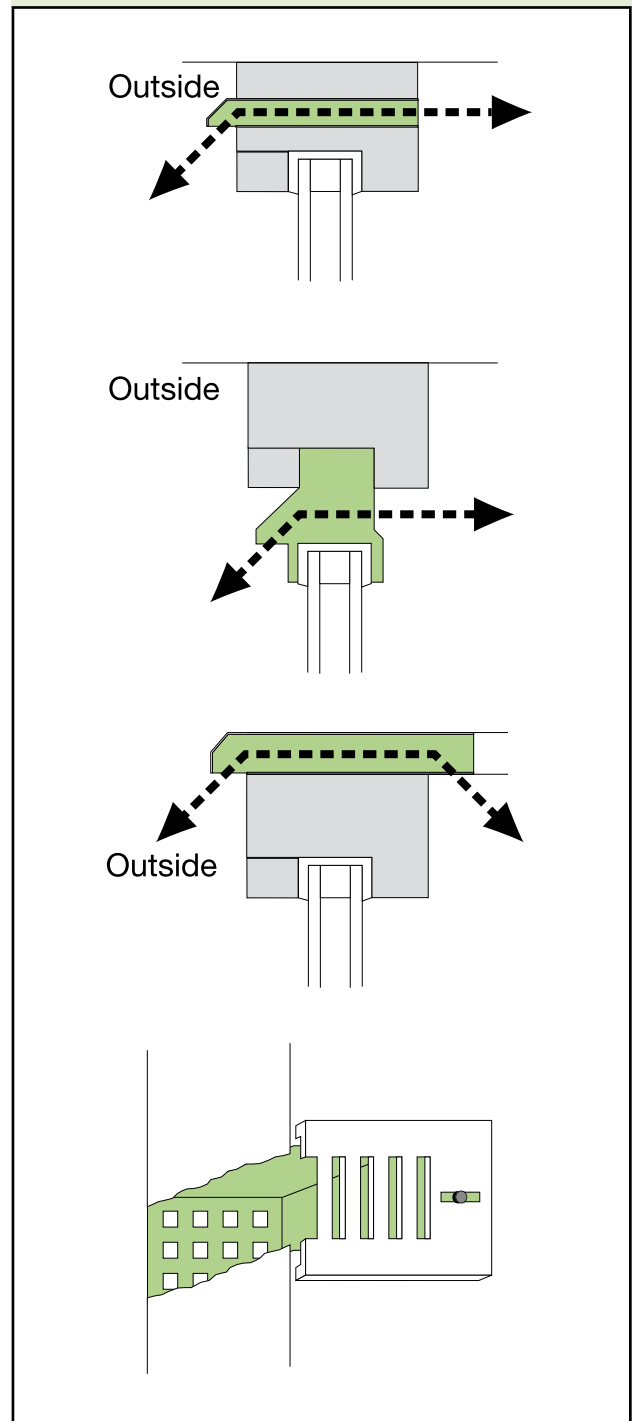
**BCB or Building Control Body** is a local authority or an approved inspector.

**Cellar** is a part of a dwelling which is situated partly or entirely below ground level, and is distinct from a **basement** in that it is used only for storage, heating plant or purposes other than habitation.

**Closable opening** is a **ventilation opening** which may be opened and closed under either **manual** or **automatic control**.

**Common space** is a space where large numbers of people are expected to gather, such as a shopping mall or cinema/theatre foyer. For the purposes of this Approved Document, a space used solely or principally for circulation (e.g. a corridor or lift lobby in an office building or blocks of flats) is not a common space.

Diagram 1 Provisions for background ventilation



**Continuous operation** is where a mechanical ventilation device runs all the time, e.g. mechanical **extract ventilation** (MEV) and mechanical ventilation with heat recovery (MVHR). The air flow rate provided by the mechanical ventilation need not be constant but may be varied, under either **manual** or **automatic control**, in response to the demand for pollutant or water vapour removal.

**Equivalent area** is a measure of the aerodynamic performance of a ventilator. It is the area of a sharp-edged circular orifice which air would pass through at the same volume flow rate, under an identical applied pressure difference, as the opening under consideration.

**Extract ventilation** is the removal of air directly from a space or spaces to outside. Extract ventilation may be by natural means (e.g. by **passive stack ventilation**) or by mechanical means (e.g. by an extract fan or central system).

**Free area** is the geometric open area of a ventilator.

**Gross internal volume** is the total internal volume of the heated space, including the volume of all furniture, internal walls, internal floors, etc.

**Habitable room** is a room used for dwelling purposes but which is not solely a kitchen, **utility room**, **bathroom**, **cellar** or **sanitary accommodation**.

**Infiltration** is the uncontrolled exchange of air between inside a building and outside through cracks, porosity and other unintentional openings in a building, caused by pressure difference effects of the wind and/or **stack effect**.

**Intermittent operation** is where a mechanical ventilator does not run all the time, usually running only when there is a particular need to remove pollutants or water vapour (e.g. during cooking or bathing). Intermittent operation may be under either **manual control** or **automatic control**.

**Manual control** is where a ventilation device is opened and closed, or switched on and off, or its performance is adjusted by the occupants of a room or building (see **automatic control**).

**Occupiable room** is a room in a building other than a dwelling that is occupied by people, such as an office, workroom, classroom or hotel bedroom, but not a **bathroom**, **sanitary accommodation**, **utility room** or rooms or spaces used solely or principally for circulation, building services plant or storage purposes.

**Passive stack ventilation (PSV)** is a ventilation system using ducts from terminals in the ceiling of rooms to terminals on the roof that extract air to outside by a combination of the natural **stack effect** and the pressure effects of wind passing over the roof of the building.

**Permanent opening** is a **ventilation opening** which is permanently fixed in the open position.

**Purge ventilation** is manually controlled ventilation of rooms or spaces at a relatively high rate to rapidly dilute pollutants and/or water vapour. Purge ventilation may be provided by natural means (e.g. an openable window) or by mechanical means (e.g. a fan).

**Purpose-provided ventilation** is that part of the ventilation of a building provided by ventilation devices designed into the building (e.g. via **background ventilators**, **PSV**, extract fans, mechanical ventilation or air-conditioning systems).

**Sanitary accommodation** is a space containing one or more water closets or urinals. Sanitary accommodation containing one or more cubicles counts as a single space if there is free circulation of air throughout the space.

**Stack effect** is the pressure differential between inside and outside a building caused by differences in the density of the air due to an indoor/outdoor temperature difference.

**Surface water activity** is a measure of the availability of water to micro-organisms, and is determined from the ratio of the vapour pressure of the water in the substrate to that of pure water at the same temperature and pressure. This ratio is, in steady-state conditions, numerically equal to the equilibrium relative humidity of the air, except that the latter is commonly expressed as a percentage (from IEA Annex 14 source book, 1991).

**Utility room** is a room containing a sink or other feature or equipment which may reasonably be expected to produce water vapour in significant quantities.

**Ventilation** is the supply and removal of air (by natural and/or mechanical means) to and from a space or spaces in a building. It normally comprises a combination of **purpose-provided ventilation** and **infiltration**.

**Ventilation opening** is any means of **purpose-provided ventilation** (whether it is permanent or closable) which opens directly to external air, such as the openable parts of a window, a louvre or a **background ventilator**. It also includes any door which opens directly to external air.

**Wet room** is a room used for domestic activities (such as cooking, clothes washing and bathing) which give rise to significant production of airborne moisture, e.g. a kitchen, **utility room** or **bathroom**. For the purposes of Part F, **sanitary accommodation** is also regarded as a wet room.

**Whole building ventilation** (general ventilation) is nominally continuous ventilation of rooms or spaces at a relatively low rate to dilute and remove pollutants and water vapour not removed by operation of **extract ventilation**, **purge ventilation** or **infiltration**, as well as supplying outdoor air into the building. For an individual dwelling this is referred to as '**whole dwelling ventilation**'.

## Types of work covered by this Approved Document

**3.2** This Approved Document gives guidance on what, in ordinary circumstances, may be considered reasonable provision for compliance with the requirements of Part F of Schedule 1 to, and regulations 39, 42 and 44 (in so far as it relates to fixed systems for mechanical ventilation) of, the Building Regulations, and regulations 20(1) and 20(6) (in so far as it relates to fixed systems for mechanical ventilation) of the Approved Inspectors Regulations, for those erecting new dwellings and buildings other than dwellings, or carrying out work on existing buildings.

## Exemptions

**3.3** The erection or extension of a number of classes of buildings is exempt under regulation 9 of, and Schedule 2 to, the Building Regulations from the requirements to comply with the requirements in paragraph 3.2 above:

- a. buildings controlled under the Manufacture and Storage of Explosives Regulations 2005, the Nuclear Installations Act 1965 or included in the schedule of monuments maintained under section 1 of the Ancient Monuments and Archaeological Areas Act 1979;
- b. detached buildings into which people do not normally go, or go only intermittently for the purpose of inspecting or maintaining fixed plant or machinery, provided that the buildings are a specified distance from buildings into which people normally go;
- c. greenhouses providing that the principal purpose of the building is not retailing, packing or exhibiting;
- d. agricultural buildings (as defined), provided that no part of the building is used as a dwelling, that the building is at least one and one-half times its height from a building containing sleeping accommodation, and that there is a fire exit not more than 30 metres distant from any point in the building. Agricultural buildings used principally for retailing, packing or exhibiting fall outside the exemption;
- e. temporary buildings not intended to remain in place for more than 28 days;
- f. ancillary buildings used for the disposal of buildings or building plots on site; buildings on the site of construction or civil engineering works for use only during the course of those works and containing no sleeping accommodation; and buildings on the site of mines and quarries which do not contain dwellings, nor are used as offices or showrooms;
- g. detached single-storey buildings, with less than 30 m<sup>2</sup> floor area and containing no sleeping accommodation, which are either constructed substantially of non-combustible material or at least 1 metre from the boundary of their curtilage;
- h. detached buildings of less than 30 m<sup>2</sup> floor area, designed and intended to be used as shelters from nuclear, chemical or conventional weapons and used for no other purpose, provided the excavation for the building is at least 1 metre plus the depth of excavation from any other exposed structure;
- i. detached buildings of less than 15 m<sup>2</sup> floor area containing no sleeping accommodation; and
- j. extensions of buildings at ground level with a floor area less than 30 m<sup>2</sup> by the addition of a conservatory, porch, covered yard, covered way, or carport open on at least two sides.

## Notification of work covered by the ventilation requirements

**3.4** In most cases where it is proposed to carry out notifiable ventilation work on a building it will be necessary to notify the work to a **BCB** in advance. This notification would usually be by way of a full plans application or a building notice given to a local authority, or an initial notice given jointly with the approved inspector. However, there are three circumstances where such work need not be notified to a **BCB** in advance:

### Competent person self-certification schemes

**3.5** It is not necessary to notify a **BCB** in advance of work which is to be carried out by a person registered with a competent person self-certification scheme for that type of work. In order to join such a scheme a person must demonstrate competence to carry out the type of work the scheme covers, and also the ability to comply with all relevant requirements in the Building Regulations.

**3.6** Where work is carried out by a person registered with a competent person scheme, regulation 20 of the Building Regulations and regulation 20(1) of the Approved Inspectors Regulations require that the occupier of the building be given, within 30 days of the completion of the work, a certificate confirming that the work complies fully with all applicable building regulation requirements. There is also a requirement that the **BCB** be given a notice of the work carried out, again within 30 days of the completion of the work. These certificates and notices are usually made available through the scheme operator.

**3.7** **BCBs** are authorised to accept these certificates and notices as evidence of compliance with the requirements of the Building Regulations. Local authority inspection and enforcement powers remain unaffected, but they are normally used only in response to a complaint that work does not comply.

**3.8** There are a number of competent person schemes for the installation of mechanical ventilation and air-conditioning systems in buildings. A list of the schemes and the types of work for which they are authorised is available at [www.communities.gov.uk](http://www.communities.gov.uk).

### Emergency repairs

**3.9** Where the work involves an emergency repair, e.g. to a failed fan, in accordance with regulation 12(8) of the Building Regulations there is no need to delay making the repair in order to make an advance notification to the **BCB** where this is not practicable. However, in such cases it will still be necessary for the work to comply with the relevant requirements and to give a notice to the **BCB** at the earliest opportunity, unless an installer registered under an appropriate competent person scheme carries out the work. A completion certificate can then be issued in the normal way.

### Minor works

**3.10** Where the work is of a minor nature as described in the schedule of non-notifiable work (Schedule 4 to the Building Regulations), the work must still comply with the relevant requirements but need not be notified to the **BCB**. In relation to mechanical ventilation and air-conditioning systems such work includes:

- replacement of parts, or the addition of an output or control device where testing and adjusting is not possible or would not affect the system's energy efficiency;
- provision of a self-contained mechanical ventilation or air-conditioning appliance provided that any electrical work is exempt from a requirement to give advance notice to a **BCB**, and testing and adjustment is not possible or would not affect its energy efficiency, and the appliance is not installed in a room containing an open-flued combustion appliance. Examples might be a cooker hood, a bathroom extract fan or a room air-conditioning unit, which cannot be adjusted from their factory settings.

## Historic and traditional buildings

**3.11** As mentioned above in paragraph 3.3a, buildings included in the schedule of monuments maintained under section 1 of the Ancient Monuments and Archaeological Areas Act 1979 are exempt from compliance with the requirements of the Building Regulations. There are other classes of buildings where special considerations may apply in deciding what is adequate provision for ventilation:

- a. listed buildings;
- b. buildings in conservation areas;
- c. buildings which are of architectural and historical interest and which are referred to as a material consideration in a local authority's development plan or local development framework;
- d. buildings which are of architectural and historical interest within national parks, areas of outstanding natural beauty, registered historic parks and gardens, registered battlefields, the curtilages of scheduled ancient monuments, and world heritage sites; and
- e. buildings of traditional construction with permeable fabric that both absorbs and readily allows the evaporation of moisture.

**3.12** When undertaking work on or in connection with a building that falls within one of the classes listed above, the aim should be to provide adequate ventilation as far as is reasonable and practically possible. The work should not prejudice the character of the host building or increase the risk of long-term deterioration of the building fabric or fittings.

**3.13** The guidance given by English Heritage<sup>1</sup> and in BS 7913 *Principles of the conservation of historic buildings* should be taken into account in determining appropriate ventilation strategies for building work in historic buildings.

**3.14** In general, new extensions to historic or traditional dwellings should comply with the standards of ventilation as set out in this Approved Document. The only exception would be where there is a particular need to match the external appearance or character of the extension to that of the host building.

**3.15** Particular issues relating to work in historic buildings that warrant sympathetic treatment and where advice from others could therefore be beneficial include:

- a. restoring the historic character of a building that has been subject to previous inappropriate alteration, e.g. replacement windows, doors and rooflights;

<sup>1</sup> [www.english-heritage.org.uk](http://www.english-heritage.org.uk)

- b. rebuilding a former historic building (e.g. following a fire or filling a gap site in a terrace);
- c. making provision for the fabric of historic buildings to 'breathe' to control moisture and potential long-term decay problems.

**3.16** In determining what is adequate ventilation in the circumstances, it is important that the **BCB** takes into account the advice of the local authority's conservation officer. The views of the conservation officer are particularly important where building work requires planning permission and/or listed building consent.

## Material change of use

**3.17** A change of use occurs when there is a change in the purposes for which, or circumstances in which, an existing building or part of a building is used. For the purposes of building regulations, a material change of use occurs where, after the change:

- a. the building or part of a building is used as a dwelling, where previously it was not;
- b. the building or part of a building contains a flat, where previously it did not;
- c. the building or part of a building is used as a hotel or a boarding house, where previously it was not;
- d. the building or part of a building is used as an institution, where previously it was not;
- e. the building or part of a building is used as a public building, where previously it was not;
- f. the building or part of a building is not a building described in Classes 1 to 4 in Schedule 2, where previously it was;
- g. the building or part of a building, which contains at least one dwelling, contains a greater or lesser number of dwellings than it did previously;
- h. the building or part of a building contains a room for residential purposes, where previously it did not;
- i. the building or part of a building, which contains at least one room for residential purposes, contains a greater or lesser number of such rooms than it did previously; or
- j. the building or part of a building is used as a shop, where previously it was not.

**3.18** Where a building undergoes any of the material changes of use described above it will be necessary for the resultant building to comply with the requirements of Part F of the Building Regulations. Where only part of the building undergoes a material change of use, normally only that part needs to comply with the requirements of Part F.

## Live-work units

**3.19** If a unit contains both living accommodation and space to be used for commercial purposes (e.g. workshop or office), the whole unit should be treated as a dwelling for the purposes of this Approved Document as long as the commercial part could revert to domestic use. This could be the case if, for example:

- a. there is direct access between the commercial space and the living accommodation; and
- b. both are contained within the same thermal envelope; and
- c. the living accommodation occupies a substantial proportion of the total area of the unit.

*Sub-paragraph c means that the presence of (e.g.) a small manager's flat in a large non-domestic building would not result in the whole building being treated as a dwelling. Similarly, the existence of a room used as an office or utility space within a dwelling would not mean that the building should not be treated as a dwelling.*

## Mixed use developments

**3.20** When constructing a dwelling as part of a larger building that contains other types of accommodation, sometimes called a mixed use development, Section 5 of this Approved Document should be used for guidance in relation to each individual dwelling. Section 6 gives guidance relating to the non-dwelling parts of such buildings.

## Materials and workmanship

**3.21** Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations shall be carried out in accordance with regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in Approved Document 7.

**3.22** Building Regulations are made for specific purposes, primarily the health and safety, welfare and convenience of people and for energy conservation. Standards and other technical specifications may provide relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance or matters which, although they relate to health and safety etc., are not covered by the Building Regulations.

**3.23** When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

## **The Workplace (Health, Safety and Welfare) Regulations 1992**

**3.24** The Workplace (Health, Safety and Welfare) Regulations 1992, as amended, apply to the common parts of flats and similar buildings if people such as cleaners, wardens and caretakers are employed to work in these common parts. These Regulations contain some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see *Workplace health, safety and welfare, Workplace (Health, Safety and Welfare) Regulations 1992, Approved Code of Practice and guidance*, HSE publication L24, 1996.

**3.25** Where the requirements of the Building Regulations that are covered by this Approved Document do not apply to dwellings, the provisions may still be required in the situations described above in order to satisfy the Workplace Regulations.

# Section 4: Introduction to the provisions

## Performance

**4.1** The purpose of this section is to outline briefly what ventilation in buildings is for and the philosophy behind the guidance for ventilation given in Approved Document F. More detail is given in some of the informative Appendices at the end of this Approved Document.

**4.2** The key aim of the requirement of Part F1(1) is that a ventilation system is provided that, under normal conditions, is capable of limiting the accumulation of moisture, which could lead to mould growth, and pollutants originating within a building which would otherwise become a hazard to the health of the people in the building.

**4.3** In general terms, the requirement may be achieved by providing a ventilation system which:

- a. extracts, before it is generally widespread, water vapour from areas where it is produced in significant quantities (e.g. kitchens, **utility rooms** and **bathrooms**);
- b. extracts, before they are generally widespread, pollutants which are a hazard to health from areas where they are produced in significant quantities (e.g. rooms containing processes or activities which generate harmful contaminants);
- c. rapidly dilutes, when necessary, pollutants and water vapour produced in **habitable rooms**, **occupiable rooms** and **sanitary accommodation**;
- d. makes available over long periods a minimum supply of outdoor air for occupants and disperses, where necessary, residual pollutants and water vapour. Such ventilation should minimise draughts and, where necessary, should be reasonably secure and provide protection against rain penetration;
- e. is designed, installed and commissioned to perform in a way which is not detrimental to the health of the people in the building; and
- f. is installed to facilitate maintenance where necessary.

**4.4** The guidance in this Approved Document has not been formulated to deal with the products of tobacco smoking.

**4.5** Ventilation systems in buildings result in energy being used to heat fresh air taken in from outside and, in mechanical ventilation systems, to move air into, out of and/or around the building. Energy efficiency is dealt with under Part L of Schedule 1 and Regulation 40 of the Building Regulations but consideration should be given to mitigation of ventilation energy use, where applicable, by employing heat recovery devices, efficient types of fan motor and/or energy-saving control devices in the ventilation system.

## The purpose of ventilation

**4.6** **Ventilation** is simply the removal of 'stale' indoor air from a building and its replacement with 'fresh' outside air. It is assumed within the Approved Document that the outside air is of reasonable quality.

**4.7** **Ventilation** is required for one or more of the following purposes:

- a. provision of outside air for breathing;
- b. dilution and removal of airborne pollutants, including odours;
- c. control of excess humidity (arising from water vapour in the indoor air);
- d. provision of air for fuel-burning appliances (which is covered under Part J of the Building Regulations).

**4.8** **Ventilation** may also provide a means to control thermal comfort but this is not controlled under the Building Regulations. Part L addresses minimising energy use due to the effects of solar gain in summer.

**4.9** The airborne pollutants and water vapour mentioned in paragraph 4.7b and c above include those that are released from materials and products paragraph used in the construction, decoration and furnishing of a building, and as a result of the activities of the building's occupants.

**4.10** The pollutant(s) of most importance will vary between building types (e.g. dwelling, office, factory), building uses (e.g. industrial process, shop, commercial kitchen), and even from room to room within a building (e.g. kitchen, shower room, conference room, photocopier room). Common pollutants in a dwelling are moisture and combustion products from unflued appliances (e.g. gas, oil or solid fuel cookers) and chemical emissions from construction and consumer products. Note that the ventilation system capacity, if used appropriately, is usually sufficient to remove odours arising from normal occupant activities within a dwelling. In an office building, body odour is often the key pollutant, but there are a number of other pollutant sources including the building itself, furnishings, printers and photocopiers.

## Types of ventilation

**4.11** Buildings are ventilated through a combination of **infiltration** and **purpose-provided ventilation**:

- **Infiltration** is the uncontrollable air exchange between the inside and outside of a building through a wide range of air leakage paths in the building structure.
- **Purpose-provided ventilation** is the controllable air exchange between the inside and outside of a building by means of a range of natural and/or mechanical devices.

**4.12** It is important to minimise the uncontrollable **infiltration** and supply sufficient **purpose-provided ventilation**. **Air tightness** measures to limit **infiltration** are covered in Part L of the Building Regulations and its supporting Approved Documents. Approved Document F recommends methods of achieving sufficient **purpose-provided ventilation**, allowing for a reasonably high level of **airtightness**.

**4.13** For the purposes of Part F, a reasonably high level of **airtightness** means a level which is significantly tighter than the minimum target value recommended under Part L, because all new buildings are expected to better the target value to some degree. Through good design and execution, domestic and non-domestic buildings can currently achieve an **air permeability** down to around 2 to 4 m<sup>3</sup>/(h.m<sup>2</sup>) of envelope area at 50 Pascal (Pa) pressure difference. Some buildings constructed are tighter than this. It can be anticipated that there will be a continual trend towards more airtight buildings due to drivers for higher energy efficiency and lower carbon emissions.

**4.14** The **ventilation** provisions recommended for new dwellings in this Approved Document have been specified for two standard designs of **air permeability**:

- In the default option, the guidance assumes zero **air permeability** and thus no **infiltration**. The building **ventilation** is reliant entirely on installed **purpose-provided ventilation**, thus ensuring sufficient **ventilation** for dwellings of all levels of **air permeability**. This option should be particularly suitable when intending to construct a more airtight dwelling, or where the person carrying out the building work does not have previous experience of closely matching design with as-constructed **air permeability** and may, as a consequence, achieve a significantly better performance than designed.
- In the alternative option, the guidance assumes an **infiltration** of 0.15 air changes per hour (ach). The recommended **purpose-provided ventilation** is less as **infiltration** contributes to the total amount of **ventilation**. This option is most appropriate when designing to an **air permeability** leakier than 5 m<sup>3</sup>/(h.m<sup>2</sup>) at 50 Pa, and it is expected from experience that the measured **air permeability** will be close to the design value and will not be better than 3 m<sup>3</sup>/(h.m<sup>2</sup>) at 50 Pa.

Paragraphs 5.8 to 5.10 provide further information.

## The ventilation strategy adopted in Approved Document F

**4.15** Approved Document F adopts the following strategy. (Systems which comply with the strategy are described in Sections 5 and 6.)

- **Extract ventilation** from rooms where most water vapour and/or pollutants are released, e.g. due to activities such as cooking, bathing or photocopying. This is to minimise their spread to the rest of the building. This extract may be either intermittent or continuous.
- **Whole building/dwelling ventilation** to provide fresh air to the building and to dilute and disperse residual water vapour and pollutants not dealt with by **extract ventilation** as well as removing water vapour and other pollutants which are released throughout the building (e.g. by building materials, furnishings, activities and the presence of occupants). **Whole building/dwelling ventilation** provides nominally continuous air exchange. The ventilation rate may be reduced or ceased when the building is not occupied. It may be necessary to purge the air when the building is re-occupied.
- **Purge ventilation** throughout the building to aid removal of high concentrations of pollutants and water vapour released from occasional activities such as painting and decorating or accidental releases such as smoke from burnt food or spillage of water. **Purge ventilation** is intermittent, i.e. required only when such occasional activities occur. **Purge ventilation** provisions may also be used to improve thermal comfort, although this is not controlled under the Building Regulations.

**4.16** This ventilation strategy can be delivered by a natural ventilation system or a mechanical ventilation system or a combination of both (i.e. 'mixed-mode' or 'hybrid' ventilation system). For mainly naturally ventilated buildings, it is common to use a combination of ventilators to achieve this strategy (e.g. for dwellings it is common to use intermittent extract fans for **extract ventilation**, trickle ventilators for **whole dwelling ventilation** and windows for **purge ventilation**). For mechanically ventilated or air-conditioned buildings, it is common for the same ventilators to provide both local extract and **whole building / dwelling ventilation** and, for buildings other than dwellings, to provide **purge ventilation** as well.

**4.17** The ventilation systems and devices mentioned in this document are examples of those commonly in use at the time of writing. Other ventilation systems and devices, perhaps following a different strategy (e.g. positive input ventilation or supply air windows), may provide acceptable solutions, provided it can be demonstrated to the **BCB** (e.g. by use of a product or system covered by a national or

European certificate issued by a European Technical Approval issuing body, provided the conditions of use are in accordance with the terms of the certificate) that they meet Requirement F1. The assessment of the suitability of a ventilation system should take account of the design air permeability of the building, and the fact that the completed building may be 'tighter' than the design value because of variability in construction quality.

## Control of ventilation

**4.18** It is important that ventilation is controllable so that it can maintain reasonable indoor air quality and avoid waste of energy. These controls can be either **manual** (i.e. operated by the occupant) or **automatic**. Demand-controlled ventilation systems employ sensors to detect the level of occupancy, water vapour or other pollutants and adjust the ventilation rate accordingly in order to avoid over-ventilation and so reduce energy consumption.

**4.19** Manually controlled trickle ventilators (the most common type of **background ventilators**) can be located over the window frames, in window frames, just above the glass or directly through the wall (see Diagram 1 in Key terms). They are positioned typically 1.7 m above floor level to avoid discomfort due to cold draughts. These ventilators often incorporate a simple flap that allows users to shut off the ventilation – depending on external weather conditions. Trickle ventilators are intended to be normally left open in occupied rooms in dwellings. A window with a night latch position is not recommended because of the difficulty of measuring the **equivalent area**, the greater likelihood of draughts and the potential increased security risk in some locations.

**4.20** In dwellings, humidity-controlled devices are available to regulate the humidity of the indoor air and, hence, minimise the risk of condensation and mould growth. These are best installed as part of an extract ventilator in moisture-generating rooms (e.g. kitchen or **bathroom**). Humidity control is not appropriate for **sanitary accommodation**, where the dominant pollutant is normally odour. Trickle ventilators are available which 'throttle down' the ventilation flow passage(s) according to the pressure difference across the ventilator to reduce draught risks during windy weather. Manufacturers should be consulted when selecting the correct type of pressure-controlled trickle ventilator.

**4.21** Other types of **automatic control** may be suitable for regulating ventilation devices (e.g. trickle ventilators, ventilation fans, dampers and air terminal devices) in dwellings. In such cases, it is important that the device controls the ventilation air supply and/or extract according to the need for ventilation in the space to remove or dilute indoor pollutants and water vapour. Trickle ventilators with automatic controls should also

have manual override, so that the occupant can close the ventilator to avoid draughts and fully open the ventilator to provide maximum air flow when required. For pressure-controlled trickle ventilators that are fully open at typical conditions (e.g. 1 Pa pressure difference), only a manual close option is recommended.

**4.22** In buildings other than dwellings, more sophisticated **automatic control** systems are available. These may be based on sensors located within the building, e.g. occupancy sensors (using local passive infra-red detectors) or indoor carbon dioxide concentration sensors (using electronic carbon dioxide detectors) as an indicator of occupancy level and, therefore, body odour.

## Performance-based guidance

**4.23** This Approved Document focuses on performance-based guidance which suggests to the designer what level of ventilation should be sufficient, rather than how it should be achieved. Therefore, the designer has the freedom to use whatever ventilation provisions suit a particular building, including the use of innovative products and solutions, if it can be demonstrated that they meet the performance standard recommended in this Approved Document.

**4.24** The actual performance criteria for acceptable levels of moisture and pollutants are given in Appendix A. The air flow rates necessary to meet the performance criteria are given in the main guidance.

**4.25** Simple guidance in the form of ventilator sizes for the whole dwelling is also provided to make it easier for designers to meet building regulations requirements in common situations.

## Equivalent area of ventilators

**4.26** **Equivalent area** is used in the Approved Document instead of **free area** for the sizing of **background ventilators** (including trickle ventilators) because it is a better measure of the air flow performance of a ventilator. Unlike equivalent area, **free area** is simply the physical size of the aperture of the ventilator but may not accurately reflect the air flow performance which the ventilator will achieve. The more complicated and/or contorted the air flow passages in a ventilator, the less air will flow through it. So, two different ventilators with the same **free area** will not necessarily have the same air flow performance. A European Standard, BS EN 13141-1:2004 (Clause 4), includes a method of measuring the **equivalent area** of **background ventilator** openings.

**4.27** As **equivalent area** cannot be verified with a ruler, it will be difficult to demonstrate to **Building Control Bodies** that trickle ventilators and similar products have the correct **equivalent area** unless it is clearly marked on the product. For this reason, it is preferable to use ventilators which have the **equivalent area** (in mm<sup>2</sup> at

1 Pa pressure difference), or **equivalent area** per metre (where the **equivalent area** of the product varies according to length) marked on the product in an easily visible location from the inside of the dwelling when installed. Where it is not practical for the manufacturer to mark the ventilator because it can be used in conjunction with a range of other components, some form of temporary marking for the installed system should be acceptable to the **BCB**.

## Ventilation effectiveness

**4.28** Ventilation effectiveness is a measure of how well a ventilation system works in terms of delivering the supply air to the occupants of a building. If the supply air is mixed fully with the room air before it is breathed by the occupants, the ventilation effectiveness is 1. If the supply air is extracted from the room before it mixes with any room air, the ventilation effectiveness is 0. If the supply air reaches the occupant without mixing with any room air, the ventilation effectiveness tends towards infinity.

**4.29** This is important as a system with a higher ventilation effectiveness achieves acceptable pollutant levels at the occupant's breathing zone for a lower air supply rate, and offers potentially significant energy savings. However, it has been decided not to make an allowance for any reduction of fresh air supply rates based on ventilation effectiveness in Approved Document F at this time. This is because ventilation effectiveness is dependent on the ventilation system design, its installation and the way in which occupants use the space. While it is possible to predict what the ventilation effectiveness of a system should be, there is currently insufficient knowledge of the actual ventilation effectiveness achieved in buildings to allow designers to guarantee performance and so avoid significant under-ventilation by reducing air supply rates. This is because ventilation effectiveness may be influenced by factors beyond the designer's control such as occupant usage (e.g. seating plan and use of computers within a space and whether the space is being heated or cooled by the ventilation air). In the designs shown in this Approved Document, it has been assumed that the ventilation effectiveness is 1.0. CIBSE Guide A provides further information on ventilation effectiveness.

## Source control

**4.30** A complementary strategy for achieving good indoor air quality is to reduce the release of water vapour and/or air pollutants into the indoor air, i.e. source control. Source control is not considered within the main guidance of the Approved Document owing to limited knowledge about the emission of pollutants from construction and consumer products used in buildings and the lack of suitable labelling schemes for England and Wales. Some construction products such as glass, stone and

ceramics are by their nature low emitters of air pollutants. Currently, some paints are labelled for their volatile organic compound (VOC) content, and some wood-based boards (class E1, BS EN 13986:2004) are available with low formaldehyde emission. This allows suitable products to be chosen when good indoor air quality is a priority, but at the present time it is not practical to make an allowance for use of these products in the ventilation requirements. Further information about control of emissions from construction products is available in BRE Digest 464.

**4.31** Exposure to house dust mite (HDM) allergens can lead to allergic sensitisation and to exacerbation of allergic conditions. The moisture criteria needed to avoid HDM are more complex and demanding than those needed to avoid mould. The reduction of mite growth may be feasible in UK dwellings via appropriate ventilation, heating and moisture control as part of an integrated approach that involves the removal of existing mite allergens.

**4.32** Useful information may be found in the World Health Organisation (WHO) publication, *House dust mites*, Crowther D and Wilkinson T (2008), which is included in *Public health significance of urban pests*, Bonnefoy X, Kampen H and Sweeney K, WHO Regional Office for Europe, available at: [www.euro.who.int/document/e91435.pdf](http://www.euro.who.int/document/e91435.pdf)

**4.33** Further information and suggested measures for source control are given in *Review of health and safety risk drivers* (BD 2518), available at: [www.communities.gov.uk/publications/planningandbuilding/reviewhealthsafety](http://www.communities.gov.uk/publications/planningandbuilding/reviewhealthsafety)

## Noise

**4.34** The noise caused by ventilation systems is not controlled under the Building Regulations. However, such noise may be disturbing to the occupants of a building and it is recommended that measures be taken to minimise noise disturbance. For example, in noisy areas, in order to reduce noise entering the building through the ventilation system, it may be appropriate to use sound-attenuating ventilation products depending on the noise level and any planning conditions.

**4.35** Noise from the ventilation system may also disturb people who are outside the building, so measures to minimise externally emitted noise should also be considered.

**4.36** Noise generated by ventilation fans (which may travel through ducts) and noise from the fan unit may disturb the occupants of the building and so discourage their use. Therefore, the designer should consider minimising noise by careful design and the specification of quieter products.

*To ensure good acoustic conditions, the average A-weighted sound pressure level in noise sensitive rooms, such as bedrooms and living rooms, should not exceed 30 dB  $L_{Aeq,T}$  (see Note below). In less sensitive rooms, such as kitchens and bathrooms, a higher level would be acceptable, e.g. 35 dB  $L_{Aeq,T}$ . Noise from a continuously running mechanical ventilation system on its minimum low rate should not normally exceed these levels, and should preferably be lower in order to minimise the impact of the ventilation system.*

*The main issues to be addressed in minimising the noise impact of the ventilation system are the noise from the fan unit entering the ducts, and the attenuation provided by the ducts, bends and junctions and the characteristics of the room grill. The noise breaking out of the fan unit casing may also be significant in adjacent rooms. The characteristics of the room will also affect the noise level.*

*Methods for measuring the sound power level produced by the fan unit of decentralised extract, centralised extract, and balanced supply and extract with heat recovery systems are under development. When available, they should be read in conjunction with the appropriate parts of BS EN 13141.*

*Note:*

*The noise index  $L_{Aeq,T}$  is used in BS 8233:1999, where  $T$  is the duration of the measurement. If the noise from the sound source is steady (e.g. fluctuating by up to 3 dB) a measuring time of 1 minute will be adequate and the  $L_{Aeq,1\text{ min}}$  level will be similar to the dB(A) level used elsewhere. If the noise from the sound source fluctuates more than this a longer measuring time ( $T$ ) will be required.*

## Fire precautions

**4.37** Where ducting passes through a fire-resisting wall/floor or fire compartment, the required measures to ensure compliance with Part B of the Building Regulations must be taken.

## Modular and portable buildings

**4.38** Buildings constructed from sub-assemblies that are delivered newly made or selected from stock should be treated no differently from any other new building and must comply with all the relevant requirements in Schedule 1 to the Building Regulations 2010 that were in force when they were manufactured. For guidance on energy efficiency requirements, see Approved Document L2A.

## Installation of ventilation systems

**4.39** It is recommended that ventilation systems are installed in new and existing dwellings in accordance with the guidance in the 2010 edition of the *Domestic ventilation compliance guide*, available from [www.planningportal.gov.uk/approveddocuments](http://www.planningportal.gov.uk/approveddocuments). The guide is referenced at relevant points of this Approved Document – in Section 5, *New dwellings*, and in Section 7, *Work on existing buildings*.

**4.40** Section 5 of the *Domestic ventilation compliance guide* includes an installation checklist which should be completed by the system installer. It also includes an installation inspection sheet where the equivalent area of background ventilators should be recorded.

**4.41** Installation guidance for buildings other than dwellings can be found in the references listed in Table 6.3.

## Air flow rate testing and commissioning of ventilation systems

**4.42** The Regulations require:

- mechanical ventilation systems to be commissioned (where they can be tested and adjusted) to provide adequate ventilation and a commissioning notice to be given to the **BCB**;
- air flow rates for mechanical ventilation systems in new dwellings to be measured and a notice to be given to the **BCB**.

**4.43** For dwellings, the procedures approved by the Secretary of State for measurement of air flow rates and for commissioning of mechanical ventilation systems are in Sections 2 and 3 of the *Domestic ventilation compliance guide*. Section 5 of the guide contains air flow measurement test and commissioning sheets which should be completed by the person responsible for commissioning.

**4.44** For commissioning of non-domestic ventilation systems, the commissioning procedure approved by the Secretary of State is CIBSE Code M, available from [www.cibse.org](http://www.cibse.org).

**4.45** The commissioning of mechanical ventilation systems to provide adequate ventilation under Part F of the Building Regulations will need to be carried out with the commissioning of such systems to ensure that they use no more fuel and power than is reasonable in the circumstances under Part L of the Building Regulations. It is permissible for the notice of commissioning to be given to the **BCB** to cover the commissioning required under both Parts F and L. Approved Documents L1A, L1B, L2A and L2B give guidance on commissioning required by Part L.

**4.46** In addition, guidance on commissioning ventilation ductwork is provided in the HVCA guidance documents DW/144 *Specification for sheet metal ductwork: low, medium and high pressure/velocity air systems*, DW/154 *Specification for plastics ductwork*, and DW/143 *Practical guide to ductwork leakage testing*, all available from [www.hvca.org.uk](http://www.hvca.org.uk).

### Provision of information

**4.47** The Regulations require sufficient information about the ventilation system and its maintenance requirements to be given to owners so that the ventilation system can be operated to provide adequate air flow.

**4.48** For new and existing dwellings, Section 4 of the *Domestic ventilation compliance guide* lists the documents that it is recommended should be given to the dwelling owner at installation handover. The inspection checklist and air flow measurement test and commissioning sheet in Section 5 should form part of the information pack. The parts of Section 5 covering air flow measurement and commissioning should also be given to the **BCB**.

**4.49** For new and existing buildings other than dwellings, a way of showing compliance would be to follow the guidance in Approved Documents L2A and L2B, which reference the CIBSE TM 31 *Building log book toolkit*, 2006.

# Section 5: New dwellings

## Introduction to provisions

**5.1** This Approved Document shows three main ways of complying with the ventilation requirements of the Building Regulations:

- providing the ventilation rates set out in paragraphs 5.4 to 5.7; or
- following the system guidance set out:
  - for dwellings without **basements** in paragraphs 5.8 to 5.10. This guidance covers all levels of design **air permeability**. Alternative guidance is also provided for dwellings designed to an **air permeability** leakier than ( $>$ )  $5 \text{ m}^3/(\text{h} \cdot \text{m}^2)$  at 50 Pa where the developer from experience will not construct significantly more airtight dwellings (not better than  $3 \text{ m}^3/(\text{h} \cdot \text{m}^2)$  at 50 Pa); or
  - for dwellings with **basements** in paragraphs 5.11 to 5.13; or
- using other ventilation systems provided it can be demonstrated to the **Building Control Body** that they satisfy the Requirement, e.g. by showing that they meet the moisture and air quality criteria set out in Appendix A.

**5.2** There should be reasonable access for maintenance. This should include access for the purpose of changing filters, replacing defective components and cleaning ductwork.

**5.3** Note that extract fans lower the pressure in a building, which can cause the spillage of combustion products from open-flued appliances (i.e. the combustion gases may fill the room instead of going up the flue or chimney). This can occur even if the appliance and the fan are in different rooms. Ceiling sweep fans produce air currents and hence local depressurisation, which can also cause the spillage of flue gases from open-flued gas appliances or from solid fuel open fires. In buildings where it is intended to install open-flued combustion appliances and extract fans, the combustion appliance should be able to operate safely whether or not the fans are running. A way of showing compliance in these circumstances would be to follow the guidance given in Approved Document J on both the installation of the appliances and tests to show that combustion appliances operate safely whether or not fans are running.

**Table 5.1a Extract ventilation rates**

Room	Intermittent extract	Continuous extract	
	Minimum rate	Minimum high rate	Minimum low rate
Kitchen	30 l/s adjacent to hob; or 60 l/s elsewhere	13 l/s	Total extract rate should be at least the <b>whole dwelling ventilation</b> rate given in Table 5.1b
Utility room	30 l/s	8 l/s	
Bathroom	15 l/s	8 l/s	
Sanitary accommodation	6 l/s	6 l/s	

**Table 5.1b Whole dwelling ventilation rates**

	Number of bedrooms in dwelling				
	1	2	3	4	5
Whole dwelling ventilation rate <sup>a, b</sup> (l/s)	13	17	21	25	29

**Notes:**

- In addition, the minimum ventilation rate should be not less than 0.3 l/s per  $\text{m}^2$  of internal floor area. (This includes all floors, e.g. for a two-storey building add the ground and first floor areas.)
- This is based on two occupants in the main bedroom and a single occupant in all other bedrooms. This should be used as the default value. If a greater level of occupancy is expected add 4 l/s per occupant.

## Ventilation rates

**5.4** The performance will be achieved by providing the air flow rates set out in paragraphs 5.5 to 5.7. The air flow rates specified are for the performance of the complete installation. The performance of the ventilation devices (and associated components such as ducting for fans) should be tested according to the Standards listed under 'Performance test methods' in Table 5.3. All natural and mechanical systems should be fully commissioned, and guidance is given in the *Domestic ventilation compliance guide*, available from: [www.planningportal.gov.uk/approveddocuments](http://www.planningportal.gov.uk/approveddocuments).

**5.5** **Extract ventilation** to outside is required in each kitchen, **utility room** and **bathroom** and for **sanitary accommodation**. The extract can be either intermittent or continuously operating. The intermittent rate, and for continuous systems the minimum extract air flow rates at the highest and lowest settings, should be no less than specified in Table 5.1a.

**5.6** The **whole dwelling ventilation** rate for the supply of air to the **habitable rooms** in a dwelling should be no less than specified in Table 5.1b.

**5.7** **Purge ventilation** provision is required in each **habitable room** and should be capable of extracting a minimum of four air changes per hour (ach) per room directly to outside. Normally, openable windows or doors can provide this function (see Appendix B), otherwise a mechanical extract system should be provided. In other rooms (e.g. kitchens and **bathrooms**) the mechanical or passive stack extract provisions should be sufficient, although **passive stack ventilation** will take longer to purge the room.

## Ventilation systems for dwellings without basements

**5.8** The performance required for dwellings without **basements** could be achieved by following Steps 1 and 2 below. Worked examples for each system are given in Appendix C.

**5.9** For each system, guidance is given for dwellings to cover all design **air permeabilities**. This guidance is therefore suitable for all dwellings and, for ventilation purposes, it is not necessary for the as-built permeability to be close to the design permeability.

**5.10** In addition to this guidance, for each system alternative guidance is provided for dwellings with as-built **air permeabilities** leakier than ( $>$ )  $3 \text{ m}^3/(\text{h.m}^2)$  at 50 Pa. It is recommended that this option is selected only if designing to an **air permeability** leakier than ( $>$ )  $5 \text{ m}^3/(\text{h.m}^2)$  at 50 Pa and if the person carrying out the building work has previous experience of closely matching design with as-built **air permeability** levels. If the alternative guidance is followed, and it is subsequently found that either

- the tested **air permeability** for that dwelling is tighter than or equal to ( $\leq$ )  $3 \text{ m}^3/(\text{h.m}^2)$  at 50 Pa, or
- if the dwelling is not tested, but another dwelling of the same dwelling type tested under regulation 43 is tighter than or equal to ( $\leq$ )  $3 \text{ m}^3/(\text{h.m}^2)$  at 50 Pa,

it may be necessary for the **BCB** to ask for more **air permeability** testing to be carried out to ensure all dwellings in the sample are provided with adequate ventilation.

**Step 1:** Select **one** of the following four ventilation systems (illustrated in Diagram 2a).

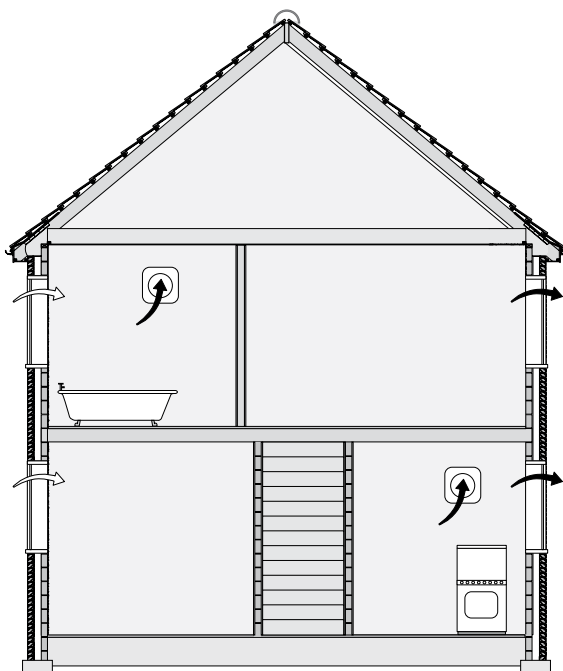
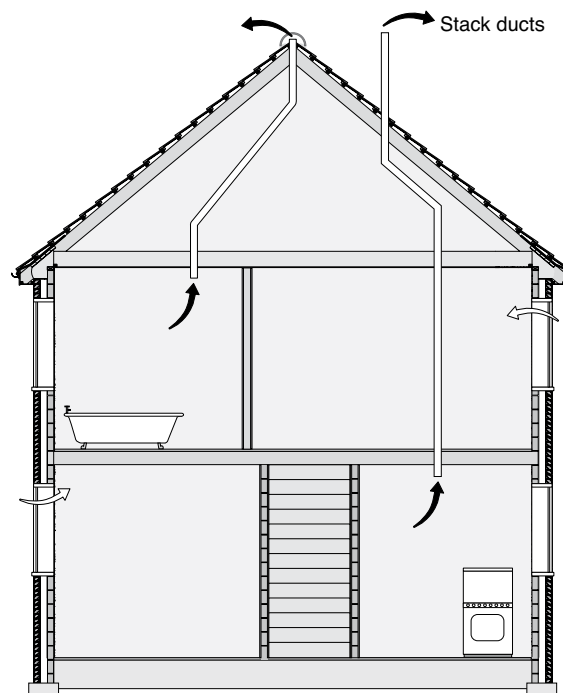
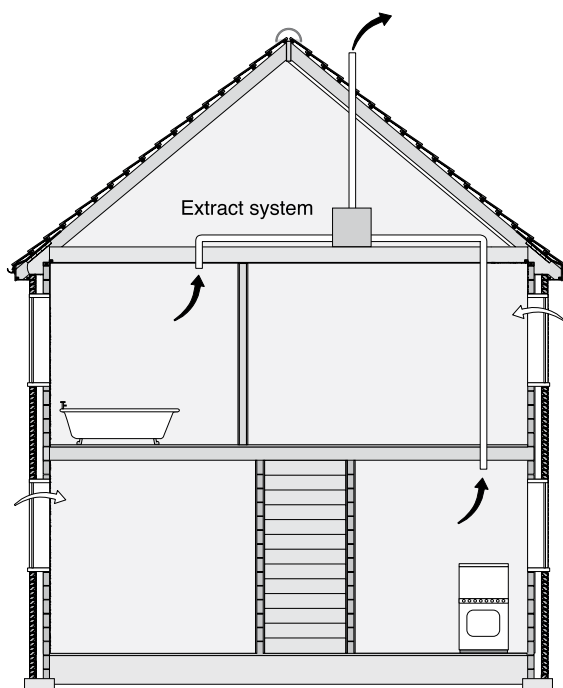
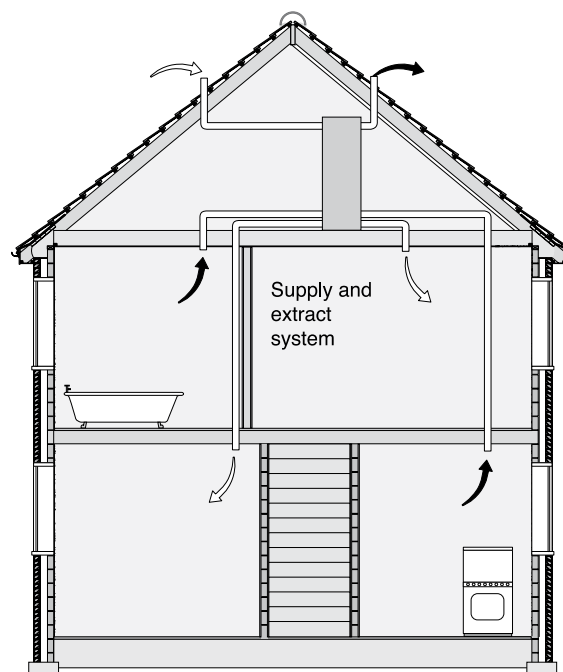
**System 1: Background ventilators and intermittent extract fans.** Guidance on minimum provisions for **extract** and **whole dwelling ventilation** is set out in Table 5.2a. Note that it includes separate guidance for dwellings with habitable rooms having only a single exposed façade.

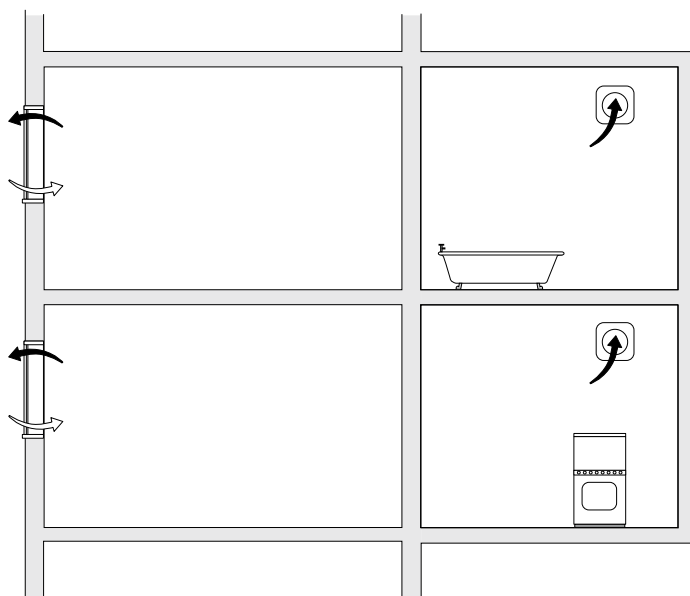
**System 2: Passive stack ventilation (PSV).** Guidance on minimum provisions for **extract** and **whole dwelling ventilation** is set out in Table 5.2b.

**System 3: Continuous mechanical extract (MEV).** Guidance on minimum provisions for **extract** and **whole dwelling ventilation** is set out in Table 5.2c.

**System 4: Continuous mechanical supply and extract with heat recovery (MVHR).** Guidance on minimum provisions for **extract** and **whole dwelling ventilation** is set out in Table 5.2d.

**Step 2:** See Table 5.3 for guidance on performance test methods for the products chosen.

Diagram 2a **Ventilation systems****Background ventilators  
and intermittent extract fans****Passive stack ventilation****Continuous mechanical extract****Continuous mechanical supply and  
extract with heat recovery**

**Diagram 2b Single-sided ventilation**

**Table 5.2a System 1 – Background ventilators and intermittent extract fans (for additional information see Table 5.3 and worked examples C1 and C5 in Appendix C)**
**Design of system 1**

The **background ventilators** have been sized for the winter period. Additional ventilation may be required during warmer months and it has been assumed that the provisions for **purge ventilation** (e.g. openable windows) could be used.

**Intermittent extract**

- Intermittent extract rates are given in Table 5.1a. For **sanitary accommodation** only, as an alternative, the **purge ventilation** provisions (windows) given in Appendix B can be used where security is not an issue.
- Instead of a conventional intermittent fan, a continuously running single room heat recovery ventilator could be used in **wet rooms**. It should use the minimum high rate given in Table 5.1a and 50% of this value as the minimum low rate. No **background ventilator** is required in the same room as the single room heat recovery ventilator. Furthermore, the total equivalent **background ventilator** area described in the tables below can be reduced by 2500 mm<sup>2</sup> for each room containing a single room heat recovery ventilator.

**Location of intermittent extract fans**

- Intermittent extract fans should be installed in each **wet room**.
- Cooker hoods should be 650 mm to 750 mm above the hob surface (or follow manufacturer instructions).
- Intermittent extract fans other than cooker hoods should be installed as high as is practical and preferably less than 400 mm below the ceiling.
- Where fans and **background ventilators** are fitted in the same room they should be a minimum of 0.5 m apart.

**Table 5.2a System 1 – Background ventilators and intermittent extract fans  
(for additional information see Table 5.3 and worked examples C1 and C5 in Appendix C)**

**Background ventilators (follow Steps 1 to 3 below)**

**Step 1:** Determine the total equivalent ventilator area – See Table A below for a dwelling with any design **air permeability**. As an alternative, the guidance in Table B below may be followed for a dwelling designed to an **air permeability** leakier than ( $>$ )  $5 \text{ m}^3/(\text{h} \cdot \text{m}^2)$  at 50 Pa which recommends less ventilation provisions, but see the cautionary advice in paragraph 5.10.

**Step 2:** Follow (i) or (ii) as appropriate depending on the number of storeys:

(i) For multi-storey dwellings, and single-storey dwellings more than four storeys above ground level:

- Use the total equivalent ventilator area from Step 1.

(ii) For single-storey dwellings up to and including the fourth storey above ground level:

- Add a further  $10000 \text{ mm}^2$  to the total equivalent ventilator area from Step 1, preferably shared between several rooms.

**Step 3:** For dwellings which have a single exposed façade, or at least 70% of the **equivalent area** is designed to be on the same façade, cross-ventilation is not possible, or is limited, and additional ventilation provisions are recommended. In this case **background ventilators** should be located at both high and low positions in the façade to provide enhanced single-sided ventilation. The total **equivalent area** as described in Steps 1 and 2 above should be provided at the high position (typically 1.7 m above floor level) for all dwelling types and all storey heights. In addition, ventilators having the same total **equivalent area** should be provided at least 1.0 m below the high ventilators as shown in Diagram 2b. Single-sided ventilation is most effective if the dwelling is designed so that the **habitable rooms** are on the exposed façade, and these rooms are no greater than 6 m in depth.

**A – Total equivalent ventilator area <sup>a</sup> ( $\text{mm}^2$ ) for a dwelling with any design air permeability.**

Total floor area ( $\text{m}^2$ )	Number of bedrooms <sup>b</sup>				
	1	2	3	4	5
$\leq 50$	35000	40000	50000	60000	65000
51–60	35000	40000	50000	60000	65000
61–70	45000	45000	50000	60000	65000
71–80	50000	50000	50000	60000	65000
81–90	55000	60000	60000	60000	65000
91–100	65000	65000	65000	65000	65000
$> 100$	Add $7000 \text{ mm}^2$ for every additional $10 \text{ m}^2$ floor area				

**B – Alternative guidance on total equivalent ventilator area <sup>a</sup> ( $\text{mm}^2$ ) for a dwelling with a designed air permeability leakier than ( $>$ )  $5 \text{ m}^3/(\text{h} \cdot \text{m}^2)$  at 50 Pa.**

Total floor area ( $\text{m}^2$ )	Number of bedrooms <sup>b</sup>				
	1	2	3	4	5
$\leq 50$	25000	35000	45000	45000	55000
51–60	25000	30000	40000	45000	55000
61–70	30000	30000	30000	45000	55000
71–80	35000	35000	35000	45000	55000
81–90	40000	40000	40000	45000	55000
91–100	45000	45000	45000	45000	55000
$> 100$	Add $5000 \text{ mm}^2$ for every additional $10 \text{ m}^2$ floor area				

**Notes:**

- The **equivalent area** of a **background ventilator** should be determined at 1 Pa pressure difference, using the appropriate test method given in Table 5.3.
- This is based on two occupants in the main bedroom and a single occupant in all other bedrooms. For a greater level of occupancy, assume a greater number of bedrooms (i.e. assume an extra bedroom per additional person). For more than five bedrooms, add an additional  $10000 \text{ mm}^2$  per bedroom.

**Table 5.2a System 1 – Background ventilators and intermittent extract fans (for additional information see Table 5.3 and worked examples C1 and C5 in Appendix C)**

## Location of background ventilators

- **Background ventilators** should be located to avoid draughts, e.g. typically 1.7 m above floor level (except in the single-sided case described above).
- **Background ventilators** should be located in all rooms with external walls, with at least 5000 mm<sup>2</sup> equivalent area in each habitable room and 2500 mm<sup>2</sup> equivalent area in each wet room. If a **habitable room** has no external walls follow the guidance in paragraphs 5.14 to 5.16. If a **wet room** has no external walls follow the guidance for **intermittent** extract given for **Purge ventilation** and **Controls** below.
- If the dwelling has more than one exposed façade, to maximise the air flow through the dwelling by encouraging cross-ventilation, it is best to locate similar equivalent areas of background ventilators on opposite (or adjacent) sides of the dwelling.

## Purge ventilation

For each **habitable room** with:

- external walls, see Appendix B for window or external door (including patio door) sizing;
- no external walls, see paragraphs 5.14 to 5.16.

There may be practical difficulties in achieving this (e.g. if unable to open a window due to excessive noise from outside).

For each **wet room** with:

- external walls, install an openable window (no minimum size);
- no external walls, the normal extract provisions will suffice, although it will take longer to purge the room.

As an alternative to the provisions given above for **habitable** and **wet rooms**, a mechanical fan extracting at 4 ach to outside could be used.

Devices used for **purge ventilation** should be manually controlled. The location of the devices is not critical for ventilation.

## Air transfer

- To ensure good transfer of air throughout the dwelling, there should be an undercut of minimum area 7600 mm<sup>2</sup> in all internal doors above the floor finish. This is equivalent to an undercut of 10 mm for a standard 760 mm width door. This should be achieved by making an undercut of 10 mm above the floor finish if the floor finish is fitted, or by a 20 mm undercut above the floorboards, or other surface, if the finish has not been fitted.

## Controls

### Intermittent extract

- May be operated manually and/or automatically by a sensor (e.g. humidity, occupancy/usage, pollutant release). Humidity controls should not be used for **sanitary accommodation** as odour is the main pollutant.
- In kitchens, any **automatic control** must provide sufficient flow during cooking with fossil fuel (e.g. gas) to avoid build-up of combustion products.
- Any **automatic control** should have a manual override to allow the occupant to turn the extract on.
- In a room with no openable window (i.e. an internal room) an **intermittent** extract fan should have a 15 minute overrun. In rooms with no natural light, the fans could be controlled by the operation of the main room light switch.

### Background ventilators

- May be either manually adjustable or automatically controlled (see paragraphs 4.18 to 4.20).

### Manual controls

Where **manual controls** are provided, they should be within reasonable reach of the occupants. It is recommended that they are located in accordance with the guidance for Requirement N3 *Safe opening and closing of windows etc.*, which is given in Approved Document N. Where reasonable, pull cords, operating rods or similar devices should be provided. Although Requirement N3 applies only to workplaces, for the purpose of this Approved Document it should also apply to dwellings.

## Noise

Fans should be quiet so as not to discourage their use by occupants.

**Table 5.2b System 2 – Passive stack ventilation (PSV) (for additional information see Table 5.3 and worked examples C2 and C6 in Appendix C)**

#### Design of system 2

The **background ventilators** have been sized for the winter period. Additional ventilation may be required during warmer months and it has been assumed that the provisions for **purge ventilation** (e.g. openable windows) could be used.

Ceiling extract grilles should have a **free area** of not less than the duct cross-sectional area (when in the fully open position if adjustable).

If a dwelling in which **PSV** is proposed is situated near a significantly taller building (i.e. more than 50% taller), it should be at least five times the difference in height away from the taller building (e.g. if the difference in height is 10 m, **PSV** should not be installed in a dwelling within 50 m of the taller building).

The roof terminal design should be as specified by the **PSV** manufacturer.

#### Size of passive stack ventilators

Room	Internal duct diameter (mm)	Internal cross-sectional area (mm <sup>2</sup> )
Kitchen	125	12000
Utility room	125	12000
Bathroom	125	12000
Sanitary accommodation*	125	12000

\*For **sanitary accommodation** only, as an alternative, the **purge ventilation** provisions (windows/doors) given in Appendix B can be used where security is not an issue.

#### Location of PSV

- For a dwelling with only a single exposed façade, the dwelling should be designed such that the **habitable rooms** are on the exposed façade so as to achieve cross-ventilation.
- PSV** extract terminals should be located in the ceiling or on a wall less than 400 mm below the ceiling.

Instead of **PSV**, an open-flued appliance may provide sufficient **extract ventilation** for the room in which it is located when in operation, and can be arranged to provide sufficient ventilation when not firing. For instance, the provisions would be adequate if: (a) the solid fuel open-flued appliance is a primary source of heating, cooking or hot water production; or (b) the open-flued appliance has a flue of **free area** at least equivalent to a 125 mm diameter duct and the appliance's combustion air inlet and dilution inlet are permanently open, i.e. there is a path with no control dampers which could block the flow, or the ventilation path can be left open when the appliance is not in use (see also paragraph 5.3).

#### Background ventilators (follow Steps 1 to 3 below)

**Step 1:** Determine the **total equivalent ventilator area** – See Table A below for a dwelling with any design **air permeability**. As an alternative, the guidance in Table B below may be followed for a dwelling with a designed **air permeability** leakier than (>) 5 m<sup>3</sup>/(h.m<sup>2</sup>) at 50 Pa which recommends less ventilation provisions, but see the cautionary advice in paragraph 5.10.

**Step 2:** Make an allowance for the total air flow through all **PSV** units. As an approximation assume each **PSV** unit provides an **equivalent area** of 3000 mm<sup>2</sup>.

**Step 3:** The actual equivalent ventilator area required for the dwelling is the value found in Steps 1 and 2.

In addition to this, the total **equivalent area** of the **background ventilators** must be at least equal to the total cross-sectional area of all the **PSV** ducts.

#### A – Total equivalent ventilator area <sup>a</sup> (mm<sup>2</sup>) for a dwelling with any design air permeability.

Total floor area (m <sup>2</sup> )	Number of bedrooms <sup>b</sup>				
	1	2	3	4	5
≤50	35000	40000	50000	60000	65000
51–60	35000	40000	50000	60000	65000
61–70	45000	45000	50000	60000	65000
71–80	50000	50000	50000	60000	65000
81–90	55000	60000	60000	60000	65000
91–100	65000	65000	65000	65000	65000
> 100	Add 7000 mm <sup>2</sup> for every additional 10 m <sup>2</sup> floor area				

**Table 5.2b System 2 – Passive stack ventilation (PSV) (for additional information see Table 5.3 and worked examples C2 and C6 in Appendix C)**

**B – Alternative guidance on total equivalent ventilator area <sup>a</sup> (mm<sup>2</sup>) for a dwelling with a designed air permeability leakier than (>) 5 m<sup>3</sup>/(h.m<sup>2</sup>) @ 50 Pa.**

Total floor area (m <sup>2</sup> )	Number of bedrooms <sup>b</sup>				
	1	2	3	4	5
≤50	25000	35000	45000	45000	55000
51–60	25000	30000	40000	45000	55000
61–70	30000	30000	30000	45000	55000
71–80	35000	35000	35000	45000	55000
81–90	40000	40000	40000	45000	55000
91–100	45000	45000	45000	45000	55000
> 100	Add 5000 mm <sup>2</sup> for every additional 10 m <sup>2</sup> floor area				

**Notes:**

- The **equivalent area** of a **background ventilator** should be determined at 1 Pa pressure difference, using the appropriate test method given in Table 5.3.
- This is based on two occupants in the main bedroom and a single occupant in all other bedrooms. For a greater level of occupancy, assume a greater number of bedrooms (i.e. assume an extra bedroom per additional person). For more than five bedrooms, add an additional 10000 mm<sup>2</sup> per bedroom.

**Location of background ventilators**

- Background ventilators** should be located in all rooms with external walls except the rooms where a **PSV** is located, but open-flued combustion appliances will still require an air supply as given in Approved Document J. There should be at least 5000 mm<sup>2</sup> equivalent area in each habitable room and 2500 mm<sup>2</sup> equivalent area in each wet room not containing a PSV.
- If a **habitable room** has no external walls, follow the guidance in paragraphs 5.14 to 5.16.
- Background ventilators should be located to avoid draughts, e.g. typically 1.7 m above floor level.
- If the dwelling has more than one exposed façade, to maximise the air flow through the dwelling by encouraging cross ventilation, it is best to locate similar equivalent areas of background ventilators on opposite (or adjacent) sides of the dwelling.

**Purge ventilation**

For each **habitable room** with:

- external walls, see Appendix B for window or external door (including patio door) sizing;
- no external walls, see paragraphs 5.14 to 5.16.

There may be practical difficulties in achieving this (e.g. if unable to open a window due to excessive noise from outside).

For each **wet room** with:

- external walls, install an openable window (no minimum size);
- no external walls – the **PSV** systems will be adequate, although it may take longer to purge the room.

As an alternative to the provisions given above for **habitable** and **wet rooms**, a mechanical fan extracting at 4 ach to outside could be used.

Devices used for **purge ventilation** should be manually controlled. The location of the devices is not critical for ventilation.

**Air transfer**

- To ensure good transfer of air throughout the dwelling, there should be an undercut of minimum area 7600 mm<sup>2</sup> in all internal doors above the floor finish. This is equivalent to an undercut of 10 mm for a standard 760 mm width door. This should be achieved by making an undercut of 10 mm above the floor finish if the floor finish is fitted, or by a 20 mm undercut above the floorboards, or other surface, if the finish has not been fitted.

**Table 5.2b System 2 – Passive stack ventilation (PSV) (for additional information see Table 5.3 and worked examples C2 and C6 in Appendix C)**

#### Controls

- Should be set up to operate without occupant intervention. May have **automatic controls** (e.g. sensors for humidity, occupancy/usage, pollutant release). Humidity controls should not be used for **sanitary accommodation** as odour is the main pollutant.
- In kitchens, any **automatic control** must provide sufficient flow during cooking with fossil fuel (e.g. gas) to avoid build-up of combustion products.
- Ensure that the system always provides the minimum **whole dwelling ventilation** rate specified in Table 5.1b in the heating season.

#### Background ventilators

- May be either manually adjustable or automatically controlled (see paragraphs 4.18 to 4.20).

#### Manual controls

Where **manual controls** are provided, they should be within reasonable reach of the occupants. It is recommended that they are located in accordance with the guidance for Requirement N3 *Safe opening and closing of windows etc.*, which is given in Approved Document N. Where reasonable, pull cords, operating rods or similar devices should be provided. Although Requirement N3 applies only to workplaces, for the purpose of this Approved Document it should also apply to dwellings.

**Table 5.2c System 3 – Continuous mechanical extract (MEV) (for additional information see Table 5.3 and worked examples C3 and C7 in Appendix C)**

#### Design of continuous mechanical extract systems

System 3 has been sized for the winter period. Additional ventilation may be required during warmer months and it has been assumed that the provisions for **purge ventilation** (e.g. openable windows) could be used.

**Step 1:** Determine the whole dwelling ventilation rate from Table 5.1b.

(Note: no allowance is made for **infiltration** as the extract system lowers the pressure in the dwelling and all air flow through **infiltration** paths does not increase the overall ventilation rate.)

**Step 2:** Calculate the whole dwelling extract ventilation rate by summing the individual room rates for 'minimum high rate' from Table 5.1a.

(For **sanitary accommodation** only, as an alternative, the **purge ventilation** provisions given in Appendix B can be used where security is not an issue. In this case the 'minimum high extract rate' for the **sanitary accommodation** should be omitted from the Step 2 calculation.)

**Step 3:** The required extract rates are as follows:

The **maximum whole dwelling extract ventilation rate** (i.e. the boost rate) should be at least the greater of Step 1 and Step 2. Note that the maximum individual room extract rates should be at least those given in Table 5.1a for minimum high rate.

The **minimum whole dwelling extract ventilation rate** should be at least the whole dwelling ventilation rate found in Step 1.

Note: This system could comprise either a central extract system or individual room fans (or a combination of both). To ensure that the system provides the intended ventilation rate, measures should be taken to minimise likely wind effects when any extract terminal is located on the prevailing windward façade. Possible solutions include ducting to another façade, use of constant volume flow rate units or, for central extract systems, follow more detailed guidance which has been prepared by the Energy Saving Trust (EST) and the Building Research Establishment (BRE) in conjunction with The Electric Heating and Ventilation Association (TEHVA) and the Residential Ventilation Association (RVA). This guidance, entitled *Performance testing of products for residential ventilation* should be read in conjunction with the appropriate parts of BS EN 13141 and is available at the SAP Appendix Q website [www.sap-appendixq.org.uk/page.jsp?id=5](http://www.sap-appendixq.org.uk/page.jsp?id=5)

Note: if a single room heat recovery ventilator (SRHRV) is used to ventilate a **habitable room**, with ventilation of the rest of the dwelling provided by **continuous** mechanical extract, the air flow rates are determined as follows:

- determine the **whole dwelling ventilation** rate from Table 5.1b;
- calculate the room supply rate required for the SRHRV from:  $(\text{Whole dwelling ventilation rate} \times \text{Room volume}) / (\text{Total volume of all habitable rooms})$ ;

Undertake Steps 1 to 3 above for sizing the continuous mechanical extract for the rest of the dwelling. However, when performing Step 1, the supply rate specified for the SRHRV should be subtracted from the value given in Table 5.1b.

#### Background ventilators

For any design air permeability, controllable **background ventilators** having a minimum **equivalent area** of 2500 mm<sup>2</sup> should be fitted in each room, except **wet rooms**, from which air is extracted. As an alternative, where the designed air permeability is leakier than (>) 5 m<sup>3</sup>/(h.m<sup>2</sup>) at 50 Pa **background ventilators** are not necessary, but see the cautionary advice in paragraph 5.10. Where this approach causes difficulties (e.g. on a noisy site) seek expert advice.

Where **background ventilators** are fitted:

- they should be located to avoid draughts, e.g. typically 1.7 m above floor level;
- fans and **background ventilators** fitted in the same room should be a minimum of 0.5 m apart;
- **background ventilators** may be either manually adjustable or automatically controlled (see paragraphs 4.18 to 4.20).

**Table 5.2c System 3 – Continuous mechanical extract (MEV) (for additional information see Table 5.3 and worked examples C3 and C7 in Appendix C)**

## Purge ventilation

For each **habitable room** with:

- external walls, see Appendix B for window or external door (including patio door) sizing;
- no external walls, see paragraphs 5.14 to 5.16.

There may be practical difficulties in achieving this (e.g. if unable to open a window due to excessive noise from outside). In such situations, seek expert advice.

For each **wet room** with:

- external walls, install an openable window (no minimum size);
- no external walls, the normal extract provisions will suffice, although it will take longer to purge the room.

As an alternative to the provisions given above for habitable and **wet rooms**, a mechanical fan extracting at 4 ach to outside could be used.

Devices used for **purge ventilation** should be manually controlled. The location of the devices is not critical for **purge ventilation**.

## Location of ventilation devices

- Extract should be from each **wet room**.
- Cooker hoods should be 650 mm to 750 mm above the hob surface (or follow manufacturer instructions).
- Mechanical extract terminals and fans should be installed as high as is practicable and preferably less than 400 mm below the ceiling.
- Where ducts etc. are provided in a dwelling with a protected stairway, precautions may be necessary to avoid the possibility of the system allowing smoke or fire to spread into the stairway. See Approved Document B.

## Air transfer

- To ensure good transfer of air throughout the dwelling, there should be an undercut of minimum area 7600 mm<sup>2</sup> in all internal doors above the floor finish. This is equivalent to an undercut of 10 mm for a standard 760 mm width door. This should be achieved by making an undercut of 10 mm above the floor finish if the floor finish is fitted, or by a 20 mm undercut above the floorboards, or other surface, if the finish has not been fitted.

## Controls

- Should be set up to operate without occupant intervention, but may have **manual** or **automatic controls** to select the boost rate. Any **manual** boost controls should be provided locally to the spaces being served, e.g. **bathrooms** and kitchen, as provision of a single centrally located switch may result in fans being left in an inappropriate mode of operation. **Automatic controls** could include sensors for humidity, occupancy/usage and pollutant release. Humidity controls should not be used for **sanitary accommodation** as odour is the main pollutant.
- In kitchens, any **automatic control** must provide sufficient flow during cooking with fossil fuel (e.g. gas) to avoid build-up of combustion products.
- Ensure that the system always provides the minimum **whole dwelling ventilation** rate specified in Table 5.1b.

Where **manual controls** are provided, they should be within reasonable reach of the occupants. It is recommended that they are located in accordance with the guidance for Requirement N3 *Safe opening and closing of windows etc.*, which is given in Approved Document N. Where reasonable, pull cords, operating rods or similar devices should be provided. Although Requirement N3 applies only to workplaces, for the purpose of this Approved Document it should also apply to dwellings.

## Noise

Any continuously running fans should be quiet so as not to discourage their use by occupants. Guidance on noise is given in paragraphs 4.35 to 4.39.

**Table 5.2d System 4 – Continuous mechanical supply and extract with heat recovery (MVHR) (for additional information see Table 5.3 and worked examples C4 and C8 in Appendix C)**

#### Design of MVHR systems

System 4 has been sized for the winter period. Additional ventilation may be required during warmer months and it has been assumed that the provisions for **purge ventilation** (e.g. openable windows) could be used.

**Step 1:** For any design **air permeability**, determine the **whole dwelling ventilation** supply rate from Table 5.1b.

As an alternative where the designed **air permeability** is intended to be leakier than ( $>$ )  $5 \text{ m}^3/(\text{h.m}^2)$  at 50 Pa, allow for infiltration for all dwelling types by subtracting from the **whole dwelling ventilation** supply rate from Table 5.1b:  $0.04 \text{ l}/(\text{s.m}^3) \times \text{gross internal volume}$  of the dwelling heated space ( $\text{m}^3$ ), but see the cautionary advice in 5.10.

**Step 2:** Calculate the whole dwelling extract ventilation rate by summing the individual room rates for 'minimum high rate' from Table 5.1a.

(For **sanitary accommodation** only, as an alternative, the **purge ventilation** provisions given in Appendix B can be used where security is not an issue. In this case the 'minimum high extract rate' for **sanitary accommodation** should be omitted from the Step 2 calculation.)

**Step 3:** The required air flow rates are as follows:

- The maximum whole dwelling extract ventilation rate (i.e. the boost rate) should be at least the greater of Step 1 and Step 2. Note that the maximum individual room extract rates should be at least those given in Table 5.1a for 'minimum high rate'.
- The minimum whole dwelling supply ventilation rate should be at least the **whole dwelling ventilation** rate found in Step 1.

#### Purge ventilation

For each **habitable room**:

- with external walls, see Appendix B for window or external door (including patio door) sizing;
- without external walls, see paragraphs 5.14 to 5.16.

There may be practical difficulties in achieving this (e.g. if unable to open a window due to excessive noise from outside). In such situations, seek expert advice.

For each **wet room**:

- with external walls, install an openable window (no minimum size);
- without external walls, the normal extract provisions will suffice, although it will take longer to purge the room.

As an alternative to the provisions given above for **habitable** and **wet rooms**, a mechanical fan extracting at 4 ach to outside could be used.

Devices used for **purge ventilation** should be manually controlled. The location of the purge devices is not critical for ventilation.

#### Location of ventilation devices

- Extract should be from each **wet room**. Air should normally be supplied to each **habitable room**. The total supply air flow should usually be distributed in proportion to the **habitable room** volumes. Recirculation by the system of moist air from the **wet rooms** to the **habitable rooms** should be avoided.
- Cooker hoods should be 650 mm to 750 mm above the hob surface (or follow the manufacturer's instructions).
- Mechanical extract terminals and fans should be installed as high as is practical and preferably less than 400 mm below the ceiling.
- Mechanical supply terminals should be located and directed to avoid draughts.
- Where ducts etc. are provided in a dwelling with a protected stairway, precautions may be necessary to avoid the possibility of the system allowing smoke or fire to spread into the stairway. See Approved Document B.
- **Background ventilators** are not required with System 4.

#### Air transfer

- To ensure good transfer of air throughout the dwelling, there should be an undercut of minimum area  $7600 \text{ mm}^2$  in all internal doors above the floor finish. This is equivalent to an undercut of 10 mm for a standard 760 mm width door. This should be achieved by making an undercut of 10 mm above the floor finish if the floor finish is fitted, or by a 20 mm undercut above the floorboards, or other surface, if the finish has not been fitted.

**Table 5.2d System 4 – Continuous mechanical supply and extract with heat recovery (MVHR) (for additional information see Table 5.3 and worked examples C4 and C8 in Appendix C)**

## Controls

- Should be set up to operate without occupant intervention, but may have **manual or automatic controls** to select the boost rate. Any **manual** boost controls should be provided locally to the spaces being served, e.g. **bathrooms** and kitchen, as provision of a single centrally located switch may result in fans being left in an inappropriate mode of operation. **Automatic controls** could include sensors for humidity, occupancy/usage and pollutant release. Humidity controls should not be used for **sanitary accommodation** as odour is the main pollutant.
- In kitchens, any **automatic control** must provide sufficient flow during cooking with fossil fuel (e.g. gas) to avoid build-up of combustion products.
- Ensure the system always provides the minimum **whole dwelling ventilation** rate specified in Table 5.1b.

Where **manual controls** are provided, they should be within reasonable reach of the occupants. It is recommended that they are located in accordance with the guidance for Requirement N3 Safe opening and closing of windows etc., which is given in Approved Document N. Where reasonable, pull cords, operating rods or similar devices should be provided. Although Requirement N3 applies only to workplaces, for the purpose of this Approved Document it should also apply to dwellings.

## Noise

All continuously running fans used should be quiet so as not to discourage their use by occupants. Guidance on noise is given in paragraphs 4.34 to 4.36.

**Table 5.3 Performance test methods**

The minimum performance requirements specified within Tables 5.2a to 5.2d should be measured using the test methods contained in relevant clauses of the following documents.

## Intermittent extract fans

- BS EN 13141-4 clause 4 *Performance testing of aerodynamic characteristics*. All sub-clauses are relevant.

## Range hoods

- BS EN 13141-3 clause 4 *Performance testing of aerodynamic characteristics*. All sub-clauses are relevant.

## Background ventilators (non-RH controlled)

- BS EN 13141-1 clause 4 *Performance testing of aerodynamic characteristics*. Only the following sub-clauses are relevant:
  - a. 4.1 *Flow rate/pressure*; and
  - b. 4.2 *Non-reverse flow ability*.

The performance requirements should normally be met for both air flow from outside to inside the dwelling and for inside to outside. To ensure that the installed performance of **background ventilators** is similar to the results achieved when they are tested to this Standard, **background ventilators** and associated components should be installed according to manufacturers' instructions. This also applies to non-RH controlled sound-attenuating **background ventilators**.

## Passive stack ventilators

For the commissioning of passive stack systems follow the guidance in the *Domestic ventilation compliance guide*, available from: [www.planningportal.gov.uk/approveddocuments](http://www.planningportal.gov.uk/approveddocuments).

## Continuous mechanical extract (MEV) systems

BS EN 13141-6 clause 4 *Performance testing of aerodynamic characteristics*. Also see Note 2 below.

## Continuous supply and extract ventilation MVHR units

BS EN 13141-7 clause 6 *Test methods*. Also see Note 2 below.

## Single room heat recovery ventilators

BS EN 13141-8 clause 6 *Test methods*. Only the following sub-clauses are relevant:

6.1 *General*; and

6.2 *Performance testing of aerodynamic characteristics* sub-clauses 6.2.1 *Leakage and mixing* and 6.2.2 *Air flow*.

For internal and external leakage and for mixing, the unit should meet at least Class U4 as given in clause 3.2 *Classification*.

**Note 1.** For all ventilation devices (e.g. extract fan, cooker hood), fitting ducting, intake/exhaust terminals, filters, etc. will impose an additional resistance to the air flow. Where appropriate this should be allowed for when specifying ventilation system components because, for example, a fan that meets the appropriate requirements when tested on its own may fail to meet the requirement when it is installed and fitted with ducting etc. In such cases, the performance of the separate components should be measured according to the relevant parts of BS EN 13141 and other relevant standards. The complete assembly, as installed, should be designed to meet the performance requirement by following good practice such as is given in the *Domestic ventilation compliance guide*, available from: [www.planningportal.gov.uk/approveddocuments](http://www.planningportal.gov.uk/approveddocuments).

**Note 2.** Detailed guidance on the tests to be undertaken has been prepared by the Energy Saving Trust (EST) and the Building Research Establishment (BRE) in conjunction with The Electric Heating and Ventilation Association (TEHVA) and the Residential Ventilation Association (RVA). This guidance, entitled *Performance testing of products for residential ventilation*, should be read in conjunction with the appropriate parts of BS EN 13141 and is available at the SAP Appendix Q website: [www.sap-appendixq.org.uk/page.jsp?id=5](http://www.sap-appendixq.org.uk/page.jsp?id=5)

## Ventilation systems for basements

**5.11** For a dwelling which includes a **basement** that is connected to the rest of the dwelling above ground by a large **permanent opening** (e.g. an open stairway), the whole dwelling including the **basement** should be ventilated in accordance with paragraph 5.8 (for dwellings without **basements**) and treated as a multi-storey dwelling. If the **basement** has only a single exposed façade, while the rest of the dwelling above ground has more than one exposed façade, ventilation systems 3 and 4 are preferred, following the guidance in paragraph 5.8. If systems 1 or 2 are to be used, seek expert advice.

**5.12** For a dwelling which includes a **basement** that is not connected to the rest of the dwelling above ground by a large **permanent opening**:

- a. the part of the dwelling above ground should be considered separately and ventilated in accordance with paragraph 5.8. If the part of the dwelling above ground has no bedrooms, assume it has one bedroom for the purpose of determining ventilation provisions; and
- b. the **basement** should be treated separately as a single-storey dwelling above ground level in accordance with paragraph 5.8. If the **basement** has no bedrooms, assume it has one bedroom for the purpose of determining ventilation provisions. The guidance on natural ventilation given in the Approved Document may not be appropriate for this situation and expert advice should be sought.

**5.13** A dwelling which comprises only a **basement** should be treated as a single-storey dwelling above ground level in accordance with paragraph 5.8. The guidance on natural ventilation given in the Approved Document may not be appropriate for this situation and expert advice should be sought.

## Ventilation of a habitable room through another room or a conservatory

**5.14** In a **habitable room** not containing openable windows (i.e. an internal room) the requirement will be met if the room is ventilated either through another **habitable room** (see paragraph 5.15) or through a conservatory (see paragraph 5.16).

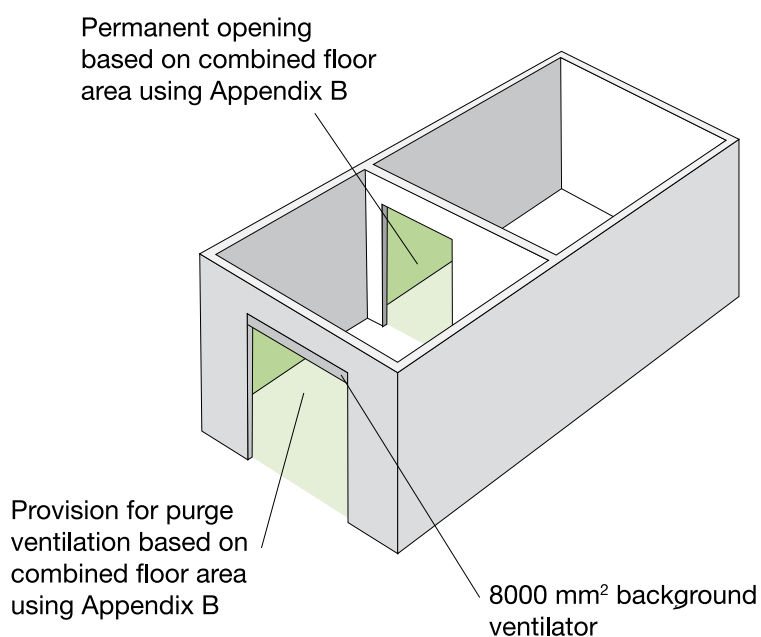
**5.15** A **habitable room** not containing openable windows may be ventilated through another **habitable room** (see Diagram 3) if:

- a. there is, from the **habitable rooms** to outside, provision for both:
  - i. **purge ventilation**, one or more **ventilation openings**, with a total area given in Diagram 3 based on at least the combined floor area of the **habitable rooms**; and
  - ii. **background ventilation** of at least 8000 mm<sup>2</sup> **equivalent area**; and
- b. there is an area of **permanent opening** between the two rooms as given in Diagram 3 based on at least the combined floor area of the **habitable rooms**.

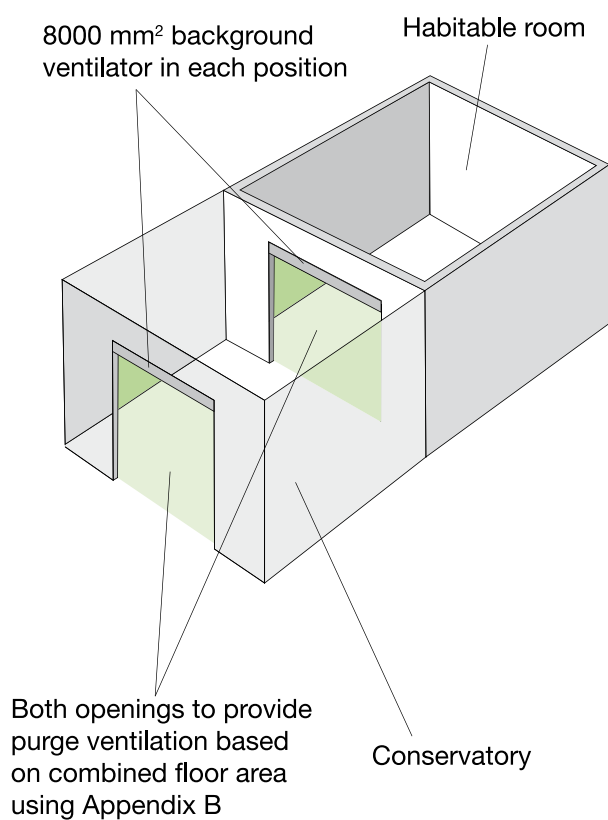
**5.16** A **habitable room** not containing openable windows may be ventilated through a conservatory (see Diagram 4) if:

- a. there is, from the conservatory to outside, provision for both:
  - i. **purge ventilation**, one or more **ventilation openings**, with a total area given in Diagram 4 based on at least the combined floor area of the **habitable room** and conservatory; and
  - ii. **background ventilation**, a **ventilation opening** (or openings) of at least 8000 mm<sup>2</sup> **equivalent area**; and
- b. there are openings (which must be **closable**) between the **habitable room** and the conservatory for:
  - i. **purge ventilation** equivalent to paragraph 5.15a(i) above; and
  - ii. **background ventilation** equivalent to paragraph 5.15a(ii) above which should be located typically at least 1.7 m above floor level and need not be within the door frame.

**Diagram 3 Two habitable rooms treated as a single room for ventilation purposes**



**Diagram 4 A habitable room ventilated through a conservatory**



# Section 6: New buildings other than dwellings

## General

**6.1** This Approved Document sets out guidance for the following range of building types and uses:

- a. offices – paragraphs 6.9 to 6.17;
- b. car parks – paragraphs 6.19 to 6.22;
- c. other building types – paragraph 6.18.

**6.2** The ventilation provisions will not necessarily meet cooling needs. Guidance on limiting solar gains in summer to control overheating is considered in Approved Document L2A *Conservation of fuel and power in new buildings other than dwellings*.

**6.3** Provision should be made to protect the fresh air supplies from contaminants injurious to health. Guidance on the siting of air inlets is provided in Appendix D.

**6.4** Guidance on design measures to avoid legionella contamination, including design features not related to the ventilation of the building, is given in the HSE document *Legionnaires' disease: the control of legionella bacteria in water systems* (see paragraphs 79 to 144). Further guidance may be found in CIBSE TM13 *Minimising the risk of Legionnaires' disease* and in BSRIA Application Guides AG19/2000, AG20/2000 and AG21/2000.

**6.5** Guidance on recirculated air in air-conditioning and mechanical ventilation systems is given in HSE document L24 *Workplace health, safety and welfare, Workplace (Health, Safety and Welfare) Regulations 1992, Approved Code of Practice and guidance* (paragraph 32).

## Access for maintenance

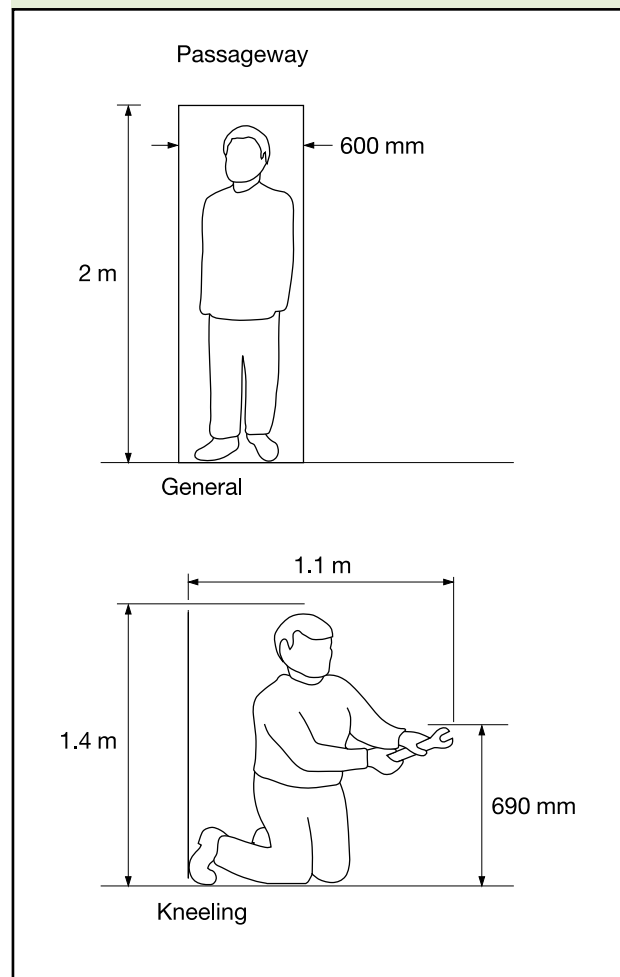
**6.6** Reasonable provision would be to include:

- a. access for the purpose of replacing filters, fans and coils; and
- b. provision of access points for cleaning duct work.

**6.7** In a central plant room adequate space should be provided as necessary for the maintenance of the plant. Where no special provision is required, the requirement could be satisfied if 600 mm space is provided where access is required between plant and 1100 mm where space for routine cleaning is required (see Diagram 5). These figures are the minimum necessary and additional space may be needed for opening of access doors, withdrawal of filters, etc. Further guidance for more complex situations can be found in Defence Works Functional Standard, Design & Maintenance Guide 08: *Space requirements for plant access operation and maintenance*. Further guidance for the cleaning of ducts is provided by CIBSE

*Ventilation hygiene toolkit and HVCA TR/19 – Guide to good practice – Internal cleanliness of ventilation systems.*

**Diagram 4 Spaces for access**



## Offices

### Introduction to provisions

**6.8** This Approved Document shows four ways of complying with the ventilation requirements of the Building Regulations:

- a. providing a ventilation system which meets the air flow rates set out in paragraphs 6.9 to 6.13; or
- b. following the system guidance set out in paragraphs 6.14 and 6.15; or
- c. using the alternative approaches set out in paragraph 6.16; or
- d. using other ventilation systems, provided it can be demonstrated to the **Building Control Body** that they satisfy the Requirement, e.g. by showing that they meet the moisture and air quality criteria set out in Appendix A.

**Table 6.1a Extract ventilation rates**

Room	Extract rate
Rooms containing printers and photocopiers in substantial use (greater than 30 minutes per hour)	Air extract rate of 20 l/s per machine during use. Note that, if the operators are in the room continuously, use the greater of the <b>extract</b> and <b>whole building ventilation</b> rates
Office sanitary accommodation and washrooms	<b>Intermittent</b> air extract rate of: 15 l/s per shower/bath 6 l/s per WC/urinal
Food and beverage preparation areas (not commercial kitchens)	<b>Intermittent</b> air extract rate of: 15 l/s with microwave and beverages only 30 l/s adjacent to the hob with cooker(s) 60 l/s elsewhere with cooker(s) All to operate while food and beverage preparation is in progress
Specialist buildings/spaces (e.g. commercial kitchens, sports centres)	See Table 6.3

**Table 6.1b Whole building ventilation rate for air supply to offices**

	Air supply rate
Total outdoor air supply rate for offices (no smoking and no significant pollutant sources)	10 l/s per person

**Table 6.2a Ventilation for offices with natural air supply – ventilation provisions**

**Extract**

Extract rates as per paragraph 6.10<sup>(1, 2)</sup>

**Whole building ventilation**

See CIBSE Application Manual AM 10: *Natural ventilation in non-domestic buildings*.

**Purge ventilation**

See CIBSE Application Manual AM 10: *Natural ventilation in non-domestic buildings*.

**Notes:**

1. **PSV** can be used as an alternative to a mechanical extract fan for office sanitary, washroom and food preparation areas.
2. When an open-flued appliance is provided in a building with mechanical extract, the spillage of flue gases could occur. The open-flued appliance needs to operate safely whether or not the fan is running, and further guidance is provided in BS 5440-1 which applies for up to 70 kW appliance input.

**Table 6.2b Ventilation for offices with natural air supply – location of ventilators in rooms**

**Extract**

- Extract ventilators should be located as high as practicable and preferably less than 400 mm below the ceiling. This will tend to remove pollutants from the breathing zone of the occupants as well as increase the effectiveness of extracting buoyant pollutants and water vapour.
- For **PSV**, extract terminals should be located in the ceiling of the room.

**Whole building ventilation**

- See CIBSE Application Manual AM 10: *Natural ventilation in non-domestic buildings*.

**Purge ventilation**

- See CIBSE Application Manual AM 10: *Natural ventilation in non-domestic buildings*.

**Ventilation rates**

**6.9** The performance will be achieved by ventilation which provides the air flow rates set out in paragraphs 6.10 to 6.13. The air flow rates specified are for the installed performance.

**6.10** Extract to outside is required in all office **sanitary accommodation**, washrooms and food and beverage preparation areas. In addition, printers and photocopiers in substantial use (greater than 30 minutes per hour) should be located in a separate room (to avoid any pollutants entering the occupied space) and extract provision installed. The extract flow rates should be no less than those specified in Table 6.1a.

**6.11** The **whole building ventilation** rate for the supply of air to the offices should be no less than that specified in Table 6.1b.

**6.12** **Purge ventilation** provision is required in each office. The total ventilation should be sufficient to reduce pollutants to an acceptable level before the space is occupied. The purged air should be taken directly to outside and should not be re-circulated to any other part of the building.

**6.13** The outdoor air supply rates in Table 6.1b for offices are based on controlling body odours with low levels of other pollutants. Where there are significant levels of other pollutants, adequate outdoor air supply can be achieved by following the calculation method provided in CIBSE Guide A.

**Natural ventilation of rooms**

**6.14** The air flow rates specified in Tables 6.1a and 6.1b can be provided by a mainly natural ventilation system by following the guidance in Tables 6.2a, 6.2b and 6.2c. A wide range of natural ventilation systems for providing **whole building ventilation** is given in CIBSE Application Manual AM 10: *Natural ventilation in non-domestic buildings*.

**Mechanical ventilation of rooms**

**6.15** The requirement will be satisfied by following:

- the air flow rates set out in paragraphs 6.9 to 6.13; and
- the location guidance in Table 6.2b for **extract ventilation**; and
- the control guidance in Table 6.2c for **extract ventilation**.

**Alternative approaches**

**6.16** As an alternative to paragraphs 6.9 to 6.13 the requirement will be satisfied by following the relevant recommendations of:

- a. CIBSE Application Manual AM 13: 2000: *Mixed mode ventilation*;
- b. CIBSE Guide A and CIBSE Guide B.

**Ventilation of other types of building**

**6.17** The requirement will be satisfied by following the appropriate design guidance for the other buildings given in Table 6.3. In addition to the guidance documents listed, it should be noted that the Workplace (Health, Safety and Welfare) Regulations 1992 apply to most places where people work. A short guide, INDG244, is available from the HSE and at: [www.hse.gov.uk/pubns/indg244.pdf](http://www.hse.gov.uk/pubns/indg244.pdf).

**Table 6.2c Ventilation for offices with natural air supply – controls for ventilators in rooms**

**Extract**

- Extract fans can be controlled either manually or automatically. For a room with no openable window (i.e. an internal room), the extract should have a 15 minute overrun.
- For **PSV**, either operated manually and/or automatically by a sensor or controller.

**Whole building ventilation**

- See CIBSE Application Manual AM 10: *Natural ventilation in non-domestic buildings*.

**Purge ventilation**

- See CIBSE Application Manual AM 10: *Natural ventilation in non-domestic buildings*.

**Accessible controls**

- Readily accessible override controls should be provided for the occupants.

**Table 6.3:** Ventilation of other buildings and spaces

Building/space/activity	Regulations and guidance (also see Section 8)
Animal husbandry	<p>The Welfare of Farm Animals (England) Regulations SI 2000 No. 1870 London: The Stationery Office 2000.</p> <p>The Welfare of Farm Animals (England) (Amendment) Regulations SI 2002 No.1646</p> <p>The Welfare of Farm Animals (England) (Amendment) Regulations SI 2003 No. 299</p> <p>BS 5502:2003 <i>Buildings and Structures for Agriculture</i></p> <p>See also CIBSE Guide B:2005, Section 2.3.24.1, and CIBSE AM10:2005 if naturally ventilated</p>
Assembly halls	CIBSE Guide B:2005, Section 2.3.3, and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode
Atria	CIBSE Guide B:2005, Section 2.3.4, and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode
Broadcasting studios	CIBSE Guide B:2005, Section 2.3.5
Building services plant rooms	Provision for emergency ventilation to control dispersal of contaminating gas releases (e.g. refrigerant leak) is given in paragraphs 23 to 25 of HSE Guidance Note 202 <i>General Ventilation in the Workplace – Guidance for Employers</i> . Other guidance is in BS 4434:1989 <i>Specification for safety aspects in the design, construction and installation of refrigeration appliances and systems</i>
Call centres	CIBSE Guide B:2005, Section 2.3.24.2 and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode
Catering (inc. commercial kitchens)	<p>HSE Catering Information Sheet No. 10, 2000: <i>Ventilation of kitchens in catering establishments</i></p> <p>HSE Information Sheet No. 11, 2000: <i>The main health and safety law applicable to catering</i></p> <p>See also CIBSE Guide B:2005, Section 2.3.6, and HVCA DW /172 <i>Specification for kitchen ventilation systems</i></p>
Cleanrooms	CIBSE Guide B:2005, Section 2.3.7
Common spaces	<p>The following provisions apply to <b>common spaces</b> where large numbers of people are expected to gather, such as shopping malls and foyers. They do not apply to <b>common spaces</b> used solely or principally for circulation.</p> <p>Either:</p> <ol style="list-style-type: none"> <li>natural ventilation by appropriately located <b>ventilation opening(s)</b> with a total opening area of at least 1/50th of the floor area of the <b>common space</b>; or</li> <li>mechanical ventilation installed to provide a supply of fresh air of 1 l/s per m<sup>2</sup> of floor area</li> </ol>
Communal residential buildings	<p>EST, Energy Efficiency Best Practice in Housing, Good Practice Guide GPG 192: <i>Designing energy efficient multi-residential buildings</i></p> <p>See also CIBSE Guide B:2005, Section 2.3.8, and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode</p>
Computer rooms	CIBSE Guide B:2005, Section 2.3.9, and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode
Darkrooms (photographic)	CIBSE Guide B:2005, Section 2.3.24.4
Dealing rooms	CIBSE Guide B:2005, Section 2.3.24.5 and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode
Factories and warehouses	<p>Factories Act</p> <p>Health and Safety at Work etc. Act</p> <p>See also CIBSE Guide B:2005, Section 2.3.11, and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode. Requirements are often exceeded by other criteria such as the ventilation requirements of the particular manufacturing process</p>
High-rise (non-domestic buildings)	CIBSE Guide B:2005, Section 2.3.12, and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode
Horticulture	CIBSE Guide B:2005, Section 2.3.24.6, and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode

**Table 6.3: Ventilation of other buildings and spaces**

Building/space/activity	Regulations and guidance (also see Section 8)
Hospitals and healthcare buildings	NHS Activity database Health Technical Memorandum (HTM) 03 Health Building Notes (HBN) – various CIBSE Guide B:2005, Section 2.3.13, and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode
Hotels	CIBSE Guide B:2005, Section 2.3.14, and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode
Industrial ventilation	<i>Industrial ventilation</i> , 24th Edition, <i>Manual of recommended practice</i> , American Conference of Government Industrial Hygienists HS(G) 37 <i>An introduction to local exhaust ventilation</i> HS(G) 54 <i>Maintenance, examination and testing of local exhaust ventilation</i> HS(G) 193 <i>COSHH essentials</i>
Laboratories	CIBSE Guide B:2005, Section 2.3.16
Museums, libraries and art galleries	BS 5454:2000 CIBSE Guide B:2005, Section 2.3.17, and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode
Plant rooms	CIBSE Guide B:2005, Section 2.3.18
Prison cells	Refer to National Offender Management Service (NOMS). Home Office, NOMS Property, Technical Services, Room 401, Abell House, John Islip St., London SW1P 4LH
Sanitary accommodation	Same as for offices in Table 6.1a
Schools and educational buildings	Ventilation provisions in schools can be made in accordance with the guidance in Building Bulletin 101, <i>Ventilation of School Buildings</i> (see <a href="http://www.teachernet.gov.uk/iaq">www.teachernet.gov.uk/iaq</a> ) and in the Education (School Premises) Regulations. Building Bulletin 101 can also be used as a guide to the ventilation required in other educational buildings such as further education establishments where the accommodation is similar to that found in schools, e.g. sixth form accommodation. However, the standards may not be appropriate for particular areas where more hazardous activities take place than are normally found in schools, e.g. some practical and vocational activities requiring containment or fume extraction.  The Building Bulletin can also be used for children's centres and other early years settings, including day nurseries, playgroups, etc.
Shops and retail premises	CIBSE Guide B:2005, Section 2.3.20, and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode
Sports centres (inc. swimming pools)	CIBSE Guide B:2005, Section 2.3.21
Standards rooms	CIBSE Guide B:2005, Section 2.3.24.7
Transportation buildings and facilities	CIBSE Guide B:2005, Section 2.3.23 and CIBSE AM10:2005 if naturally ventilated or CIBSE AM13:2000 if mixed mode

## Ventilation of car parks

**6.18** The requirement will be satisfied for car parks below ground level, for enclosed-type car parks and for multi-storey car parks if the mean predicted pollutant levels are calculated, the ventilation rate is designed and equipment is installed to limit the carbon monoxide to:

- a. an average concentration of not more than 30 parts per million over an eight hour period; and
- b. peak concentrations, such as by ramps and exits, of not more than 90 parts per million for periods not exceeding 15 minutes.

**6.19** Note that Approved Document B also includes provisions for the ventilation of car parks for the purpose of fire risk management.

## Alternative approaches for ventilation of car parks

**6.20** As an alternative to paragraph 6.18, the following guidance would satisfy the requirement:

- a. **Naturally ventilated car parks.** The provision of well-distributed permanent natural ventilation, e.g. openings at each car parking level with an aggregate **equivalent area** equal to at least 1/20th of the floor area at that level, of which at least 25% should be on each of two opposing walls.
- b. **Mechanically ventilated car parks**
  - i. either the provision of both permanent natural **ventilation openings** of **equivalent area** not less than 1/40th of the floor area and a mechanical ventilation system capable of at least three air changes per hour (ach); or  
for basement car parks, the provision of a mechanical ventilation system capable of at least six air changes per hour (ach).

And:

- ii. for exits and ramps, where cars queue inside the building with engines running, provisions should be made to ensure a local ventilation rate of at least 10 air changes per hour (ach).

**6.21** Further guidance can be found in *Code of practice for ground floor, multi-storey and underground car parks* published by the Association for Petroleum and Explosives Administration ([www.apea.org.uk](http://www.apea.org.uk)); CIBSE Guide B:2005, Section 2.3.23.3; and Health and Safety Publication EH40: *Occupational exposure limits for limiting concentration of exhaust pollutants*. Fire safety issues are considered in Approved Document B.

# Section 7: Work on existing buildings

## General

**7.1** When building work is carried out on an existing building, the work should comply with the applicable requirements of Schedule 1 to the Building Regulations, and the rest of the building should not be made less satisfactory in relation to the requirements than before the work was carried out (see regulations 3 and 4 of the Building Regulations). Further, when a building undergoes a material change of use, as defined in regulation 5 of the Building Regulations (see paragraph 3.17 above), Part F applies to the building or that part of the building which has been subject to the change of use, in accordance with regulation 6. Therefore, the guidance in other sections of this Approved Document may be applicable.

**7.2** Windows are a controlled fitting. Regulation 4(1) of the Building Regulations requires that, when windows in an existing building are replaced, the replacement work should comply with the applicable requirements of Schedule 1, i.e. Parts L and N. In addition, the building work once completed should not have a worse level of compliance with other applicable requirements of Schedule 1 than before commencement of the work. Other applicable requirements of Schedule 1 may include Parts B, F and J.

**7.3** Where the original windows were fitted with trickle ventilators the replacement windows should include them and they should be sized as set out in paragraph 7.6.

**7.4** Where the original windows were not fitted with trickle ventilators and the room is not ventilated adequately by other installed provisions, it would be good practice to fit trickle ventilators (or an equivalent means of ventilation) to help with control of condensation and improve indoor air quality. Ventilation devices should be fitted with accessible controls.

See *A guide to trickle ventilators* at [www.ggf.org.uk](http://www.ggf.org.uk)

**7.5** When windows are replaced as part of the work connected with a material change of use, Sections 5 and 6 of this Approved Document apply.

**7.6** In all cases where trickle ventilators (or an equivalent means of ventilation) are to be fitted, the new **ventilation opening** should not be smaller than was originally provided, and it should be controllable. Where there was no **ventilation opening**, or where the size of the original **ventilation opening** is not known, the following minimum sizes should be adopted.

Dwellings:

- **habitable rooms** – 5000 mm<sup>2</sup> **equivalent area**
- kitchen, **utility room** and **bathroom** (with or without WC) – 2500 mm<sup>2</sup> **equivalent area**.

Buildings other than dwellings:

- **occupiable rooms:** for floor areas up to 10 m<sup>2</sup> – 2500 mm<sup>2</sup> **equivalent area**; greater than 10 m<sup>2</sup> – at the rate of 250 mm<sup>2</sup> **equivalent area** per m<sup>2</sup> of floor area
- kitchens (domestic type) – 2500 mm<sup>2</sup> **equivalent area**
- **bathrooms** and shower rooms – 2500 mm<sup>2</sup> **equivalent area** per bath or shower
- **sanitary accommodation** (and/or washing facilities) – 2500 mm<sup>2</sup> **equivalent area** per WC.

## Addition of a habitable room (not including a conservatory) to an existing dwelling

**7.7** The requirements will be met by following the guidance in paragraphs 7.8 to 7.10.

**7.8** The general ventilation rate for the additional room and, if necessary, adjoining rooms could be achieved by one of the following options.

- Background ventilators** could be used as follows:
  - if the additional room is connected to an existing **habitable room** which now has no windows opening to outside, the guidance in paragraph 5.15 should be followed; or
  - if the additional room is connected to an existing **habitable room** which still has windows opening to outside but with a total **background ventilator equivalent area** less than 5000 mm<sup>2</sup>, the guidance in paragraph 5.15 should be followed; or
  - if the additional room is connected to an existing **habitable room** which still has windows opening to outside and with a total **background ventilator equivalent area** of at least 5000 mm<sup>2</sup>, there should be **background ventilators** of at least 8000 mm<sup>2</sup> **equivalent area** between the two rooms and **background ventilators** of at least 8000 mm<sup>2</sup> **equivalent area** between the additional room and outside.
- A single room heat recovery ventilator could be used to ventilate the additional **habitable room**. The supply rate to that room should be determined as follows. First, determine the **whole building ventilation** rate from Table 5.1b. Second, calculate the room supply rate required from:

$$\frac{(\text{Whole building ventilation rate} \times \text{Room volume})}{(\text{Total volume of all habitable rooms})}$$

**7.9** For **purge ventilation**, follow the guidance given in Table 5.2a.

**7.10** Guidance on location and controls is also given in Table 5.2a and guidance on performance testing standards is given in Table 5.3.

### **Addition of a wet room to an existing dwelling**

**7.11** The requirements for the additional **wet room** will be met by following the guidance in paragraphs 7.12 to 7.15.

**7.12** **Whole building** and **extract ventilation** can be provided by:

- a. intermittent extract, as given in Table 5.2a, and a **background ventilator** of at least 2500 mm<sup>2</sup> **equivalent area**; or
- b. single room heat recovery ventilator, as given in Table 5.2a; or
- c. **passive stack ventilator**, as given in Table 5.2b; or
- d. continuous extract fan, as given in Table 5.2c.

**7.13** To ensure good transfer of air throughout the dwelling, there should be an undercut of minimum area 7600 mm<sup>2</sup> in the internal door between the **wet room** and the existing dwelling. This is equivalent to an undercut of 10 mm for a standard 760 mm width door. This should be achieved by making an undercut of 10 mm above the floor finish if the floor finish is fitted, or by a 20 mm undercut above the floorboards, or other surface, if the finish has not been fitted.

**7.14** For **purge ventilation**, follow the guidance for the appropriate system given in Tables 5.2a to 5.2c.

**7.15** Guidance on location and controls is given in Tables 5.2a to 5.2c and guidance on performance standards is given in Table 5.3.

### **Addition of a conservatory to an existing building**

**7.16** The guidance applies to conservatories with a floor area over 30 m<sup>2</sup>.

**7.17** The requirements will be met by following the guidance in paragraphs 7.18 to 7.20.

**7.18** The general ventilation rate for the conservatory and, if necessary, adjoining rooms could be achieved by the use of **background ventilators**. Follow the guidance in paragraph 5.16 whatever the ventilation provisions in the existing room adjacent to the conservatory.

**7.19** For **purge ventilation**, follow the guidance given in Table 5.2a.

**7.20** Guidance on location and controls is also given in Tables 5.2a and guidance on performance standards is given in Table 5.3.

### **Refurbishing a kitchen or bathroom in an existing dwelling**

**7.21** If any of the work being carried out in the kitchen or **bathroom** of an existing building is 'building work', as defined in regulation 3 of the Building Regulations, the Regulations require that you comply with the appropriate requirements of the Regulations, and in doing so you do not make compliance with other requirements of the Regulations, including ventilation, worse than before. The Regulations also require that before you start work, the work is notified to a **BCB**, except in certain circumstances. (See paragraphs 3.4 to 3.10 inclusive above for details of notification requirements and exemptions.)

**7.22** The definition of 'building work' in regulation 3 of the Building Regulations includes a range of building activities in existing buildings, and includes all work on controlled services. For more information see the Building Regulations 2010 at: [www.planningportal.gov.uk](http://www.planningportal.gov.uk).

**7.23** If you carry out any 'building work', and there is an existing extract fan or passive stack ventilator (or cooker hood extracting to outside in the kitchen), you should retain or replace it. However, if there is no existing ventilation system you need not provide one. Replacing an extract fan or cooker hood with a similar type, and using the existing cabling, need not be notified to a **BCB**.

**7.24** If a combustion appliance is installed, Approved Document J: *Combustion appliances and fuel storage systems* should be consulted. It is available at: [www.planningportal.gov.uk/approveddocuments](http://www.planningportal.gov.uk/approveddocuments).

# Section 8: Standards and other publications

## Standards

**BS EN 378-3:2008** *Refrigerating systems and heat pumps. Safety and environmental requirements. Installation site and personal protection.*

**BSI PD CR 1752:1999** *Ventilation for buildings – design criteria for the indoor environment.*

**BS 5502:2003** *Buildings and structures for agriculture. Various relevant parts including: Part 33:1991 Guide to the control of odour pollution, AMD 10014 1998. Part 52:1991 Code of practice for design of alarm systems, emergency ventilation and smoke ventilation for livestock housing, AMD 10014 1998.*

**BS 5454:2000** *Recommendations for the storage and exhibition of archival documents.*

**BS 5925:1991** *Code of practice for ventilation principles and designing for natural ventilation. AMD 8930 1995.*

**BS 7913:1998** *Principles of the conservation of historic buildings.*

**BS EN 13141-1:2004** *Ventilation for buildings. Performance testing of components/products for residential ventilation. Externally and internally mounted air transfer devices.*

**BS EN 13141-3:2004** *Ventilation for buildings. Performance testing of components/products for residential ventilation. Range hoods for residential use.*

**BS EN 13141-4:2004** *Ventilation for buildings. Performance testing of components/products for residential ventilation. Fans used in residential ventilation systems.*

**BS EN 13141-6:2004** *Ventilation for buildings. Performance testing of components/products for residential ventilation. Exhaust ventilation system packages used in a single dwelling.*

**BS EN 13141-7:2004** *Ventilation for buildings. Performance testing of components/products for residential ventilation. Performance testing of a mechanical supply and exhaust ventilation units (including heat recovery) for mechanical ventilation systems intended for single family dwellings.*

**BS EN 13141-8:2006** *Ventilation for buildings. Performance testing of components/products for residential ventilation. Performance testing of unducted mechanical supply and exhaust ventilation units [including heat recovery] for mechanical ventilation systems intended for a single room.*

**BS EN 13986:2004** *Wood-based panels for use in construction. Characteristics, evaluation of conformity and marking.*

## Other publications

### American Conference of Government Industrial Hygienists (ACGIH)

Industrial ventilation 26th Edition, *Manual of recommended practice.*

Available from: [www.acgih.org/store](http://www.acgih.org/store)

### BRE

BRE Digest 464, Part 1: *VOC emissions from building products. Sources, testing and emission data*, 2002. ISBN 978 1 86081 546 1.

BRE Digest 464, Part 2: *VOC emissions from building products. Control, evaluation and labelling schemes*, 2002. ISBN 978 1 86081 547 8.

### BSRIA

Ventilation hygiene toolkit:

BSRIA Facilities Management Specification 1 *Guidance to the standard specification for ventilation hygiene*, 2002. ISBN 978 0 86022 454 9.

### Chartered Institution of Building Services Engineers (CIBSE)

Applications Manual AM10: *Natural ventilation in non-domestic buildings*, 2005. ISBN 978 1 80328 756 0.

Applications Manual AM13: *Mixed mode ventilation*, 2000. ISBN 978 1 90328 701 4.

CIBSE Guide A: *Environmental design*, 2006. ISBN 978 1 90328 766 8.

CIBSE Guide B: *Heating, ventilating, air conditioning and refrigeration*, 2005. ISBN 978 1 90328 758 3.

TM13: *Minimising the risk of Legionnaires' disease*, 2002. ISBN 978 1 90328 723 1.

CIBSE Commissioning Codes, available from: [www.cibse.org/index.cfm?go=publications.view&item=266](http://www.cibse.org/index.cfm?go=publications.view&item=266).

CIBSE TM26 *Hygienic maintenance of office ventilation ductwork*, 2000. ISBN 978 1 90328 711 8.

### Defence Estates

Defence Works Functional Standard, Design and Maintenance Guide 08: *Space requirements for plant access operation and maintenance*, 1996. ISBN 978 1 11772 785 4. Available from: [www.defence-estates.mod.uk/publications/dmg/dmg\\_08.pdf](http://www.defence-estates.mod.uk/publications/dmg/dmg_08.pdf)

### Department for Children, Schools and Families (DCSF);

Building Bulletin 101, *Ventilation of school buildings*, 2006. ISBN 978 0 11271 164 3. See: [www.teachernet.gov.uk/iaq](http://www.teachernet.gov.uk/iaq)

**Department of Health Estates and Facilities Division**

HTM 03; Part A – *Ventilation in healthcare premises: Design and validation*, 2007.

HTM 03; Part B – *Ventilation in healthcare premises: Verification and operational Management*, 2007.

HBN (various).

**Energy Saving Trust**

Good Practice Guide 192. *Designing energy efficient multi-residential buildings*, 1997.  
Available from: [www.est.org.uk/bestpractice/index.cfm](http://www.est.org.uk/bestpractice/index.cfm) (archived).

**Health and Safety Executive (HSE)**

HSE Catering Information Sheet No 10, *Ventilation of kitchens in catering establishments*, 2007. Available from: [www.hsebooks.com](http://www.hsebooks.com).

HSE Catering Information Sheet No 11, *The main health and safety law applicable to catering*, 2000. Available from: [www.hsebooks.com](http://www.hsebooks.com).

HSG 258 *Controlling airborne contaminants at work. A guide to local exhaust ventilation (LEV)*, 2008. ISBN 978 0 71766 298 2.

HSG 193. *COSHH Essentials*. Accessed on: [www.coshh-essentials.org.uk](http://www.coshh-essentials.org.uk)

HSG 202 *General ventilation in the workplace – Guidance for employers*, 2000.  
ISBN 978 0 71761 793 7.

L8 *Legionnaires Disease: The control of legionella bacteria in water systems*. Approved code of practice and guidance, 2000.  
ISBN 978 0 71761 772 2.

L24 Workplace (Health, Safety and Welfare) Regulations 1992. *Approved Code of Practice and guidance*, 2001. ISBN 978 0 71760 413 5.

**HVCA**

HVCA DW/144 *Specification for sheet metal ductwork – low, medium and high pressure/air systems*, 1998. ISBN 978 0 90378 327 9.

HVCA DW/154 *Specification of plastics ductwork*, 2000. ISBN: 0 90378 331 2.

HVCA DW/143 *A practical guide to ductwork leakage testing*, 2000. ISBN: 978 0 90378 330 9.

HVCA DW/172 *Specification for kitchen ventilation systems*, 2005  
ISBN 978 0 90378 329 3.

HVCA TR/19 *Guide to good practice. Internal cleanliness of ventilation systems*, 2005.  
ISBN 978 0 90378 335 4.

**Legislation**

Factories Act 1961, Chapter 34.

Welfare of Farm Animals (England) Regulations 2000, SI 2000/1870.

Welfare of Farm Animals (England) (Amendment) Regulations 2002, SI 2002/1646.

Welfare of Farm Animals (England) (Amendment) Regulations 2003, SI 2003/299.

**Department for Communities and Local Government**

Planning Policy Statement (PPS) 15: *Planning and the historic environment*; DoE, 1994.  
Paragraphs 6.1 to 6.40 have been superseded by Circular 01/2007, *Revisions to principles of selection for listing buildings*. Both available at: [www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/historicenvironment/ppg15](http://www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/historicenvironment/ppg15).

Review of health and safety risk drivers (BD 2518). Available at: [www.communities.gov.uk/documents/planningandbuilding/pdf/reviewhealthsafety.pdf](http://www.communities.gov.uk/documents/planningandbuilding/pdf/reviewhealthsafety.pdf).

# Appendix A: Performance-based ventilation

## Introduction

As specified in the section on Performance, this Approved Document recommends ventilation provisions to control both moisture and pollutants in buildings. In order to do this, acceptable levels of moisture and other pollutants need to be defined. This Appendix sets out the levels of moisture and other pollutants that the provisions in this Approved Document are designed to control.

Note that the guidance within this Approved Document may not be adequate to address pollutants from flueless combustion space heaters or from occasional, occupant-controlled events such as painting, smoking, cleaning or other high-polluting events. It does not address the airborne spread of infection or contamination from outdoor sources. While many of these considerations could be important factors in achieving acceptable indoor air quality, solutions are not ready for inclusion in this guidance, and indeed indoor air quality may be better controlled at source (e.g. avoidance, isolation or use of lower emitting products).

## Performance criteria for dwellings

The performance criterion for moisture is as follows:

- There should be no visible mould on external walls in a properly heated dwelling with typical moisture generation.

The principal performance criteria used for other indoor air pollutants are as follows.

Exposure to the following levels of nitrogen dioxide (NO<sub>2</sub>) should not be exceeded:

- 288 µg/m<sup>3</sup> (150 ppb) – 1 hour average (DOH, 2004)
- 40 µg/m<sup>3</sup> (20 ppb) – long-term average (DOH, 2004).

Exposure to the following levels of carbon monoxide should not be exceeded:

- 100 mg/m<sup>3</sup> (90 ppm) – 15 minute averaging time (DOH, 2004)
- 60 mg/m<sup>3</sup> (50 ppm) – 30 minute averaging time (DOH, 2004)
- 30 mg/m<sup>3</sup> (25 ppm) – 1 hour averaging time (DOH, 2004)
- 10 mg/m<sup>3</sup> (10 ppm) – 8 hours averaging time (DOH, 2004).

Exposure to total volatile organic compound (TVOC) levels should not exceed 300 µg/m<sup>3</sup> averaged over 8 hours (ECA, 1992).

Control of bio-effluents (body odours) for adapted individuals (reduction in perception due to being exposed to the environment for a period of time) will be achieved by an air supply rate of 3.5 l/s/person (ASHRAE, 2003).

Mould growth can occur whether the dwelling is occupied or unoccupied, so the performance criteria for moisture (as set out in Table A2) should be met at all times, regardless of occupancy. The other pollutants listed above are harmful to the occupants only when the dwelling is occupied.

## Assumptions used in applying performance criteria for dwellings in Section 5

### General

- For the default option in which the design **air permeability** can be any value, dwellings with ventilation System 1 or 2 are assumed to have an **infiltration** of 0.05 ach (air changes per hour); and dwellings with ventilation System 3 or 4 are assumed to have no **infiltration**.
- For the alternative option in which the design **air permeability** is >5 m<sup>3</sup>/(h.m<sup>2</sup>) at 50 Pa, dwellings with ventilation System 1, 2 or 4 are assumed to have an **infiltration** of 0.15 ach, and dwellings with ventilation System 3 are assumed to have negligible **infiltration**, as discussed in Table 5.2c.
- The ventilation effectiveness is 1.0.
- For the purpose of this Approved Document, for all dwellings (new, and existing where Part F applies), the moisture criterion is likely to be met if the moving average **surface water activity** of the internal surfaces of external walls is always less than the value noted in Table A1 during the heating season, evaluated over each of the stated averaging periods. Table A1 is the primary basis for demonstrating compliance with the moisture criterion.

**Table A1 Surface water activity**

Moving average period	Surface water activity
1 month	0.75
1 week	0.85
1 day	0.95

As a guide, for new dwellings, for the purpose of this Approved Document, the moisture criteria in Table A1 are likely to be met if the moving average relative humidity (RH) in a room is always less than the value given in Table A2 during the heating season, evaluated over each of the stated averaging periods.

**Table A2 Indoor air relative humidity**

Moving average period	Room air relative humidity
1 month	65%
1 week	75%
1 day	85%

The performance criterion for moisture (given above) is the same as that used in the 2006 edition of Approved Document F. However, research carried out since 2006 (Altamirano-Medina et al, 2009) has indicated that the values of relative humidity needed to satisfy the criterion could be expressed in a different and more practical way as shown in Table A2. These RH values may, in general, be slightly less onerous than those used in the 2006 edition. This may not be true in all cases and so the ventilation rates necessary to satisfy the criterion have not been changed.

## Extract ventilation

- The principal pollutant to be removed by **extract ventilation** is moisture. The source rates were taken from BS 5250:2002 Table B.1.
- For intermittent extract:
  - Historically, a ventilation rate of 60 l/s has been specified in the kitchen for the removal of moisture and there is no strong justification to amend it. The ventilation rate removes moisture generated at a production rate of 2000 g/h. A reduced ventilation rate of 30 l/s is used for a cooker hood, owing to the greater ventilation effectiveness.
  - Historically, a ventilation rate of 15 l/s has been specified in the **bathroom** for the removal of moisture and there is no strong justification to amend it. The ventilation rate removes moisture generated at a production rate of 400 g/h.
  - In the **utility room**, it is assumed that the ventilation rate required is 50% of that in the kitchen.
  - In WCs, the main pollutant is odour. Historically, a ventilation rate of 6 l/s has been specified and there is no strong justification to amend it.

- For continuous extract:
  - No reason has been found to change the extract rates, so the rates used in Table 5.1a are the same as used in the 2006 edition of AD F.

## Whole dwelling ventilation

- The principal pollutant to be removed by **whole dwelling ventilation** is moisture. The source rates were taken from BS 5250:2002 Table B.1.
- It was assumed that local extract removes 100% of the moisture generated in the **bathroom** and 50% of the moisture generated in the kitchen.
- The rates given in Table 5.1b are the same as in the 2006 edition.
- The calculations were based on winter weather conditions. During warmer spring and autumn periods, the moisture removal capacity of the outdoor air will be less (i.e. the outdoor air on being heated to the internal temperature within the dwelling will have a higher relative humidity in the spring and autumn periods) and additional ventilation may be required. The provisions for **purge ventilation** (e.g. windows) may be used for this purpose.
- There are other pollutants which must also be adequately controlled. These are particularly important in homes of low occupant density where moisture production is low for the size of the property. Levels of volatile organic compounds were monitored in a BRE study of UK homes (Dimitroulopoulou et al, 2005). From these data, the total source production rate of volatile organic compounds was determined to be 300 µg/h per m<sup>2</sup> of floor area. To meet the performance criterion of 300 µg/m<sup>3</sup>, it requires a minimum **whole dwelling ventilation** rate of 0.3 l/s per m<sup>2</sup> of internal floor area.

## Purge ventilation

- A value of 4 ach has been selected as:
  - it provides a **purge ventilation** rate an order of magnitude above **whole building ventilation**;
  - it is similar to the ventilation rate provided by windows in the 1995 edition of Approved Document F. The calculation assumes single-sided ventilation for a dwelling in an urban environment and an internal/external temperature difference of 3°C.

### Basis of Table 5.2 – Whole dwelling ventilation rates

- In determining the ventilation rates, the air supply rates in Table 5.1b have been used.
- For dwellings having an **air permeability** of  $> 5 \text{ m}^3/(\text{h} \cdot \text{m}^2)$  at 50 Pa, the air supply rate has been reduced by 0.15 ach to allow for **infiltration**.
- To determine the **equivalent areas**, the standard air flow equation has been used as below:

$$A = 1000 \cdot (Q/C_d) \cdot (\rho/2 \cdot \Delta P)^{0.5}$$

Where:

A = the **background ventilator equivalent area** ( $\text{mm}^2$ )

Q = the air supply rate ( $\text{l/s}$ )

$C_d$  = the discharge coefficient, taken as 0.61

$\rho$  = the air density ( $\text{kg/m}^3$ ), taken as 1.2

$\Delta P$  = the pressure across the vent, which has been taken as 0.6 Pa for single-storey dwellings and 1.0 Pa for multi-storey dwellings.

Note that the total actual **equivalent area** required ( $A_r$ ) is double that derived from the equation above, which provides the **equivalent area** only for air supplied to the dwelling. A similar **equivalent area** is required for air to exit the dwelling. The total **equivalent area** determined in this way is given in the guidance for Systems 1 and 2. Note that in determining these pressure differences, a meteorological wind speed of 4 m/s at 10 m height was taken (based on BS 5925:1991) and an internal/external temperature difference of 15°C.

### Performance criteria for buildings other than dwellings

The main guidance within this document has focused on offices. For this, the main criteria have been:

- A supply rate, in the absence of tobacco smoking or other excessive pollutants, of 10 l/s/person, based upon surveys which indicate that below this level the incidence of health effects becomes increasingly significant. This will also satisfy the requirement of 8 l/s/person needed to control bio-effluents for unadapted individuals.
- There should be no visible mould on external walls in a properly heated building with typical moisture generation.
- Exposure to the following levels of nitrogen dioxide ( $\text{NO}_2$ ) should not be exceeded:
  - 288  $\mu\text{g/m}^3$  (150 ppb) – 1 hour average (Department of the Environment, 1996)
  - 40  $\mu\text{g/m}^3$  (21 ppb) – annual mean (WHO, 2005).

- Exposure to the following levels of carbon monoxide should not be exceeded:
  - 100  $\text{mg/m}^3$  (90 ppm) – 15 minute averaging time (WHO, 2000)
  - 60  $\text{mg/m}^3$  (50 ppm) – 30 minute averaging time (WHO, 2000)
  - 30  $\text{mg/m}^3$  (25 ppm) – 1 hour averaging time (WHO, 2000)
  - 10  $\text{mg/m}^3$  (10 ppm) – 8 hours averaging time (Department of the Environment, 1994a).
- Exposure to the following levels of carbon monoxide for occupational exposure should not be exceeded:
  - 35  $\text{mg/m}^3$  (30 ppm) – 8 hours averaging time (HSE, 2003).
- Exposure to total volatile organic compound (TVOC) levels should not exceed 300  $\mu\text{g/m}^3$  averaged over 8 hours (ECA, 1992).
- Ozone levels should not exceed 100  $\mu\text{g/m}^3$  (Department of the Environment, 1994b).

Note that the guidance within this Approved Document may not be adequate to address pollutants from occasional, occupant-controlled events such as painting, smoking, cleaning or other high-polluting events. While these could be important factors in achieving acceptable indoor air quality, solutions are not ready for inclusion in this guidance, and indeed they may be better controlled at source (e.g. avoidance, isolation or use of lower emitting products).

Mould growth can occur whether the building is occupied or unoccupied, so the performance criteria for moisture (as set-out in Table A1) should be met at all times, regardless of occupancy. The other pollutants listed above are harmful to the occupants only when the building is occupied.

Where the Health and Safety Executive gives guidance for specific situations, it should be followed in preference to the guidance given here.

### Assumptions used in applying performance criteria for offices in Section 2

#### General

- The office has an **air permeability** of 3  $\text{m}^3/(\text{h} \cdot \text{m}^2)$  at 50 Pa.
- At this level of **air permeability**, in large buildings (low ratio of surface area to volume contained), **infiltration** can be assumed to be negligible compared with the **purpose-provided ventilation**.
- The ventilation effectiveness is 0.9 (for Table 6.1b).
- For the purposes of this Approved Document, the moisture criterion will be met if the **surface water activity** in a room does not

exceed the values given in Table A1 during the heating season.

### Extract ventilation

- Office equipment can emit pollutants including ozone and organic compounds. For example, a study by Black and Wortham (1999) suggests the following emission rates for laser printers and dry paper copiers assuming 30 minutes use in an hour:
  - 25 mg/h for TVOCs
  - 3 mg/h for ozone.

To meet the performance criteria for these pollutants requires an extract rate of 20 l/s per machine during use.

- For **sanitary accommodation**, the extract rates used for dwellings have been applied.
- For food and beverage preparation areas, the extract rates used for dwellings have been applied.

### Whole building ventilation

- A number of studies have investigated ventilation and health in offices (principally sick building syndrome). Although there is no clear threshold ventilation rate below which health suddenly worsens, a number of sources have identified 10 l/s/p as a significant level. This can probably be traced back to an analysis of experimental studies of office buildings by Mendell (1993). Hence the recommendation within the Approved Document is for 10 l/s/p for buildings with no smoking and no significant pollutant sources.
- Increasing the ventilation rate above 10 l/s/p may improve health (results unclear), but there are diminishing returns (i.e. the improvement in health per l/s/p increase in ventilation rate becomes smaller as the ventilation rate increases). This suggests that there is little advantage in increasing the **whole building ventilation** rate above 10 l/s/p. Increased ventilation has a cost in economic and environmental terms. Having set a ventilation rate of 10 l/s/p, if further improvements in indoor air quality are necessary, alternative approaches should be considered first, e.g. use of low-emission materials.

### Purge ventilation

- There are normally more options for the removal of high concentrations of pollutants from office spaces than for dwellings (e.g. leaving rooms unoccupied until acceptable pollutant levels are achieved). Hence, general guidance has been provided rather than specifying any ventilation rate(s).

## References

Altamirano-Medina H., Mumovic D., Davies M., Ridley I. and Oreszczyn T., (2009). *Guidelines to avoid mould growth in buildings*, Advanced Buildings Energy Research, 3, pp 221–236.

ASHRAE. Handbook 2007: HVAC applications.

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BS 5250:2002 *Code of practice for the control of condensation in buildings*. BSI.

BS 8233:1999 *Code of Practice: Sound insulation and noise reduction for buildings*, BSI.

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Department of Health (2004). Committee on the Medical Effects of Air Pollutants. *Guidance on the effects on health of indoor air pollutants*. [www.advisorybodies.doh.gov.uk/comeap/PDFS/guidanceindoorairqualitydec04.pdf](http://www.advisorybodies.doh.gov.uk/comeap/PDFS/guidanceindoorairqualitydec04.pdf).

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WHO (2000). *Guidelines for air quality*. World Health Organisation, Geneva.

WHO (2005). *Air quality guidelines – global update*. World Health Organization, Geneva.

# Appendix B: Purge ventilation

## Introduction

Adequate **purge ventilation** may be achieved by the use of openable windows and/or external doors. This Appendix provides details of necessary window and door sizes. The diagrams highlight the window dimensions of importance.

## Windows

- For a hinged or pivot window that opens 30° or more or for parallel sliding windows (e.g. vertical sliding sash windows), the height x width of the opening part should be at least 1/20th of the floor area of the room.
- For a hinged or pivot window that opens between 15° and 30°, the height x width of the opening part should be at least 1/10th of the floor area of the room.
- If the window opens less than 15° it is not suitable for providing **purge ventilation** and other arrangements should be made.
- If the room contains more than one openable window, the areas of all the opening parts may be added to achieve the required proportion of the floor area. The required proportion of the floor area is determined by the opening angle of the largest window in the room.
- Note that Approved Document B includes provisions for the size of escape windows. The larger of the provisions in Approved Document B or F should apply in all cases.

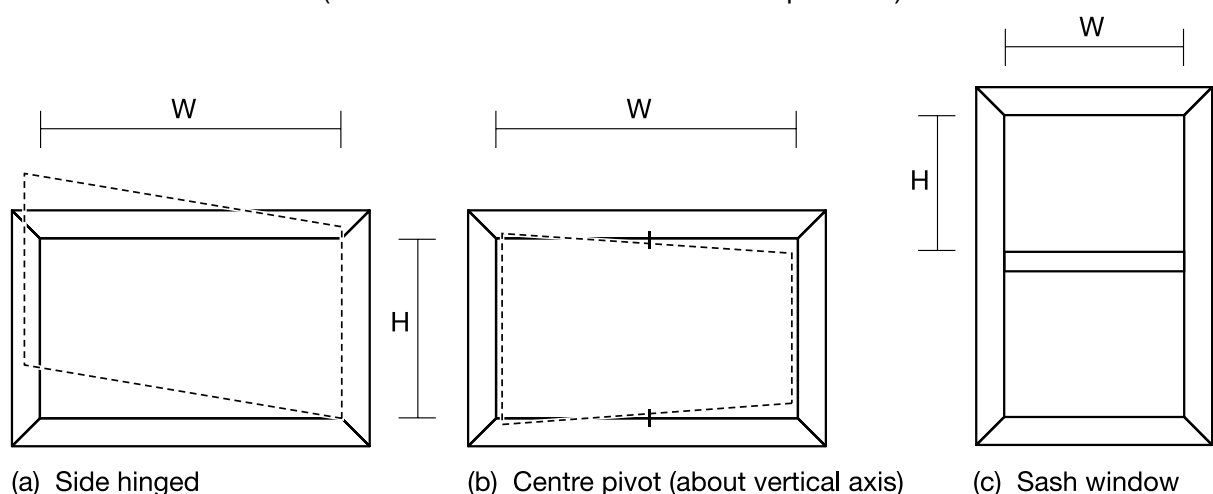
## External doors

### (including patio doors)

- For an external door, the height x width of the opening part should be at least 1/20th of the floor area of the room. If the room contains more than one external door, the areas of all the opening parts may be added to achieve at least 1/20th of the floor area of the room.
- If the room contains more than one external door, the areas of all the opening parts may be added to achieve at least 1/20th of the floor area of the room.
- If the room contains a combination of at least one external door and at least one openable window, the areas of all the opening parts may be added to achieve at least 1/20th of the floor area of the room.

### Window dimensions

Window opening area =  $H \times W$   
(H and W are the dimensions of the open area)



### Further information

The aim of this guidance is to achieve a purge ventilation rate of 4 ach.

- It provides a purge ventilation rate of an order of magnitude above the whole building ventilation rate.
- It is similar to the purge ventilation rate provided by windows historically in ADF.

The guidance contained within this Appendix is a simplification of guidance in BS5925:1991 (AMD 8930, 1995) *Code of practice for ventilation principles and designing for natural ventilation*.

This Appendix has assumed single-sided ventilation for dwellings in an urban environment (local wind speed of 2.1m/s) and a summer-time internal/external temperature difference of 3°C. It has considered and simplified variations in air flow rates caused by factors including window type and window height.

This design guidance should deliver 4 ach in most cases. Depending on the dwelling design or the external climate, it may be possible to achieve this ventilation rate through a smaller window opening area. BS5925 provides a good starting point for determining the window openings required. It may be beneficial to also seek expert advice.

# Appendix C: Example calculations for ventilation sizing for dwellings

## Introduction

This Appendix provides example calculations for each ventilation system set out in paragraph 5.10. A ground-floor flat and a semi-detached house have been considered for each system type. Thus there are eight examples as follows.

### Ground-floor flat:

Example C1 – Background ventilators and intermittent extract fans

Example C2 – Passive stack ventilation

Example C3 – Continuous mechanical extract

Example C4 – Continuous mechanical supply and extract

### Semi-detached house:

Example C5 – Background ventilators and intermittent extract fans

Example C6 – Passive stack ventilation

Example C7 – Continuous mechanical extract

Example C8 – Continuous mechanical supply and extract

It has been assumed that the intended measured **air permeability** is  $> 5 \text{ m}^3/(\text{h} \cdot \text{m}^2)$  in examples C1, C2, C5 and C6, and the design **air permeability** is  $\leq 3 \text{ m}^3/(\text{h} \cdot \text{m}^2)$  in the other examples.

## Details of ground-floor flat

### Description

The flat contains the following rooms:

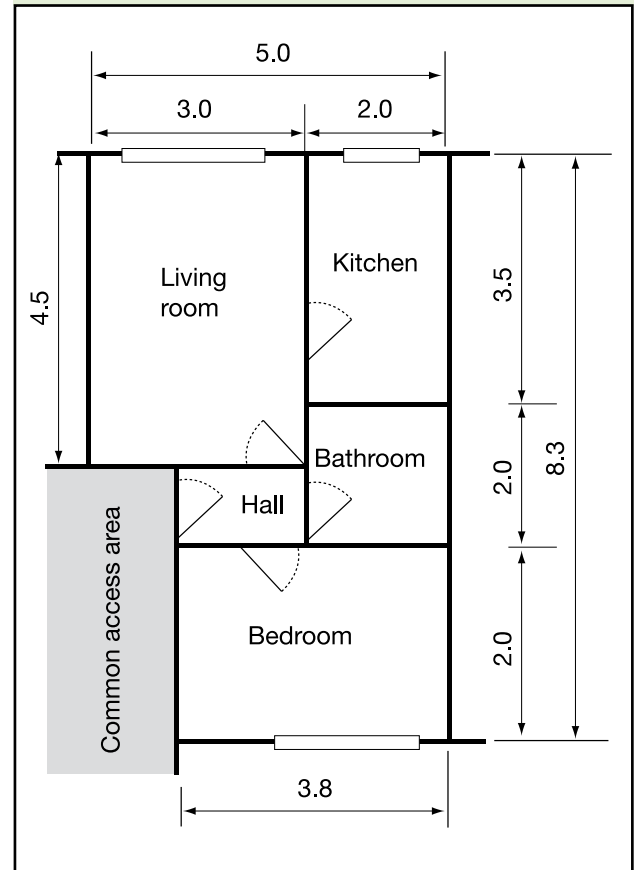
- kitchen
- combined living/dining room
- one double bedroom
- internal **bathroom** containing WC, and in addition
- all rooms have an external wall except for the **bathroom**.

The floor plan is given in Diagram C1.

### Assumptions:

- cooker hood adjacent to cooker hob
- **gross internal volume** of the heated space of  $83 \text{ m}^3$
- total floor area of  $36 \text{ m}^2$
- two-person occupancy and
- side-hinged windows 1.0 m high and openable to  $60^\circ$ .

Diagram C1 Ground floor flat plan example



### Example C1 Background ventilators and intermittent extract fans (this is based on Table 5.2a)

#### Intermittent extract

Room	Intermittent extract rate
Kitchen	30 l/s (adjacent to hob)
Bathroom	15 l/s

#### Background ventilators

- For a single-storey ground-floor dwelling of 36 m<sup>2</sup> floor area, Table 5.2a shows that the equivalent **background ventilator** area is 35000 mm<sup>2</sup> (this includes the additional 10000 mm<sup>2</sup> as we are considering a single-storey building).
- To maximise the air flow through the dwelling by encouraging cross ventilation, it is best to locate similar **equivalent areas** of **background ventilators** on opposite sides of the dwelling.

#### Purge ventilation

- Calculate the percentage window opening area (percentage of floor area) for each room having an external wall.
- Using Appendix B with an opening angle of 60° gives: 1/20th of the floor area.
- Therefore, for a living room of 13.5 m<sup>2</sup> floor area there should be a window opening area of at least 0.68 m<sup>2</sup>. This calculation should be carried out for all **habitable rooms**.

### Example C2 Passive stack ventilation (this is based on Table 5.2b)

Choose appropriate passive stack ventilation provision

Room	Internal duct diameter (mm)	Internal cross-sectional area (mm <sup>2</sup> )
Kitchen	125	12000
Bathroom	100	12000

#### Background ventilators

Calculate the total **equivalent area** of ventilators required for a dwelling as follows:

**Step 1:** for a single-storey ground-floor dwelling of 36 m<sup>2</sup> floor area, Table 5.2b shows that the equivalent **background ventilator** area is 35000 mm<sup>2</sup> (this includes the additional 10000 mm<sup>2</sup> as we are considering a single-storey building).

**Step 2:** for a **PSV** in both the kitchen and **bathroom**, an allowance of 6000 mm<sup>2</sup> can be made.

**Step 3:** 35000 – 6000 = 29000 mm<sup>2</sup>.

- In addition, the **equivalent area** must be at least the total cross-sectional area of the ducts (24000 mm<sup>2</sup>), which it is. It should be distributed with similar areas on opposite sides of the dwelling (but not in the kitchen and **bathroom**).

#### Purge ventilation

- Calculate the percentage window opening area (percentage of floor area) for each room having an external wall.
- Using Appendix B with an opening angle of 60° gives: 1/20th of the floor area.
- Therefore, for a living room of 13.5 m<sup>2</sup> floor area there should be a window opening area of at least 0.68 m<sup>2</sup>. This calculation should be carried out for all **habitable rooms**.

**Example C3 Continuous mechanical extract (this is based on Table 5.2c)****Continuous extract**

**Step 1:** *Whole dwelling ventilation* rate is 13 l/s from Table 5.1b.

**Step 2:** Whole dwelling extract ventilation rate is 21 l/s (from Table 5.1a assuming extract in kitchen and *bathroom*).

**Step 3:** Maximum whole dwelling extract rate (i.e. the boost rate) should be at least 21 l/s (with a minimum of 13 l/s in the kitchen and 8 l/s in the *bathroom*).

The minimum whole dwelling extract rate should be at least 13 l/s (spread between the kitchen and *bathroom*).

**Background ventilators**

As the *design air permeability* is  $\leq 3 \text{ m}^3/(\text{h} \cdot \text{m}^2)$  *background ventilators* of at least 2500 mm<sup>2</sup> *equivalent area* should be located in the living room and bedroom.

**Purge ventilation**

- Calculate the percentage window opening area (percentage of floor area) for each room having an external wall.
- Using Appendix B with an opening angle of 60° gives: 1/20 of the floor area.
- Therefore, for a living room of 13.5 m<sup>2</sup> floor area there should be a window opening area of at least 0.68 m<sup>2</sup>. This calculation should be carried out for all *habitable rooms*.

**Example C4 Continuous mechanical supply and extract with heat recovery (this is based on Table 5.2d)****Continuous supply and extract**

**Step 1:** Whole dwelling supply ventilation rate is 13 l/s from Table 5.1b.

**Step 2:** Whole dwelling extract ventilation *rate* is 21 l/s (from Table 5.1a assuming extract in kitchen and bathroom).

**Step 3:** Maximum whole dwelling extract rate (i.e. the boost rate) should be at least 21 l/s (with 13 l/s extract in the kitchen and 8 l/s extract in the *bathroom*).

The minimum whole dwelling supply rate should be at least 13 l/s.

**Purge ventilation**

- Calculate the percentage window opening area (percentage of floor area) for each room having an external wall.
- Using Appendix B with an opening angle of 60° gives: 1/20th of the floor area.
- Therefore, for a living room of 13.5 m<sup>2</sup> floor area there should be a window opening area of at least 0.68 m<sup>2</sup>. This calculation should be carried out for all *habitable rooms*.

## Details of semi-detached house

### Description

The semi-detached house contains the following rooms:

- entrance hall/stairway
- kitchen
- dining room
- living room
- three bedrooms
- **bathroom** containing WC, and in addition
- all rooms have an external wall.

The floor plans are given in Diagrams C2 and C3.

### Assumptions

- cooker hood adjacent to cooker hob
- **gross internal volume** of the heated space of 210 m<sup>3</sup>
- total floor area of 84 m<sup>2</sup>
- four-person occupancy
- side-hinged windows 1.0 m high and openable to a fixed position of 20°.

Diagram C2 Semi-detached house ground-floor plan example

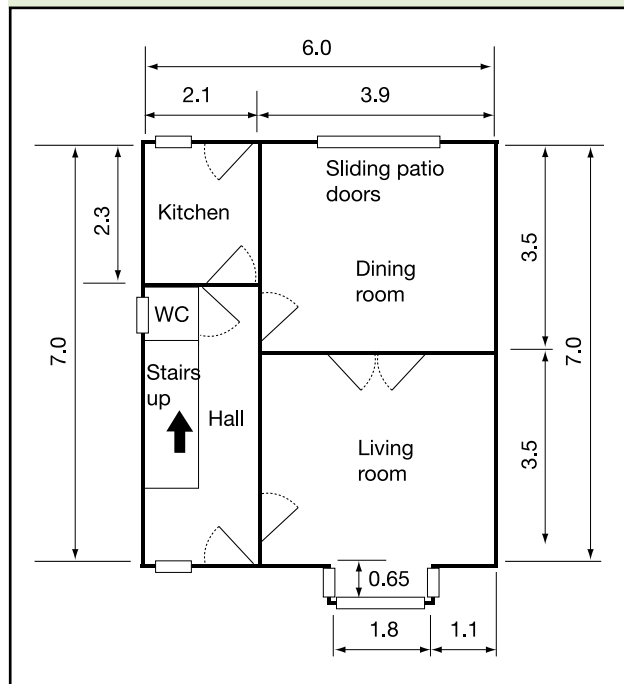
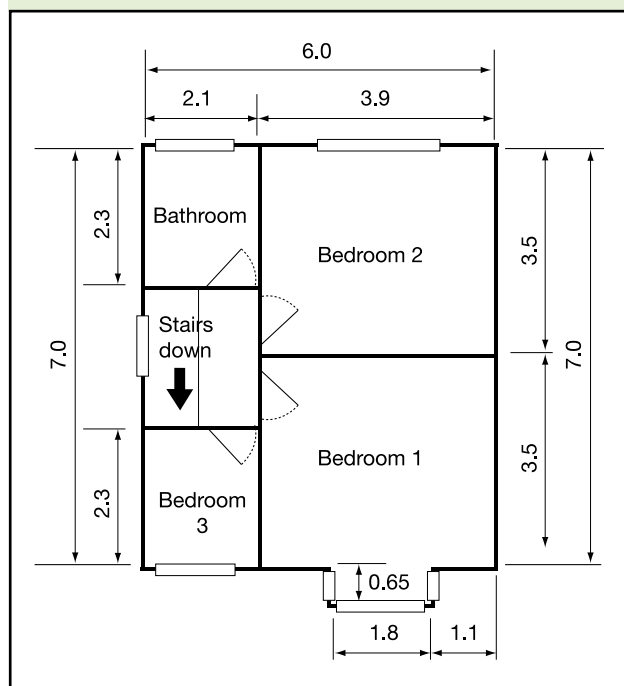


Diagram C3 Semi-detached house first-floor plan example



### Example C5 Background ventilators and intermittent extract fans (this is based on Table 5.2a)

#### Intermittent extract

Room	Intermittent extract rate
Kitchen	30 l/s (adjacent to hob)
Bathroom	15 l/s

#### Background ventilators

- For a two-storey semi-detached house of 84 m<sup>2</sup> floor area, Table 5.2a shows that the equivalent **background ventilator** area is 40000 mm<sup>2</sup>.
- To maximise the air flow through the dwelling by encouraging cross-ventilation, it is best to locate similar **equivalent areas** of **background ventilators** on opposite sides of the dwelling.

#### Purge ventilation

- Calculate the percentage window opening area (percentage of floor area) for each room having an external wall.
- Using Appendix B with an opening angle of 20° gives: 1/10th of the floor area.
- Therefore, for a living room of 14.8 m<sup>2</sup> floor area there should be a window opening area of at least 1.48 m<sup>2</sup>. This calculation should be carried out for all **habitable rooms**.

### Example C6 Passive stack ventilation (this is based on Table 5.2b)

Choose appropriate passive stack ventilation provision

Room	Internal duct diameter (mm)	Internal cross-sectional area (mm <sup>2</sup> )
Kitchen	125	12000
Bathroom	125	12000

#### Background ventilators

Calculate the total **equivalent area** of ventilators required for a dwelling as follows:

**Step 1:** for a two-storey semi-detached house of 84 m<sup>2</sup> floor area, Table 5.2a shows that the equivalent **background ventilator** area is 40000 mm<sup>2</sup>.

**Step 2:** for a **PSV** in both the kitchen and **bathroom**, an allowance of 6000 mm<sup>2</sup> can be made.

**Step 3:** 40000 – 6000 = 34000 mm<sup>2</sup>.

- In addition, the **equivalent area** must be at least the total cross-sectional area of the ducts (24000 mm<sup>2</sup>), which it is. It should be distributed with similar areas on opposite sides of the dwelling (but not in the kitchen and **bathroom**).

#### Purge ventilation

- Calculate the percentage window opening area (percentage of floor area) for each room having an external wall.
- Using Appendix B with an opening angle of 20° gives: 1/10th of the floor area.
- Therefore, for a living room of 14.8 m<sup>2</sup> floor area there should be a window opening area of at least 1.48 m<sup>2</sup>. This calculation should be carried out for all **habitable rooms**.

**Example C7 Continuous mechanical extract (this is based on Table 5.2c)****Continuous extract**

**Step 1:** *Whole dwelling ventilation* rate from the list in Table 5.1b is 21 l/s.

- However, minimum whole dwelling ventilation rate =  $0.3 \times \text{floor area} = 0.3 \times 84 = 25 \text{ l/s}$ .
- Hence, **whole dwelling ventilation** rate is 25 l/s.

**Step 2:** Whole dwelling extract rate is 21 l/s (from Table 5.1a assuming extract in kitchen and bathroom).

**Step 3:** In this case the required whole dwelling ventilation rate is greater than the whole dwelling extract ventilation rate, and only a minimum whole dwelling extract ventilation rate of 25 l/s is required (with at least 13 l/s in the kitchen and 8 l/s in the bathroom).

**Background ventilators**

- As the design **air permeability** is  $\leq 3 \text{ m}^3/(\text{h.m}^2)$  **background ventilators** of at least  $2500 \text{ mm}^2$  **equivalent area** should be located in the living room, dining room and each bedroom.

**Purge ventilation**

- Calculate the percentage window opening area (percentage of floor area) for each room having an external wall.
- Using Appendix B with an opening angle of  $15^\circ$  gives: 1/10th of the floor area.
- Therefore, for a living room of  $14.8 \text{ m}^2$  floor area there should be a window opening area of at least  $1.48 \text{ m}^2$ . This calculation should be carried out for all **habitable rooms**.

**Example C8 Continuous mechanical supply and extract with heat recovery (this is based on Table 5.2d)**

**Step 1:** Calculate the whole dwelling supply ventilation rate:

- Whole dwelling ventilation supply rate for the dwelling from the list in Table 5.1b is 21 l/s.
- However, minimum air supply rate =  $0.3 \times \text{floor area} = 0.3 \times 84 = 25 \text{ l/s}$ .
- Hence, *whole dwelling supply ventilation* rate is 25 l/s.

**Step 2:** Calculate the whole dwelling extract ventilation rate:

- Whole dwelling extract ventilation rate is 21 l/s (from Table 5.1a assuming extract in kitchen and bathroom).

**Step 3:** Maximum whole dwelling extract ventilation rate (i.e. the boost rate) should be at least 25 l/s (with at least 13 l/s extract in the kitchen and 8 l/s extract in the bathroom).

- The minimum whole dwelling supply ventilation rate should be at least 25 l/s.

**Purge ventilation**

- Calculate the percentage window opening area (percentage of floor area) for each room having an external wall.
- Using Appendix B with an opening angle of  $20^\circ$  gives: 1/10th of the floor area.
- Therefore, for a living room of  $14.8 \text{ m}^2$  floor area there should be a window opening area of at least  $1.48 \text{ m}^2$ . This calculation should be carried out for all **habitable rooms**.

# Appendix D: Minimising ingress of external pollution into buildings in urban areas

Typical urban pollutants that need to be considered include those covered by the UK Air Quality Strategy ([www.defra.gov.uk/environment/airquality/strategy/index.htm](http://www.defra.gov.uk/environment/airquality/strategy/index.htm) (2007)). These are:

- carbon monoxide, CO
- nitrogen dioxide, NO<sub>2</sub>
- sulphur dioxide, SO<sub>2</sub>
- ozone, O<sub>3</sub>
- particles (PM<sub>10</sub>)
- benzene
- 1,3-butadiene
- polycyclic aromatic hydrocarbons (PAHs)
- ammonia
- lead.

Although nitrogen oxide, NO, is not included in the UK Air Quality Strategy, it is a normal constituent of combustion discharges and in many cases (for example, from gas-fired plant) the largest polluting emitter. Therefore, it also needs to be taken into account.

Typical pollution emission sources that need to be considered include:

- road traffic, including traffic junctions and underground car parks
- combustion plant (such as heating appliances) running on conventional fuels, most commonly natural gas
- other combustion processes (for example, waste incineration, thermal oxidation abatement systems)
- discharges from industrial processes
- fugitive (i.e. adventitious/not effectively controlled) discharges from industrial processes and other sources
- building ventilation system exhaust discharges
- construction and demolition sites which are a source of particles and vaporous discharges.

In urban areas, buildings are exposed simultaneously to a large number of individual pollution sources from varying upwind distances (long range, intermediate range and short range) and heights and also over different timescales. The relationship between these and their proportionate contribution under different circumstances governs pollutant concentrations over the building shell and also internally.

Internal contamination of buildings from outdoor pollution sources therefore depends upon the pollutant sources, the physical characteristics of the building and its relation to its surroundings, the ventilation strategy employed and the location of the air intake. Whatever type of ventilation system is used, it is important to ensure that the intake air is not contaminated. This is especially important in air quality management areas where, by definition, pollution levels of at least one pollutant are already close to the air quality standards. Simplified guidance on ventilation intake placement for minimising ingress of pollutants may be summarised, as in Table D1.

## Control of ventilation intakes

For pollutant sources such as urban road traffic, whose concentration fluctuates with the time of day, reducing the flow of external air or closing ventilation intakes during peak periods of high external pollutant concentrations, for example during rush hours, for up to an hour may be an option.

Air intakes located on a less polluted side of the building may then be used for fresh air, or air may be fully recirculated within the building. Alternatively, the building may be used as a 'fresh air' reservoir to supply air during these short periods. The use of atria as a source of 'fresh air' for this purpose may be an option.

However, care must be taken since, for example, reducing the inflow of external air will also reduce the outflow of internal air, resulting in a build-up of internally generated pollutants that need to be removed. Most modern buildings have low ceiling heights and therefore the concept of a substantial 'fresh air' reservoir available within the building may not apply. Further details of this principle with examples may be found in Liddament (2000).

Table D1 **Guidance on ventilation intake placement for minimising ingress of pollutants**

Pollutant source	Recommendation
<b>Local static sources</b> <ul style="list-style-type: none"> <li>• Parking areas</li> <li>• Welding areas</li> <li>• Loading bays</li> <li>• Adjacent building exhausts</li> <li>• Stack discharges</li> </ul>	<ul style="list-style-type: none"> <li>• Ventilation intakes need to be placed away from the direct impact of short-range pollution sources, especially if the sources are within a few metres of the building. Some guidance is given in CIBSE TM21</li> </ul>
<b>Urban traffic</b>	<ul style="list-style-type: none"> <li>• Air intakes for buildings positioned directly adjacent to urban roads should be as high as possible and away from the direct influence of the source so as to minimise the ingress of traffic pollutants. There will be exceptions to this simple guide and these risks may need to be measured by modelling. In such cases, it is recommended that expert advice is sought</li> <li>• For buildings located one or two streets away, the placement of intakes is less critical</li> </ul>
Building features/layout: <ul style="list-style-type: none"> <li>• Courtyards</li> <li>• Street canyons (i.e. a canyon formed in a street between two rows of tall buildings)</li> </ul>	<ul style="list-style-type: none"> <li>• Intakes should not be located in these spaces where there are air pollutant discharges. This includes emission discharges from building ventilation system exhausts</li> <li>• If air intakes are to be located in these spaces, they should be positioned as far as possible from the source in an open or well-ventilated area. In addition, steps should be taken to reduce the polluted source, e.g. parking and loading should be avoided as pollutants can accumulate in enclosed regions such as courtyards</li> </ul>
Multiple sources	<ul style="list-style-type: none"> <li>• Where there are a large number of local sources, the combined effect of these around the façade of the building should be measured. The façade experiencing the lowest concentration of the pollutants would be an obvious choice for locating ventilation intakes but this will require expert assistance such as numerical and wind tunnel modelling. In general, however, it is recommended that air intakes be positioned as far away as possible from the source and at a location where air is free to move around the intake</li> </ul>
Weather factors	<ul style="list-style-type: none"> <li>• In areas where predominant wind comes from opposing directions (e.g. a valley location) the air intakes and outlets should point in opposite directions</li> <li>• In complex urban layouts, complex wind flows are likely to occur. In these cases, expert advice should be sought</li> </ul>

## Location of exhaust outlets

The location of exhausts is as important as the location of air intakes. These should be located such that re-entry to a building, or ingestion into other nearby buildings, is minimised (for both natural and mechanical intakes) and such that there is no adverse effect on the surrounding area. Guidance on outlet placement may be summarised as follows:

- Exhausts should be located downstream of intakes where there is a prevailing wind direction
- Exhausts should not discharge into courtyards, enclosures or architectural screens as pollutants tend to build up in such spaces and do not disperse very readily
- It is recommended that stacks should discharge vertically upwards and at high level to clear surrounding buildings and so that downwash does not occur

- Where possible, pollutants from stacks should be grouped together and discharged vertically upwards. The increased volume will provide greater momentum and increased plume height. This is common practice where there are a number of fume cupboard discharges; greater plume height dispersion can be achieved by adding the general ventilation exhaust.

## References

CIBSE (1999). CIBSE Technical Memorandum TM21, *Minimising pollution at air intakes*. ISBN 978 0 90095 391 0.

Liddament MW (2000) Chapter 13: 'Ventilation strategies', *Indoor Air Quality Handbook*. McGraw-Hill.

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The Building Regulations 2010

## **Sanitation, hot water safety and water efficiency**



### **APPROVED DOCUMENT**

- G1 Cold water supply**
- G2 Water efficiency**
- G3 Hot water supply and systems**
- G4 Sanitary conveniences and washing facilities**
- G5 Bathrooms**
- G6 Food preparation areas**
- Water efficiency calculator for new dwellings**

## **MAIN CHANGES IN THE 2015 EDITION**

This approved document supports Regulation 36 and Part G of Schedule 1 to the Building Regulations 2010. It takes effect on 1 October 2015 for use in England\*. The 2010 edition, as amended, will continue to apply to work started before 1 October 2015 or work subject to a building notice, full plans application or initial notice submitted before that date.

The main changes are:

- Introduction of an optional requirement for tighter water efficiency in Regulation 36 (section G2).
- Introduction of a fittings approach as an alternative to using the water efficiency calculator (section G2).
- Inclusion of the water efficiency calculator methodology into this approved document, with minor alterations resulting from European efficiency labelling and consequential amendments resulting from removal of references to the Code for Sustainable Homes (Appendix A).
- The annex listing the relevant competent person self-certification schemes has been deleted.

## **CHANGE MADE BY THE 2016 AMENDMENTS**

The change, made to section G2, requires the water efficiency calculator to be completed for new dwellings where a shower will not be provided.

\*This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No 2) Order 2009.

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# Introduction

## What is an Approved Document?

This document has been approved and issued by the Secretary of State to provide practical guidance on ways of complying with Requirements G1 to G6 and regulations 7 and 36 of the Building Regulations 2010 (SI 2010/2214) for England and Wales, as amended. The Building Regulations 2010 are referred to throughout the remainder of this Document as ‘the Building Regulations’. Where appropriate the Approved Document also gives guidance on relevant requirements in the Building (Approved Inspectors etc.) Regulations 2010 (SI 2010/2215).

The intention of issuing Approved Documents is to provide guidance about compliance with specific aspects of the Building Regulations in some of the more common building situations. They include examples of what, in ordinary circumstances, may be reasonable provision for compliance with the relevant requirement(s) of the Building Regulations to which they refer.

If guidance in an Approved Document is followed there will be a presumption of compliance with the requirement(s) covered by the guidance. However, this presumption is not conclusive, so simply following guidance does not guarantee compliance in an individual case. It is also important to note that there may well be other ways of achieving compliance with the requirements. There is therefore no obligation to adopt any particular solution contained in this Approved Document if you would prefer to meet the relevant requirement in some other way. However, persons intending to carry out building work should always check with their Building Control Body (BCB), either the local authority or an Approved Inspector, that their proposals comply with Building Regulations.

The guidance contained in this Approved Document relates only to the particular requirements of the Building Regulations that the document addresses (see ‘Requirements’ below). However, building work may be subject to more than one requirement of the Building Regulations. In such cases the work will also have to comply with any other applicable requirements of the Building Regulations.

This document is one of a series that has been approved and issued by the Secretary of State for the purpose of providing practical guidance with respect to the requirements of Schedule 1 and regulation 7 of the Building Regulations 2010 (SI 2010/2214) for England and Wales.

At the back of this document is a list of all the documents that have been approved and issued by the Secretary of State for this purpose.

## Consideration of technical risk

In relation to the installation of new and replacement sanitation and hot water services, building work must satisfy all the technical requirements set out in Schedule 1 to the Building Regulations. Attention should be paid in particular to the need to comply with Part A (Structure), Part B (Fire safety), Part C (Site preparation and resistance to contaminants and moisture), Part J (Combustion appliances and fuel storage systems), Part L (Conservation of fuel and power) and Part P (Electrical safety), as well as Part G.

## How to use this Approved Document

In this document the following conventions have been adopted to assist understanding and interpretation:

- a. Texts shown against a green background are extracts from the Building Regulations or Building (Approved Inspectors etc.) Regulations, and set out the legal requirements that relate to compliance with the sanitation, hot water safety and water efficiency requirements of Building Regulations. It should be remembered however that, as noted above, building works must comply with all the other applicable provisions of Building Regulations.
- b. Key terms are defined below and are printed in ***bold italic text***.
- c. Details of technical publications referred to in the text of this document are repeated as references in Appendix C. A reference to a publication is likely to be made for one of two main reasons. The publication may contain additional or more comprehensive technical detail, which it would be impractical to include in full in this Document but which is needed to fully explain ways of meeting the requirements; or it is a source of more general information. The reason for the reference will be indicated in each case. The reference will be to a specified edition of the document. The Approved Document may be amended from time to time to include new references or to refer to revised editions where this aids compliance.

## Where you can get further help

If you do not understand the technical guidance or other information set out in this Approved Document and the additional detailed technical references to which it directs you, there are a number of routes through which you can seek further assistance:

- The Government website: [www.gov.uk](http://www.gov.uk)
- If you are the person undertaking the building work you can seek assistance either from your local authority building control service or from your approved inspector (depending on which building control service you are using, or intend to use, to certify compliance of your work with the requirements of the Building Regulations).
- Businesses registered with a competent person self-certification scheme may be able to get technical advice from their scheme operator.
- If your query is of a highly technical nature you may wish to seek the advice of a specialist, or industry technical body, in the area of concern.

## Responsibility for compliance

It is important to remember that if you are the person (e.g. designer, builder, installer) carrying out building work to which any requirement of Building Regulations applies you have a responsibility to ensure that the work complies with any such requirement. The building owner may also have a responsibility for ensuring compliance with Building Regulation requirements and could be served with an enforcement notice in cases of non-compliance.

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# The requirements

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This Approved Document deals with the sanitation, hot water safety and water efficiency requirements in the Building Regulations 2010.

## Limitation on requirements

In accordance with regulation 8 of the Building Regulations, the requirements in Parts A to D, F to K and P (except for paragraphs G2, H2 and J7) of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings).

Paragraph G2 is excluded from regulation 8 as it deals with the conservation of water. Paragraphs H2 and J7 are excluded from regulation 8 because they deal directly with prevention of the contamination of water and of oil pollution. Parts E and M (which deal, respectively, with resistance to the passage of sound, and access to and use of buildings) are excluded from regulation 8 because they address the welfare and convenience of building users. Part L is excluded from regulation 8 because it addresses the conservation of fuel and power. All these matters are amongst the purposes, other than health and safety, that may be addressed by Building Regulations.

# General guidance

## Key terms

The following are key terms used in this document:

**Note:** Terms shown with \* are defined in legislation, either in the Building Act 1984 or the Building Regulations 2010, where the definition may be fuller than the definition given here.

**BCB** means Building Control Body: a local authority or an Approved Inspector.

**\*Building** means any permanent or temporary building, but not any other kind of structure or erection, and a reference to a building includes a reference to part of a building. This includes dwellings (houses, flats) and public buildings.

**\*Building work** includes the erection or extension of a **building**, the provision or extension of a **controlled service or fitting** in or in connection with a building, and the **material alteration** of a building, or a controlled service or fitting.

**Combined temperature and pressure relief valve** means a mechanically operated valve that opens to discharge water when a fixed (factory set) temperature or fixed (factory set) pressure is exceeded.

**Controlled service or fitting** includes a service or fitting subject to Schedule 1 requirements in respect of sanitation, hot water safety, water efficiency, drainage and waste disposal, combustion appliances and fuel storage, conservation of fuel or power, and electrical safety.

**Direct heating** means a method of heating in which the heat source is integral with the hot water vessel. Examples are an electrical immersion heater, or a gas burner with a flue arrangement that passes through the vessel so that the flue transfers heat to the stored water, or the circulation of water from a vessel situated near a burner with a flue arrangement so that the flue transfers heat to the circulating water.

**Domestic hot water** means water that has been heated for cooking, food preparation, personal washing or cleaning purposes. The term is used irrespective of the type of **building** in which the hot water system is installed.

**\*Earth-closet** means a closet having a movable receptacle for the reception of faecal matter and its deodorisation by the use of earth, ashes or chemicals, or by other methods. This will therefore include chemical and composting toilets.

**Exempt buildings and work** means the erection of any building or extension of a kind described in regulation 9 of and Schedule 2 to the Building Regulations 2010; or the carrying out of any work to or in connection with such a building or extension, if after the carrying out of that work it is still a building or extension of a kind described in that Schedule.

**Expansion vessel** means a vessel to temporarily accommodate the expansion of water from the unvented hot water storage vessel as it is heated.

**Greywater** is domestic wastewater excluding faecal matter and urine. When appropriately treated this may replace the use of **wholesome water** in **WCs**, **urinals**, irrigation or washing machines.

**Harvested rainwater** means rainwater harvested from roofs or other suitable surfaces and collected and stored. When appropriately treated, this may replace the use of **wholesome water** in **WCs**, **urinals**, irrigation or washing machines.

**Heated wholesome water** means water that, when cold, was wholesome in accordance with the definition below and has been subjected to a heat source to increase its temperature.

**Hot water storage system** means a vessel for storing:

- heated **wholesome hot water** or **softened wholesome hot water** for subsequent use
- water that is used to heat other water

together with any ancillary safety devices described in paragraphs 3.10 and 3.11 of this Approved Document and all other applicable operating devices.

**Hot water storage system package** means a **hot water storage system** having the safety devices described in 3.10 and 3.17 of this Approved Document factory-fitted by the manufacturer, together with a kit containing other applicable devices supplied by the manufacturer to be fitted by the installer.

**Hot water storage system unit** means a **hot water storage system** having the safety devices described in 3.10 and 3.17 of this Approved Document and all other applicable operating devices factory-fitted by the manufacturer.

**Indirect heating** means a method of heating stored water through a heat exchanger.

**Kitchen** means a room or part of a room which contains a **sink** and food preparation facilities

**Material alteration** means an alteration which results in a **building** or a **controlled service or fitting** not complying with, or being more unsatisfactory than it was before in relation to Schedule 1 requirements in relation to structure, means of warning and escape, internal and external fire spread, fire service access and facilities, and access and use.

**Non-self-resetting energy cut-out** means a device that will interrupt the supply of heat to a hot water storage vessel when a fixed (factory set) temperature is exceeded. If this protective device is actuated it should only be possible to reset it manually.

**Preparation of food** means handling, making and cooking of food.

**Pressure relief valve** means a mechanically operated valve that opens to discharge water when a fixed (factory set) pressure is exceeded.

**Primary thermal store** means a store of heat energy that can be used to heat **domestic hot water** by means of a heat exchanger. The thermal store can be heated by a variety of heat sources. Primary hot water thermal stores can be either vented or unvented.

**Risk assessment** for the purposes of this document means the identification of the hazards associated with a process or activity combined with an assessment of the probability and consequences of each hazard.

**\*Room for residential purposes** means a room, or a suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep in, and includes a room in a hostel, a hotel, a boarding house, a hall of residence or a residential home, but does not include a room in a hospital, or other similar establishment, used for patient accommodation.

**Sanitary accommodation** means a room containing a **WC** or **urinal**, whether or not it also contains other **sanitary appliances**. Sanitary accommodation containing one or more cubicles counts as a single space if there is free circulation of air throughout the space.

**Sanitary appliance** means **WC**, **urinal**, bath, shower, washbasin, **sink**, bidet and drinking fountain. It also includes appliances that are not connected to a water supply (e.g. composting toilet) or drain (e.g. waterless **urinal**).

**\*Sanitary convenience** means closets and **urinals**.

**Sink** means a receptacle used for holding water (for **preparation of food** or washing up) supplied through a tap and having a wastepipe.

**\*Softened wholesome water** means water which would be regarded as wholesome for the purposes of regulations made under section 67 of the Water Industry Act 1991 (standards of wholesomeness) as they apply for the purposes of Part G of Schedule 1 in accordance with paragraph (2c) but for the presence of sodium in excess of the level specified in those regulations if it is caused by a water softener or water softening process which reduces the concentrations of calcium and magnesium.

**Tundish** means a device, installed in the discharge pipe from a valve, that provides an air break allowing discharge to be conducted safely to a place of termination. The tundish also provides a visible indication of a discharge and functions as backflow prevention device.

**Temperature relief valve** means a mechanically operated valve that opens to discharge water when a fixed (factory set) temperature is exceeded.

**Unvented (closed) hot water storage system** means a vessel fed with cold water from a supply pipe or dedicated storage cistern (without a vent pipe) and in which water is heated directly or indirectly. Expansion of the water when it is heated is accommodated either internally or externally and the system is fitted with safety devices to prevent water temperatures exceeding 100°C, and other applicable operating devices to control primary flow, prevent backflow, control working pressure and accommodate expansion.

**Urinal** means an appliance used for reception and disposal of urine.

**Vented (open) hot water storage system** means a vessel fed with cold water from a dedicated storage cistern. Expansion of the water when it is heated is accommodated through the cold feed pipe. A vent pipe connecting the top of the vessel to a point open to the atmosphere above the cold water storage cistern is provided as a safety device.

**\*Water-closet (WC)** means a closet that has a separate fixed receptacle connected to a drainage system and separate provision for flushing from a supply of clean water either by the operation of a mechanism or by automatic action. Water-closets are also referred to as WCs.

**Wholesome water** means water complying with the requirements of regulations made under Section 67 (Standards of wholesomeness) of the Water Industry Act 1991. The regulations made under this Section at the time of publication of this Approved Document are for England the Private Water Supplies Regulations 2009 (SI 2009/3101), for Wales the Private Water Supplies (Wales) Regulations (SI 2010/66) and, for England, the Water Supply (Water Quality) Regulations 2000 (SI 2000/3184 as amended), and, for Wales, the Water Supply (Water Quality) Regulations 2001 (SI 2001/3911 as amended).

## Types of work covered by this Approved Document

### Building work

Building work, as defined in regulation 3 of the Building Regulations 2010, includes the erection and extension of a building, the provision or extension of a controlled service or fitting, and the material alteration of a building or a controlled service or fitting. In addition, Building Regulations may apply in cases where the purposes for which or the manner or circumstances in which a building or part of a building is used change in a way that constitutes a material change of use.

Under regulation 4 of the Building Regulations 2010, building work should be carried out in such a way that, on completion of work,

- i. the building complies with the applicable Parts of Schedule 1 of the Building Regulations,
- ii. in the case of an extension or material alteration of a building, or the provision, extension or material alteration of a controlled service or fitting, where it did not comply with any such requirement, it is no more unsatisfactory in relation to that requirement than before the work was carried out.

Work described in Part G concerns the provision or extension of controlled services or fittings. Work associated with installations covered in these sections may be subject to other relevant Parts of the Building Regulations.

### **Material change of use**

A material change of use occurs in specified circumstances in which a building or part of a building that was previously used for one purpose will be used in future for another. Where there is a material change of use the Building Regulations set requirements that must be met before the building can be used for its new purpose.

Regulation 5 of the Building Regulations specifies the following circumstances as material changes of use:

- a building is used as a dwelling where previously it was not
- a building contains a flat where previously it did not
- a building is used as an hotel or boarding house where previously it was not.
- a building is used as an institution where previously it was not
- a building is used as a public building where previously it was not
- a building no longer comes within the exemptions in Schedule 2 to the Building Regulations where previously it did
- a building which contains at least one dwelling contains a greater or lesser number of dwellings than it did previously
- a building contains a room for residential purposes where previously it did not
- a building which contains at least one room for residential purposes contains a greater or lesser number of such rooms than it did previously
- a building is used as a shop where previously it was not

Parts G1, G3(1) to (3) and G4 to G6 will apply to all the material changes of use mentioned above. This means that whenever such changes occur the building must be brought up to the standards required by Parts G1 and G3 to G6.

Parts G2, G3(4) and regulation 36 will apply only to material changes of use where a building is used as a dwelling where previously it was not and where a building contains a flat where previously it did not.

### **Historic buildings**

The types of building work covered by this Approved Document may include work on historic buildings. Historic buildings include:

- a. listed buildings
- b. buildings situated in designated conservation areas
- c. buildings which are of architectural or historic interest and which are referred to as a material consideration in a local authority's development plan
- d. buildings of architectural and historical interest within national parks, areas of outstanding or natural beauty and world heritage sites.

Special considerations may apply if the building on which the work is to be carried out has special historic or architectural value, and compliance with the sanitation or hot water safety requirements would unacceptably alter the character or appearance of the building or parts of it.

When undertaking work on or in connection with buildings with special historic or architectural value, the aim should be to improve sanitation and hot water safety where and to the extent that it is possible provided that the work does not prejudice the character of the host building or increase the risk of long-term deterioration to the building's fabric or fittings.

In arriving at a balance between historic building conservation and sanitation or hot water safety requirements, it would be appropriate to take into account the advice of the local authority's conservation officer before work begins.

Guidance is also available in the English Heritage publication Building Regulations and Historic Buildings, 2002 (revised 2004), which is available at [www.english-heritage.org.uk](http://www.english-heritage.org.uk).

**Note:** Any building in the schedule of monuments maintained under section 1 of the Ancient Monuments and Archaeological Areas Act 1979 is exempt from all Building Regulations requirements including those in Part G.

### **Notification of work**

In almost all cases of new building work it will be necessary to notify a BCB in advance of any work starting. There are two exceptions to this: where work is carried out under a self-certification scheme listed in Schedule 3, and where work is listed in Schedule 4 to the Building Regulations as being not notifiable.

**Competent person self-certification schemes under Schedule 3**

Under regulation 12(6) of the Building Regulations it is not necessary to notify a BCB in advance of work which is covered by this Approved Document if that work is of a type set out in column 1 of Schedule 3 to the Regulations and is carried out by a person registered with a relevant self-certification (competent persons) scheme as set out in column 2 of that Schedule. In order to join such a scheme a person must demonstrate competence to carry out the type of work the scheme covers, and also the ability to comply with all relevant requirements in the Building Regulations. Details of current schemes including those relating to sanitation, hot water safety and water efficiency can be found at [www.gov.uk](http://www.gov.uk). These schemes may change from time to time, or schemes may change name, or new schemes may be authorised; so the current list on the website should always be consulted. Full details of the schemes can be found on the individual scheme websites.

Where work is carried out by a person registered with a competent person scheme, regulation 20 of the Building Regulations and regulation 20(1) of the Building (Approved Inspectors etc.) Regulations 2010 require that the occupier of the building be given, within 30 days of the completion of the work, a certificate confirming that the work complies with all applicable Building Regulation requirements. There is also a requirement that the BCB be given a notice that this has been done, or a copy of the certificate, again within 30 days of the completion of the work. These certificates and notices are usually made available through the scheme operator.

BCBs are authorised to accept these certificates as evidence of compliance with the requirements of the Building Regulations. However, local authority inspection and enforcement powers remain unaffected, although they are normally used only in response to a complaint that work does not comply.

**Work which is not notifiable under Schedule 4**

Schedule 4 to the Building Regulations sets out types of work where there is no requirement to notify a BCB that work is to be carried out. These types of work are mainly of a minor nature where there is no significant risk to health, safety, water efficiency or energy efficiency. Health, safety, water efficiency and energy efficiency requirements continue to apply to these types of work; only the need to notify a BCB has been removed.

Where only non-notifiable work as set out in Schedule 4 is carried out, there is no requirement for a certificate confirming that the work complies with Building Regulation requirements to be given to the occupier or the BCB.

The types of non-notifiable work in Schedule 4

relevant to the sanitation, hot water safety and water efficiency provisions of the Regulations are:

- i. in an existing hot water system, the replacement of any part which is not a combustion appliance, or the addition of an output device or control device. The work will however remain notifiable where commissioning is possible, and will affect the reasonable use of fuel and power. This is most likely to be where water heaters are being provided
- ii. the installation of a stand-alone, self-contained fixed hot water appliance. This is restricted to a single appliance and any associated controls and must not be connected to, or form part of, any other fixed building service. However, if any of the following apply, the work will remain notifiable building work:
  - the service is a combustion appliance
  - any electrical work associated with the installation is notifiable
  - commissioning is possible and would affect the service's energy efficiency, such as that of water heaters
- iii. the replacement of a sanitary convenience with one that uses no more water than the one it replaces, a washbasin, sink, bidet, fixed bath, or a shower but only where the work does not include any work to:
  - underground drainage
  - the hot or cold water system or above-ground drainage which could prejudice the health and safety of any person on completion of work
- iv. replacing any part or adding an output or control device to an existing cold water supply
- v. providing a hot water storage system that has a storage vessel with a capacity not exceeding 15 litres provided that any electrical work associated with the installation is also not notifiable.

Schedule 4 also sets out what types of electrical installation work in dwellings is non-notifiable. Full information on this is given in Approved Document P.

**Exemptions**

Schedule 2 to the Building Regulations sets out a number of classes of buildings which are exempt from all Building Regulations requirements. However, the exemption has been removed in respect of some requirements of Part G where hot or cold water supply systems are shared with other buildings. This is to help ensure that the whole hot or cold water system is safe. In particular:

- i. the requirements of Parts G 1, G3(2) and G3(3) will apply to any greenhouse which receives a hot or cold water supply from a source shared

with or located inside a dwelling

- ii. the requirements of Parts G1, G3(2) and G3(3) will apply to any small detached building falling within Class 6 of Schedule 2 and any extension falling within Class 7 of Schedule 2 (which includes conservatories under 30m<sup>2</sup> in area) which receives a hot or cold water supply shared with or located inside any building that is subject to the Regulations.

Please note that the Regulations do not require the provision of hot or cold water systems to such exempt buildings, but if such systems are provided they must meet the minimum hygiene and safety requirements in those Parts.

All other Classes of buildings within Schedule 2 retain their exemption from compliance with Part G.

## Materials and workmanship

Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations shall be carried out in accordance with regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in Approved Document 7.

Building Regulations are made for specific purposes, primarily the health and safety, welfare and convenience of people and for energy conservation. Standards and other technical specifications may provide relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance or matters which, although they relate to health and safety etc., are not covered by the Building Regulations.

When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

## Supplementary guidance

The Department for Communities and Local Government occasionally issues additional material to aid interpretation of the guidance in Approved Documents. This material may be conveyed in official letters to chief executives of local authorities and Approved Inspectors and/or posted on the websites accessed through: [www.gov.uk](http://www.gov.uk).

## Interaction with other legislation

This Approved Document makes reference to other legislation, including those listed below, that may also need to be considered.

**Note:** All statutory instruments can be accessed at [www.legislation.gov.uk](http://www.legislation.gov.uk).

**The Water Supply (Water Quality) Regulations 2000** (SI 2000/3184 as amended), and in Wales **the Water Supply (Water Quality) Regulations 2001** (SI 2001/3911 as amended) are made under the Water Industry Act 1991 and apply to the supply of water by a statutory water undertaker or a licensed water supplier. They make provision for the wholesomeness of water supplied for such domestic purposes as consist in or include cooking, drinking, food preparation or washing; or to premises in which food is produced.

**The Water Supply (Water Fittings) Regulations 1999** (SI 1999/1148 as amended) are made under the Water Industry Act 1991 and apply to any water fitting installed or used, or to be installed or used, in premises to which water is or is to be supplied by a water undertaker. They make provision for preventing contamination, waste, misuse, undue consumption and erroneous measurement of water supplied by a statutory water undertaker or licensed water supplier.

**The Private Water Supplies Regulations 2009** (SI 2009/3101) in England and **The Private Water Supplies (Wales) Regulations 2010** (SI 2010/66) in Wales are made under the Water Industry Act 1991 and section 2(2) of the European Communications Act 1972 and are concerned with the quality of water supplied from private supplies for drinking, washing or cooking or for food preparation purposes.

**The Workplace (Health, Safety and Welfare) Regulations 1992** (SI 1992/3004 as amended) are made under the Health and Safety at Work etc. Act 1974 and apply to any workplace or part of a workplace. They apply to the common parts of flats and similar **buildings** if people such as cleaners, wardens and caretakers are employed to work in these common parts. They make provision for, amongst other matters, space requirements, cleaning and provision of **sanitary conveniences**.

**Food Hygiene (England) Regulations 2006**

(SI 2006/14 as amended) and **the Food Hygiene (Wales) Regulations 2006** (SI 2006/31 W5 as amended) are made under European Communities Act 1972 and apply to measures relating to food (including drink) including the primary production of food. The provision of washbasins and **sinks** is relevant to Approved Document G.

**Gas Safety (Installation and Use) Regulations**

**(SI 1998/2451)** extend to all dangers arising from the transmission, distribution, supply or use of gas conveyed from a gas storage vessel. The installation of gas heated water systems is relevant to Approved Document G.

## The Requirement G1

This Approved Document deals with the following Requirement from Part G of Schedule 1 to the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>Cold water supply</b>	
<b>G1.</b> (1) There must be a suitable installation for the provision of:	
(a) wholesome water to any place where drinking water is drawn off;	
(b) wholesome water or softened wholesome water to any washbasin or bidet provided in or adjacent to a room containing a sanitary convenience;	
(c) wholesome water or softened wholesome water to any washbasin, bidet, fixed bath or shower in a bathroom; and	
(d) wholesome water to any sink provided in any area where food is prepared.	
(2) There must be a suitable installation for the provision of water of suitable quality to any sanitary convenience fitted with a flushing device.	

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# Guidance

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## Performance

In the Secretary of State's view Requirement G1(1) will be met if:

- a. the water supplied is wholesome;
- b. the pressure and flow rate is sufficient for the operation of **sanitary appliances** planned in the **building**;
- c. the supply is reliable; and
- d. the installation conveys **wholesome water** or **softened wholesome water** to the sanitary appliances and locations specified in the Requirement without waste, misuse, undue consumption or contamination of water.

The water will be wholesome if it is provided:

- a. by a statutory water undertaker or a licensed water supplier; or
- b. by a source complying with the Private Water Supplies Regulations 2009 (SI 2009/3101) in England or the Private Water Supplies (Wales) Regulations (SI 2010/66) in Wales.

In the Secretary of State's view Requirement G1(2) will be met if:

- a. the water supplied is either wholesome, softened wholesome or of suitable quality having regard to the risks to health;
- b. the pressure and flow rate is sufficient for the operation of the **sanitary appliances**;
- c. the supply is reliable; and
- d. the installation conveys water to **sanitary appliances** and locations specified in the Requirement without waste, misuse, undue consumption or contamination of **wholesome water**.

## Wholesome water

**1.1** Water supplied to the **building** by a statutory water undertaker or a licensed water supplier through an installation complying with the requirements of the Water Supply (Water Fittings) Regulations 1999 (SI 1999/1148 as amended) may be assumed to be **wholesome water**. The requirements in the appropriate water quality regulations are set out for ease of reference in Appendix B to this Approved Document.

**1.2** Attention is drawn to the requirements of the Water Supply (Water Fittings) Regulations 1999 (SI 1999/1148 as amended) which make provision for preventing contamination, waste, misuse, undue consumption and erroneous measurement of water supplied by a water undertaker or licensed water supplier.

**1.3** Where a **building** is supplied with water from a source other than a water undertaker or licensed water supplier, the water shall be considered to be wholesome if it meets the criteria set out in the Private Water Supplies Regulations 2009 (SI 2009/3101) in England or the Private Water Supplies (Wales) Regulations (SI 2010/66) in Wales. The requirements in those regulations are set out for ease of reference in Appendix B to this Approved Document.

## Softened wholesome water

**1.4** Wholesome water which has been treated by a water softener or a water softening processes to adjust the content of hardness minerals may have raised levels of sodium. Where the water, after this treatment, still complies with the requirements for wholesome water it is still considered to be wholesome water.

**1.5** However, where it complies with all requirements for wholesome water other than its sodium content, it will be considered to be wholesome softened water. Whilst wholesome softened water may be considered suitable for most purposes it should not be provided in place of wholesome water to any place where drinking water is drawn off or to any sink provided in an area where food is prepared.

## Alternative sources of water

**1.6** Water treated to the high standards of **wholesome water** is not essential for all of the uses that water is put to in and about **buildings**, e.g. toilet flushing, irrigation. A variety of alternative sources are available for water. These include:

- a. water abstracted from wells, springs, bore-holes or water courses;
- b. **harvested rainwater**;
- c. reclaimed **greywater**; and
- d. reclaimed industrial process water.

**1.7** The design of treatment systems for water from alternative sources should incorporate measures to minimise the impact on water quality of:

- a. failure of any components;
- b. failure to undertake any necessary maintenance;
- c. power failure where appropriate; and
- d. any other measures identified in a risk assessment.

**1.8** Guidance on the marking of pipework conveying water from alternative sources can be found in the WRAS Information & Guidance Note No. 9-02-05 Marking and identification of pipework for reclaimed (greywater) systems and in BS 8515:2009 *Rainwater harvesting systems – Code of Practice*.

**1.9** Guidance on installing, modifying and maintaining reclaimed water systems can be found in the WRAS Information and Guidance Note No. 9-02-04 *Reclaimed water systems* and in BS 8515:2009 *Rainwater harvesting systems. Code of practice*.

**1.10** Information on the technical and economic feasibility of rainwater and **greywater** can be found in MTP (2007) *Rainwater and greywater: technical and economic feasibility*.

**1.11** Information on the specification of rainwater and **greywater** systems can be found in MTP (2007) *Rainwater and greywater: a guide for specifiers*.

**1.12** Guidelines for rainwater and **greywater** systems, in relation to water quality standards, can be found in MTP (2007) *Rainwater and greywater: review of water quality standards alternative and recommendations for the UK*.

**1.13** Water from alternative sources may be used in dwellings for **sanitary conveniences**, washing machines and irrigation, provided the appropriate risk assessment has been carried out. A **risk assessment** should ensure that the supply is appropriate to the situation in respect of the source of the water and the treatment of it, and not likely to cause waste, misuse, undue consumption or contamination of **wholesome water**.

**1.14** Any system/unit used to supply dwellings with water from alternative sources should be subject to a risk assessment by the system designer and manufacturer, and appropriate testing carried out to demonstrate that any risks have been suitably addressed. A risk assessment should include consideration of the effect on water quality of system failure and failure to carry out necessary maintenance.

# The Requirement G2 and Regulation 36

This Approved Document deals with the following Requirement from Part G of Schedule 1 and regulation 36 to the Building Regulations 2010, as amended.

<i>Requirement</i>	<i>Limits on application</i>
<b>Water efficiency</b>	
<b>G2.</b> Reasonable provision must be made by the installation of fittings and fixed appliances that use water efficiently for the prevention of undue consumption of water.	Requirement G2 applies only when a dwelling is— <ul style="list-style-type: none"> <li>(a) erected; or</li> <li>(b) formed by a material change of use of a building within the meaning of regulation 5(a) or (b).</li> </ul>
<b>Water efficiency of new dwellings</b>	
<b>36.</b> —(1) The potential consumption of wholesome water by persons occupying a new dwelling must not exceed the requirement in paragraph (2).	
(2) The requirement referred to in paragraph (1) is either— <ul style="list-style-type: none"> <li>(a) 125 litres per person per day; or</li> <li>(b) in a case to which paragraph (3) applies, the optional requirement of 110 litres per person per day,</li> </ul> as measured in either case in accordance with a methodology approved by the Secretary of State.	
(3) This paragraph applies where the planning permission under which the building work is carried out— <ul style="list-style-type: none"> <li>(a) specifies the optional requirement in paragraph (2)(b); and</li> <li>(b) makes it a condition that that requirement must be complied with.</li> </ul>	
(4) In this Part, “new dwelling” does not include a dwelling that is formed by a material change of use of a building within the meaning of regulation 5(g).	
<b>Wholesome water consumption calculation</b>	
<b>37.</b> —(1) Where regulation 36 applies, the person carrying out the work must give the local authority a notice which specifies— <ul style="list-style-type: none"> <li>(a) which of the requirements in regulation 36(2)(a) or (b) applies to the dwelling; and</li> <li>(b) the potential consumption of wholesome water per person per day in relation to the completed dwelling.</li> </ul>	
<b>Building (Approved Inspectors) Regulations 2010</b>	
<b>Application of Provisions of the Principal Regulations</b>	
<b>20.</b> —(1) Regulation 20 (provisions applicable to self-certification schemes), 27 (CO <sub>2</sub> emission rate calculations), 29 (energy performance certificates), 37 (wholesome water consumption calculation), 41 (sound insulation testing), 42 (mechanical ventilation air flow rate testing), 43 (pressure testing) and 44 (commissioning) of the Principal Regulations apply in relation to building work which is the subject of an initial notice as if references to the local authority were references to the approved inspector.	
(4) Regulation 37(2) of the Principal Regulations applies in relation to building work which is the subject of an initial notice as if after “work has been completed” there were inserted, “or, if earlier the date on which in accordance with regulation 17 of the Building (Approved Inspectors etc.) Regulations 2010 the initial notice ceases to be in force”.	

# Guidance

## Performance

In the Secretary of State's view Requirement G2 will be met for new dwellings if:

- the estimated consumption of wholesome water resulting from the design of cold and hot water systems (calculated in accordance with the methodology set out in Appendix A to this approved document and taking into account the use of any alternative sources of water provided in accordance with G1(2)) is not greater than the standard set by the Secretary of State of 125 litres/person/day of **wholesome water** or 110 litres/person/day where the optional requirement applies;
- the manner in which **sanitary appliances** and white goods used in the design calculation undertaken to demonstrate compliance with paragraph (a) are provided and installed in the dwelling takes account of the other provisions in this approved document;
- the manner in which any alternative sources of water used in the design calculation undertaken to demonstrate compliance with paragraph (a) are supplied to the dwelling, takes account of other provisions in this approved document;
- a record of the **sanitary appliances** and white goods used in the water consumption calculation and installed in the dwelling is provided along with sufficient other information enabling **building** owners or occupiers to maintain the **building** and its services so as to maintain the water efficiency of the **building**. In this context, relevant white goods are washing machines and dishwashers;
- a record of the alternative sources of water used in the water consumption calculation and supplied to the dwelling is provided along with sufficient other information enabling **building** owners or occupiers to maintain the **building** and its services so as to maintain the water efficiency of the **building**.

Where a **building** consists of more than one dwelling (such as a block of flats) it should be designed so that the estimated consumption of wholesome water resulting from the design of the cold and hot water systems for each individual dwelling should be no greater than the target.

## General

**2.1** The water used by **sanitary appliances** and relevant white goods in a new dwelling should be calculated using the manufacturer's declared value for water consumption of each of those appliances and white goods.

**2.2** The estimated water consumption of a new dwelling should be calculated in accordance with the methodology set out in Appendix A, referred to as the water efficiency calculator.

**2.3** The estimated consumption of **wholesome water** of a new dwelling should be no more than 125 litres/person/day or 110 litres/person/day where the optional requirement applies. This includes a fixed factor of water for outdoor use of 5 litres/person/day.

**2.4** Where alternative sources of water are to be used in the dwelling design, this should be reflected in the estimate of water use.

## Fittings approach

**2.5** As an alternative to calculating the water consumption (as paragraph 2.2), a fittings approach that is based on the water efficiency calculator methodology may be used.

**2.6** Where the fittings approach is used, the water consumption of the fittings provided must not exceed the values in Table 2.1. If they do, the water efficiency calculator must be completed to demonstrate compliance. Similarly, where a shower is not to be provided or where a waste disposal unit, a water softener or water re-use is to be provided the water efficiency calculator must be completed.

**Table 2.1 Maximum fittings consumption**

Water fitting	Maximum consumption
WC	6/4 litres dual flush or 4.5 litres single flush
Shower	10 l/min
Bath	185 litres
Basin taps	6 l/min
Sink taps	8 l/min
Dishwasher	1.25 l/place setting
Washing machine	8.17 l/kilogram

**2.7** Where the fittings approach is used, the notice given under regulation 37 should state "Less than 125 litres/person/day using fittings approach".

## Optional requirement

**2.8** The optional requirement only applies where a condition that the dwelling should meet the optional requirement is imposed as part of the process of granting planning permission. Where it applies, the estimated consumption of wholesome water calculated in accordance with the methodology in the water efficiency calculator, should not exceed 110 litres/person/day.

**2.9** The person carrying out the work must inform the **BCB** where the optional requirement applies.

**2.10** As an alternative to calculating the water consumption (as paragraph 2.8), a fittings approach that is based on the water efficiency calculator methodology may be used.

**2.11** Where the fittings approach is used, the water consumption of the fittings provided must not exceed the values in Table 2.2. If they do, the water efficiency calculator must be completed to demonstrate compliance. Similarly, where a shower is not to be provided or where a waste disposal unit, a water softener or water re-use is to be provided the water efficiency calculator must be completed.

**2.12** Where the fittings approach is used, the notice given under regulation 37 should state “Less than 110 litres/person/day using fittings approach”.

**Table 2.2 Maximum fittings consumption optional requirement level**

Water fitting	Maximum consumption
WC	4/2.6 litres dual flush
Shower	8 l/min
Bath	170 litres
Basin taps	5 l/min
Sink taps	6 l/min
Dishwasher	1.25 l/place setting
Washing machine	8.17 l/kilogram

## Notification of water efficiency calculation to the BCB

**2.13** Where regulation 36 applies, regulation 37 of the Building Regulations and regulation 20(1) and (4) of the Building (Approved Inspectors etc.) Regulations require that a notice specifying the calculated potential consumption of **wholesome water** per person per day relating to the dwelling as constructed be given to the appropriate **BCB**.

**2.14** In most cases, this notice must be given to the **BCB** no later than five days after the completion of the **building work**. However, where the **BCB** is an Approved Inspector and the dwelling is occupied before completion, the notice must be given no later than the day that the initial notice ceases to be in force in consequence of regulation 18 of the Building (Approved Inspectors etc.) Regulations when this is earlier than five days after the completion of the work.

**2.15** It is permissible for the notice to be served on the **BCB** electronically provided the **BCB** has stated its willingness to receive the document by those means and it is delivered to the electronic address that the body has specified.

**2.16** Local authorities are unlikely to be able to give a completion certificate for the building until the notice required under regulation 37 of the Building Regulations has been received. Approved Inspectors are unlikely to be able to give a final certificate until the equivalent notice under regulation 20(1) and (4) of the Building (Approved Inspectors etc.) Regulations has been received.

## The Requirement G3

This Approved Document deals with the following Requirement from Part G of Schedule 1 to the Building Regulations 2010.

Requirement	Limits on application
<p><b>G3.</b> (1) There must be a suitable installation for the provision of heated wholesome water or heated softened wholesome water to:</p> <ul style="list-style-type: none"> <li>(a) any washbasin or bidet provided in or adjacent to a room containing a sanitary convenience;</li> <li>(b) any washbasin, bidet, fixed bath and shower in a bathroom; and</li> <li>(c) any sink provided in any area where food is prepared.</li> </ul> <p>(2) A hot water system, including any cistern or other vessel that supplies water to or receives expansion water from a hot water system, shall be designed, constructed and installed so as to resist the effects of temperature and pressure that may occur either in normal use or in the event of such malfunctions as may reasonably be anticipated, and must be adequately supported.</p> <p>(3) A hot water system that has a hot water storage vessel shall incorporate precautions to:</p> <ul style="list-style-type: none"> <li>(a) prevent the temperature of the water stored in the vessel at any time exceeding 100°C; and</li> <li>(b) ensure that any discharge from safety devices is safely conveyed to where it is visible but will not cause a danger to persons in or about the building.</li> </ul> <p>(4) The hot water supply to any fixed bath must be so designed and installed as to incorporate measures to ensure that the temperature of the water that can be delivered to that bath does not exceed 48°C.</p>	<p>Requirement G3(3) does not apply to a system which heats or stores water for the purposes only of an industrial process.</p> <p>Requirement G3(4) applies only when a dwelling is—</p> <ul style="list-style-type: none"> <li>(a) erected;</li> <li>(b) formed by a material change of use within the meaning of regulation 5(a) or (b).</li> </ul>

# Guidance

## Performance

In the Secretary of State's view Requirement G3(1) will be met if:

- a. the installation conveys hot water to the **sanitary appliances** and locations specified in the requirement without waste, misuse or undue consumption of water; and
- b. the water supplied is **heated wholesome water** or heated softened water.

In the Secretary of State's view Requirement G3(2) will be met if all components of the hot water system including any cistern that supplies water to, or receives expansion water from the hot water system continues to safely contain the hot water:

- a. during normal operation of the hot water system;
- b. following failure of any thermostat used to control temperature; and
- c. during operation of any of the safety devices fitted in accordance with paragraph G3(3).

In the Secretary of State's view Requirement G3(3) will be met for a **hot water storage system** that has a vented storage vessel if:

- a. the storage vessel has a suitable vent pipe connecting the top of the vessel to a point open to the atmosphere above the level of the water in the cold water storage cistern and over it; and,
- b. in addition to any thermostat, either the heat source, or the storage vessel is fitted with a device that will prevent the temperature of the stored water at any time exceeding 100°C; and
- c. the hot water system has pipework that incorporates a provision for the discharge of hot water from the safety devices to an appropriate place open to the atmosphere where it will cause no danger to persons in or about the **building**.

In the Secretary of State's view Requirement G3(3) will be met for a hot water system that has an unvented storage vessel if:

- a. the storage vessel has at least two independent safety devices such as those that release pressure and so prevent the temperature of the stored water at any time exceeding 100°C in addition to any thermostat; and
- b. the hot water system has pipework that incorporates a provision for the discharge of hot water from safety devices to be visible at some point and safely conveys it to an appropriate place open to the atmosphere where it will cause no danger to persons in or about the **building**.

In the Secretary of State's view Requirement G3(4) will be met if:

the hot water outlet temperature is appropriate for the appliance being served, and any device to limit the maximum temperature that can be supplied at the outlet can not be easily altered by **building** users.

## General

**3.1** The delivered hot water can be considered as **heated wholesome water** or heated softened wholesome water where:

- a. the cold water supply to the hot water system is wholesome or softened wholesome; and
- b. the installation complies with the requirements of the Water Supply (Water Fittings) Regulations 1999 (SI 1999/1148 as amended).

**3.2** The Water Supply (Water Fittings) Regulations make provision for preventing contamination, waste, misuse, undue consumption and erroneous measurement of water supplied by a water undertaker or licensed water supplier. Guidance on the application of the Water Supply (Water Fittings) Regulations can be found in the Water Regulations Guide published by the Water Regulations Advisory Scheme.

**3.3** Attention is also drawn to the requirements of the Gas Safety (Installation and Use) Regulations 1994 (SI 1994/1886) for all gas installation work.

**3.4** Electrical work associated with hot water systems should be carried out in accordance with BS7671:2008 *Requirements for electrical installations* (IEE Wiring Regulations 17th Edition).

**3.5** For installations in dwellings and associated **buildings**, attention is drawn to Building Regulations 2010 Schedule 1 Part P (Electrical safety – Dwellings) and to Approved Document P.

**3.6** For workplaces and premises controlled in connection with a trade, business or other undertaking, attention is also drawn to the HSC publication *Legionnaires' Disease: Control of Legionella Bacteria in Water Systems. Approved code of practice and guidance*. L8, Health and Safety Commission 2000. ISBN 0 7176 1772 6.

**3.7** Pipework should be designed and installed in such a way as to minimise the transfer time between the **hot water storage system** and hot water outlets.

**3.8** The safety requirements for hot water systems used solely for supplying water for industrial processes is contained in the Pressure Systems Safety Regulations 2000 (SI 2000/128) and further guidance is available in *Safety of pressure systems. Pressure Systems Safety Regulations 2000. Approved Code of Practice* L122 HSE Books 2000. ISBN 0 7176 1767 X.

## Provision of hot water supply

**3.9** The Requirement G3 only requires the provision of a hot water supply to:

- a. any washbasin provided in association with a sanitary convenience in accordance with G4(2);
- b. any washbasin, bidet, fixed bath or shower in a bathroom in a dwelling or provided for rooms for residential purposes, provided in accordance with G5;
- c. any **sink** in a food preparation area, provided in accordance with G6.

There is no requirement under the Building Regulations to provide hot water to other washing facilities, but there may be such requirements under other legislation (see paragraphs 4.3, 4.4 and 6.4).

## Design and installation of directly or indirectly heated hot water storage systems

### General

**3.10** Hot water storage systems should be designed and installed in accordance with BS 6700:2006 + A1:2009 *Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages* or BS EN 12897:2006 *Water supply. Specification for indirectly heated unvented (closed) storage water heaters*.

**3.11** Hot water storage vessels should conform to BS 853-1:1996 *Specification for vessels for use in heating systems. Calorifiers and storage vessels for central heating and hot water supply*, BS 1566-1:2002 *Copper indirect cylinders for domestic purposes. Open vented copper cylinders. Requirements and test methods*, or BS 3198:1981 *Specification for copper hot water storage combination units for domestic purposes* or other relevant national standards as appropriate.

### Vented hot water storage systems

**3.12** Vented **hot water storage systems** should incorporate a vent pipe of an adequate size, but not less than 19mm internal diameter, connecting the top of the hot water storage vessel to a point open to the atmosphere above and over the level of the water in the cold water storage cistern.

**3.13** In addition to the vent pipe referred to in 3.12 and any thermostat provided to control the temperature of the stored water to a desired temperature, vented **hot water storage systems** should incorporate either:

- a. for all direct heat sources, a non-self-resetting energy cut-out to disconnect the supply of heat to the storage vessel in the event of the storage system overheating; and,
- for all indirect heat sources, an overheat

cut-out to disconnect the supply of heat to the storage vessel in the event of the stored water overheating so that the temperature of the stored water does not exceed 100°C; or

- b. an appropriate safety device, for example, a **temperature relief valve** or a **combined temperature and pressure relief valve** to safely discharge the water in the event of significant over heating.

**3.14** Vent pipes should discharge over a cold water storage cistern conforming to BS 417-2:1987 *Specification for galvanized low carbon steel cisterns, cistern lids, tanks and cylinders. Metric units*; or BS 4213:2004 *Cisterns for domestic use. Cold water storage and combined feed and expansion (thermoplastic) cisterns up to 500 litres. Specification*; as appropriate.

**3.15** The cold water storage cistern into which the vent pipe discharges should be supported on a flat, level, rigid platform which is capable of safely withstanding the weight of the cistern when filled with water to the rim and fully supporting the bottom of the cistern over the whole of its area. The platform should extend a minimum of 150mm in all directions beyond the edge of the maximum dimensions of the cistern.

**Note:** Where an existing metal cistern is replaced, or a plastic cistern is replaced by one with larger dimensions, the existing support should be upgraded, as necessary, with one in accordance with paragraph 3.15.

**3.16** The cistern should be accessible for maintenance, cleaning and replacement.

### Unvented hot water storage systems – all systems

**3.17** To minimize the danger from excessive pressure, unvented hot water storage systems should incorporate a minimum of two independent safety devices. These shall be in addition to any thermostat provided to control the desired temperature of the stored water. The selection of safety devices should take account of the physical location of the devices, and the design, configuration, location of components and performance characteristics of the system to which they are attached.

**3.18** An acceptable approach might consist of:

- a. a non self-resetting energy cut-out to disconnect the supply of heat to the storage vessel in the event of the storage system over-heating; and
- b. a temperature relief valve or a combined temperature and pressure relief valve to safely discharge the water in the event of serious over-heating.

Alternative approaches to this are acceptable provided that they provide an equivalent degree of safety.

**Note:** See 3.35 for suitability of devices for primary thermal stores

**3.19** Water heaters with a capacity of 15 litres or less that have appropriate safety devices for temperature and pressure will generally satisfy the requirement set out in G3(3).

**Unvented hot water storage systems – systems up to 500 litres capacity and 45kW power input**

**3.20** Paragraphs 3.21 to 3.24 are in addition to the provisions of 3.17 above.

**3.21** If an indirect supply of heat to an unvented **hot water storage system** incorporates a boiler, the energy cut-out may be on the boiler.

**3.22** Any unvented **hot water storage system** up to 500 litres and less than 45kW should be in the form of a proprietary **hot water storage system unit** or package. The package and components should be appropriate to the circumstances in which they are used and should satisfy an appropriate standard that will ensure the requirements of regulation G3(2) and G3(3) will be met (e.g. BS EN 12897:2006 *Water Supply. Specification for indirectly heated unvented (closed) hot water storage systems* or BS 6700:2006 + A1:2009 *Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages*).

**3.23** Any unvented **hot water storage system unit** or package should be indelibly marked with the following information:

- a. the manufacturer's name and contact details;
- b. a model reference;
- c. the rated storage capacity of the storage water heater;
- d. the operating pressure of the system and the operating pressure of the expansion valve;
- e. relevant operating data on each of the safety devices fitted; and
- f. the maximum primary circuit pressure and flow temperature of indirect **hot water storage system units** or **packages**.

**3.24** In addition, the following warning should be indelibly marked on the **hot water storage system unit** or package so that it is visible after installation:

**WARNING TO USER**

- a. Do not remove or adjust any component part of this unvented water heater; contact the installer.
- b. If this unvented water heater develops a fault, such as a flow of hot water from the discharge pipe, switch the heater off and contact the installer.

**WARNING TO INSTALLER**

- a. This installation is subject to the Building Regulations.
- b. Use only appropriate components for installation or maintenance.

Installed by:

Name .....

Address .....

Tel. No. ....

Completion date .....

### Unvented hot water storage systems – systems over 500 litres capacity or over 45kW power input

**3.25** Paragraph 3.26 and 3.27 are in addition to the provisions of 3.17 above.

**3.26** Systems over 500 litres capacity will generally be bespoke designs for specific projects and as such are inappropriate for approval by a third party accredited product conformity certification scheme. Where this is the case, the unvented **hot water storage system** should be designed to the safety requirements in 3.17 by an appropriately qualified engineer.

**3.27** Any unvented **hot water storage system** having a power input of more than 45kW, but a capacity of 500 litres or less should be in the form of a proprietary **hot water storage system unit** or package. The package and components should be appropriate to the circumstances in which they are used and should satisfy an appropriate standard that will ensure the requirement of regulation G3(2) and G3(3) will be met (e.g. BS EN 12897:2006 *Water Supply. Specification for indirectly heated unvented (closed) hot water storage systems* or BS 6700:2006 + A1:2009 *Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages*).

## Safety devices

### Non-self-resetting energy cut-outs

**3.28** Non-self-resetting energy cut-outs may only be used where they would have the effect of instantly disconnecting the supply of energy to the storage vessel.

**3.29** Non-self-resetting energy cut-outs should conform to:

- a. BS EN 60335-2-73:2003 *Specification for safety of household and similar electrical appliances. Particular requirements. Fixed immersion heaters* and BS EN 60730-2-9:2002 *Automatic electrical controls for household and similar use. Particular requirements for temperature sensing control*; or
- b. BS EN 257:1992 *Mechanical thermostats for gas-burning appliances*.

**3.30** Where a non self-resetting energy cut-out operates indirectly on another device (see paragraph 3.18) to interrupt the supply of heat (e.g. it is wired up to a motorised valve or some other suitable device to shut off the flow to the primary heater), the energy cut-out should comply with the relevant European Standard (see paragraph 3.29) or the supplier or installer should be able to demonstrate that the device has equivalent performance to that set out in relevant standards.

**3.31** Where an electrical device is connected to the energy cut-out, such as a relay or motorised valve, the device should operate to interrupt the

supply of energy if the electrical power supply is disconnected.

**3.32** Where there is more than one energy cut-out (see paragraph 3.35), each non-self-resetting energy cut-out should be independent (e.g. each should have a separate motorised valve and a separate temperature sensor).

**3.33** Where an energy cut-out is fitted as set out in paragraphs 3.13 a) or 3.18, each heat source should have a separate non self-resetting energy cut-out.

### Temperature and pressure relief devices

**3.34** Where relevant, appropriate pressure, temperature or temperature and pressure-activated safety devices should be fitted in addition to a safety device such as an energy cut-out.

**3.35** Temperature relief valves and **combined temperature and pressure relief valves** should not be used in systems which have no provision to automatically replenish the stored water (e.g. unvented primary thermal storage vessels). In such cases there should be a second non-self-resetting energy cut-out independent of the one provided in accordance with paragraph 3.18(a).

**3.36** Temperature relief valves should conform to relevant national standards such as BS 6283-2:1991 *Safety and control devices for use in hot water systems. Specifications for temperature relief valves for pressures from 1 bar to 10 bar. Combined temperature and pressure relief valves* should conform to BS EN 1490:2000 *Building valves. Combined temperature and pressure relief valves. Tests and Requirements*.

**3.37** **Temperature relief valves** (see paragraph 3.18) should be sized to give a discharge rating at least equal to the total power input to the hot water storage system, when measured in accordance with Appendix F of BS 6283-2:1991 or BS EN 1490:2000.

**3.38** **Temperature relief valve(s) or combined temperature and pressure relief valve(s)** (see paragraph 3.18) should be located directly on the storage vessel, such that the stored water does not exceed 100°C.

**3.39** In **hot water storage system units** and packages, the **temperature relief valve(s)** (see paragraph 3.18) should be:

- a. factory fitted and should not be disconnected other than for replacement; and
- b. not relocated in any other device or fitting installed.

**3.40** The safety and performance of an unvented system is dependent on the choice of system and safety devices appropriate for the location and correct installation of the system. Building owners and occupiers should therefore take care to choose installers who have the necessary skills to carry out this work. These skills can be demonstrated for example, by registration with a competent person scheme for

this type of work or by the holding of a current registered operative skills certification card for unvented hot water systems.

**3.41** The installation of an unvented system is notifiable building work which must be notified to the **BCB** before work commences. The **BCB** may then check to make sure the work is safe and meets current energy efficiency requirements.

**3.42** If the installer is registered with a competent person scheme for the installation of unvented hot water systems it will not be necessary for the work to be notified in advance to the **BCB**. Installers registered with such schemes will self-certify that the work complies with all relevant requirements in the Building Regulations and the building owner/occupier will be given a building regulations certificate of compliance which is usually issued by the competent person scheme operator.

## Electric water heating

**3.43** Electric fixed immersion heaters should comply with the provisions of BS EN 60335-2-73:2003 *Household and similar electrical appliances. Safety. Particular requirements for fixed immersion heaters*.

**3.44** Electric instantaneous water heaters should comply with the provisions of BS EN 60335-2-35:2002 *Specification for safety of household and similar electrical appliances*.

**3.45** Electric storage water heaters should comply with the provisions of BS EN 60335-2-21:2003 *Household and similar electrical appliances. Safety. Particular requirements for storage water heaters*.

## Solar water heating

**3.46** Factory-made solar water heating systems should comply with the provisions of BS EN 12976-1:2006 *Thermal solar systems and components. Factory made systems. General requirements*.

**3.47** Other solar water heating systems should comply with the provisions of prEN/TS 12977-1:2008 *Thermal solar systems and components. Custom built systems. General requirements for solar water heaters and combi systems*, or BS 5918:1989 *British Standard Code of Practice for Solar heating systems for domestic hot water as appropriate*. Further guidance is available in *CIBSE Guide G, Public Health Engineering and CIBSE technical guide Solar Heating Design and Installation*.

**3.48** Where solar water heating systems are used, an additional heat source should be available.

**Note:** The additional heat source should be used, when necessary, to maintain the water temperature to restrict microbial growth.

**3.49** As some solar hot water systems operate at elevated temperatures and pressures, and so all components should be rated to the appropriate temperatures and pressures.

## Discharge pipes from safety devices

### Discharge pipe D1

**3.50** Safety devices such as **temperature relief valves** or **combined temperature and pressure relief valves** (see paragraphs 3.13 or 3.18) should discharge either directly or by way of a manifold via a short length of metal pipe (D1) to a **tundish**.

**3.51** The diameter of discharge pipe (D1) should be not less than the nominal outlet size of the safety device, e.g. **temperature relief valve**.

**3.52** Where a manifold is used it should be sized to accept and discharge the total discharge from the discharge pipes connected to it.

**3.53** Where valves other than a **temperature and pressure relief valve** from a single unvented hot water system discharge by way of the same manifold that is used by the safety devices, the manifold should be factory fitted as part of the **hot water storage system unit** or package.

### Tundish

**3.54** The **tundish** should be vertical, located in the same space as the unvented **hot water storage system** and be fitted as close as possible to, and lower than, the safety device, with no more than 600mm of pipe between the valve outlet and the **tundish** (see Diagram 1).

**Note:** To comply with the Water Supply (Water Fittings) Regulations, the **tundish** should incorporate a suitable air gap.

**3.55** Any discharge should be visible at the **tundish**. In addition, where discharges from safety devices may not be apparent, e.g. in dwellings occupied by people with impaired vision or mobility, consideration should be given to the installation of a suitable safety device to warn when discharge takes place, e.g. electronically operated.

### Discharge pipe D2

**3.56** The discharge pipe (D2) from the **tundish** should:

- have a vertical section of pipe at least 300mm long below the **tundish** before any elbows or bends in the pipework (see Diagram 1); and
- be installed with a continuous fall of at least 1 in 200 thereafter.

**3.57** The discharge pipe (D2) should be made of:

- metal; or
- other material that has been demonstrated to be capable of safely withstanding temperatures of the water discharged and is clearly and permanently marked to identify

the product and performance standard (e.g. as specified in the relevant part of BS 7291-1:2006 *Thermostatic pipes and fittings for hot and cold water for domestic purposes and heating installations in buildings. General requirements*).

**3.58** The discharge pipe D2 should be at least one pipe size larger than the nominal outlet size of the safety device unless its total equivalent hydraulic resistance exceeds that of a straight pipe 9m long, i.e. for discharge pipes between 9m and 18m the equivalent resistance length should be at least two sizes larger than the nominal outlet size of the safety device; between 18 and 27m at least 3 sizes larger, and so on; bends must be taken into account in calculating the flow resistance. See Diagram 1, Table 3.1 and the worked example.

**Note:** An alternative approach for sizing discharge pipes would be to follow Annex D, section D.2 of BS 6700:2006 + A1:2009 *Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages*.

Diagram 1 Typical discharge pipe arrangement

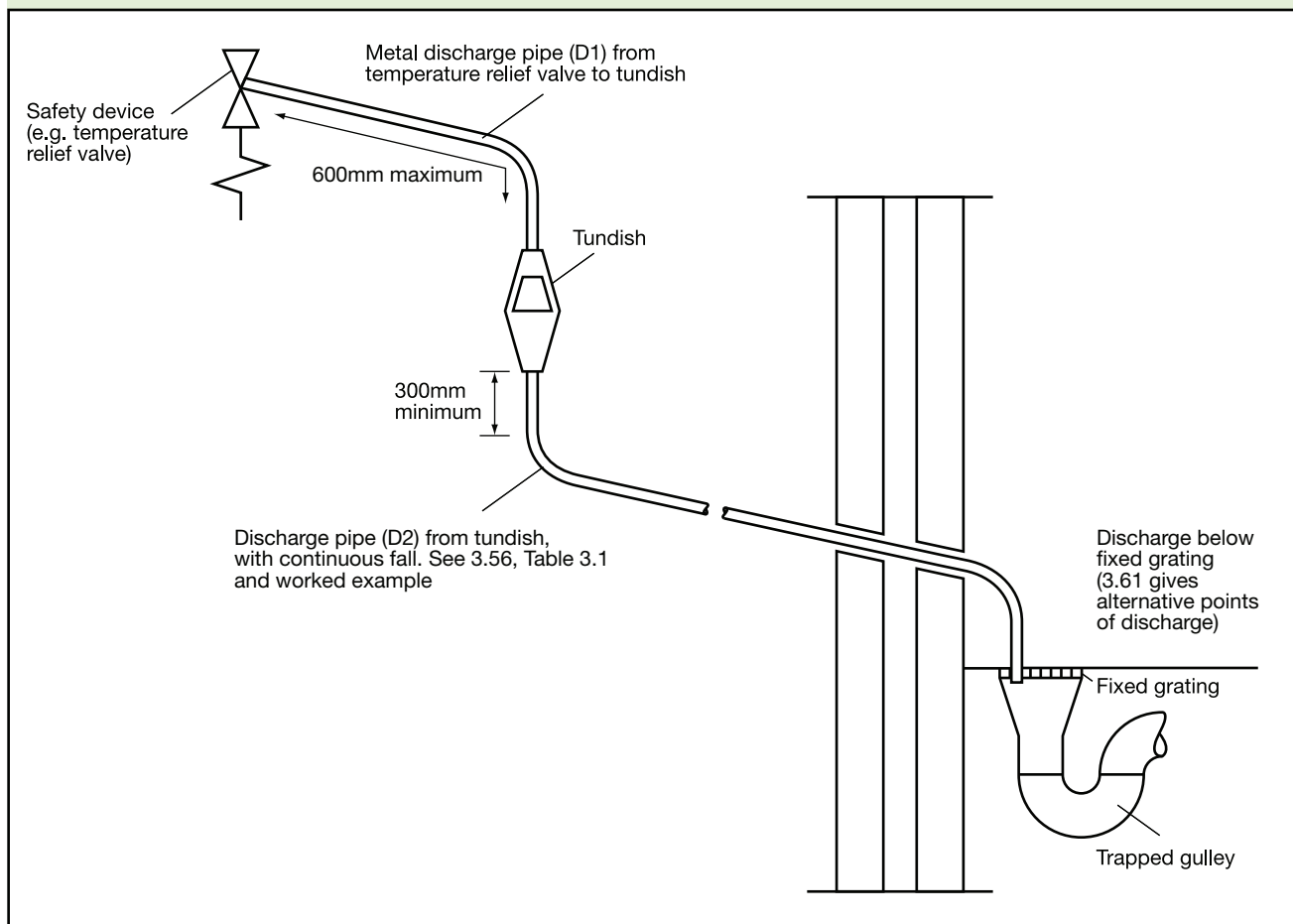


Table 3.1 Sizing of copper discharge pipe 'D2' for common temperature relief valve outlet sizes

Valve outlet size	Minimum size of discharge pipe D1*	Minimum size of discharge pipe D2* from tundish	Maximum resistance allowed, expressed as a length of straight pipe (i.e. no elbows or bends)	Resistance created by each elbow or bend
G½	15mm	22mm	Up to 9m	0.8m
		28mm	Up to 18m	1.0m
		35mm	Up to 27m	1.4m
G¾	22mm	28mm	Up to 9m	1.0m
		35mm	Up to 18m	1.4m
		42mm	Up to 27m	1.7m
G1	28mm	35mm	Up to 9m	1.4m
		42mm	Up to 18m	1.7m
		54mm	Up to 27m	2.3m

\*see 3.51 and 3.58 and Diagram 1

**Note:** The above table is based on copper tube. Plastic pipes may be of different bore and resistance.

Sizes and maximum lengths of plastic should be calculated using data prepared for the type of pipe being used.

### Worked example:

The example below is for a G½ **temperature relief valve** with a discharge pipe (D2) having 4 No. 22mm elbows and length of 7m from the **tundish** to the point of discharge.

From Table 3.1:

Maximum resistance allowed for a straight length of 22mm copper discharge pipe (D2) from a G½ **temperature relief valve** is: 9.0m

Subtract the resistance for 4 No. 22mm elbows at 0.8m each = 3.2m

Therefore the maximum permitted length equates to 5.8m which, is less than the actual length of 7m therefore calculate the next largest size.

Maximum resistance allowed for a straight length of 28mm copper discharge pipe (D2) from a G½ **temperature relief valve** is: 18m

Subtract the resistance for 4 No. 28mm elbows at 1.0m each = 4m

Therefore the maximum permitted length equates to: 14m

As the actual length is 7m, a 28mm (D2) copper pipe will be satisfactory.

**3.59** Where a single common discharge pipe serves more than one system, it should be at least one pipe size larger than the largest individual discharge pipe (D2) to be connected.

**3.60** The discharge pipe should not be connected to a soil discharge stack unless it can be demonstrated that the soil discharge stack is capable of safely withstanding temperatures of the water discharged, in which case, it should:

- contain a mechanical seal, not incorporating a water trap, which allows water into the branch pipe without allowing foul air from the drain to be ventilated through the **tundish**;
- be a separate branch pipe with no **sanitary appliances** connected to it;
- if plastic pipes are used as branch pipes carrying discharge from a safety device, they should be either polybutylene (PB) or cross-linked polyethylene (PE-X) complying with national standards such as Class S of BS 7291-2:2006 or Class S of BS 7291-3:2006 respectively; and
- be continuously marked with a warning that no **sanitary appliances** should be connected to the pipe.

### Notes:

- Plastic pipes should be joined and assembled with fittings appropriate to the circumstances in which they are used as set out in

BS EN ISO 1043-1:2002 *Plastics. Symbols and abbreviated terms. Basic polymers and their special characteristics.*

- Where pipes cannot be connected to the stack it may be possible to route a dedicated pipe alongside or in close proximity to the discharge stack

### Termination of discharge pipe

**3.61** The discharge pipe (D2) from the **tundish** should terminate in a safe place where there is no risk to persons in the vicinity of the discharge.

**3.62** Examples of acceptable discharge arrangements are:

- to a trapped gully with the end of the pipe below a fixed grating and above the water seal;
- downward discharges at low level; i.e. up to 100mm above external surfaces such as car parks, hard standings, grassed areas etc. are acceptable providing that a wire cage or similar guard is positioned to prevent contact, whilst maintaining visibility; and,
- discharges at high level: e.g. into a metal hopper and metal downpipe with the end of the discharge pipe clearly visible or onto a roof capable of withstanding high temperature discharges of water and 3 m from any plastic guttering system that would collect such discharges.

**3.63** The discharge would consist of high temperature water and steam. Asphalt, roofing felt and non-metallic rainwater goods may be damaged by such discharges.

## Prevention of excessive temperatures

**3.64** Where the operating temperature of **domestic hot water** in the storage vessel in a dwelling is capable of exceeding 80°C under normal operating conditions (a situation that may occur in vessels used as heat stores and those connected to solar heat collectors or solid fuel boilers that do not have intervening controls between the boiler and the vessel containing the hot water) the outlet from the storage vessel should be fitted with a device, such as an in-line hot water supply tempering valve in accordance with BS EN 15092:2008 *Building Valves. In-line hot water tempering valves*, to ensure that the temperature supplied to the **domestic hot water** distribution system does not exceed 60°C.

## Prevention of scalding

**3.65** The hot water supply temperature to a bath should be limited to a maximum of 48°C by use of an in-line blending valve or other appropriate temperature control device, with a maximum temperature stop and a suitable arrangement of pipework.

**3.66** The acceptability of in-line blending valves can be demonstrated by compliance with the relevant European Standard such as BS EN 1111:1999 *Sanitary tapware. Thermostatic mixing valves (PN 10). General technical specification* or BS EN 1287:1999 *Sanitary tapware. Low pressure thermostatic mixing valves. General technical specifications* to demonstrate that the maximum temperature of 48°C cannot be exceeded in operation and that the product will fail-safe (i.e. not discharge water above the maximum temperature). Such valves should not be easily altered by **building** users.

**3.67** In-line blending valves and composite thermostatic mixing valves should be compatible with the sources of hot and cold water that serve them.

**3.68** The length of supply pipes between in-line blending valves and outlets should be kept to a minimum in order to prevent the colonisation of waterborne pathogens. If intermittent use of the bath is anticipated, provision should be made for high temperature flushing to allow pasteurisation of the pipes and outlet fittings. Such events should be managed to prevent the risk associated with inadvertent use.

### Notes:

1. Further guidance on the use of in-line blending valves can be found in BRE Information paper IP14/03 *Preventing hot water scalding in bathrooms: using TMVs*

2. In some **buildings**, e.g. care homes, in-line blending valves would need to meet the additional performance standards set out in *NHS Estates Model specification D 08*

## Installation

**3.69** Good workmanship is essential. Workmanship should be in accordance with appropriate standards such as BS 8000-15:1990 *Workmanship on Building Sites Code of practice for hot and cold water services (domestic scale)*.

## Commissioning of fixed building services

**3.70** Water heaters require the input of energy to raise the temperature of water. It is therefore necessary to ensure their efficiency by proper installation and commissioning.

**3.71** Fixed **building** services, including controls, should be commissioned by testing and adjusting as necessary to ensure that they use no more fuel and power than is reasonable in the circumstances.

**3.72** Commissioning means the advancement of these systems from the state of static completion to working order to achieving compliance with Part L. For each system it includes setting-to-work, regulation (that is testing and adjusting repetitively) to achieve the specified performance, the calibration, setting up and testing of the associated automatic control systems, and recording of systems and the performance test results that have been accepted as satisfactory.

**3.73** Not all fixed **building** services will need to be commissioned. For example, with some systems it is not possible as the only controls are 'on' and 'off' settings. In other cases commissioning would be possible but in the specific circumstances would have no effect on energy use.

**3.74** Where commissioning is carried out it must be done in accordance with a procedure approved by the Secretary of State. For new and existing dwellings the approved procedure for hot water systems is set out in the *Domestic Heating Compliance Guide*; for **buildings** other than dwellings in *CIBSE Commissioning Code M*.

**3.75** Commissioning must be carried out in such a way as not to prejudice compliance with any applicable health and safety requirements.

**3.76** Commissioning is often carried out by the person who installs the system. Sometimes it may be carried out by a subcontractor or by a specialist firm. It is important that whoever carries it out follows the relevant approved procedure in doing so.

## Notice of completion of commissioning

**3.77** The Building Regulations (regulation 20C(2)) and the Building (Approved Inspectors etc.) Regulations (regulation 20(1) and (6)) require that the person carrying out the work shall give a notice to the relevant BCB that commissioning has been carried out according to a procedure approved by the Secretary of State, unless testing and adjustment is not possible, or would not affect the energy efficiency of the fixed **building** service.

**3.78** Where the work is carried out in accordance with a **building** notice, or full plans, or an initial notice or amendment notice, the notice of commissioning should be given not more than 5 days after the completion of the commissioning work. In other cases, for example where work is carried out by a person registered with a competent person scheme, it must be given not more than 30 days after the completion of work.

**3.79** Where the installation of fixed building services which require commissioning is carried out by a person registered with a competent person scheme the notice of commissioning will be given by that person.

**3.80** Until the BCB receives notice of commissioning it is unlikely to be satisfied that Part G has been complied with and consequently is unlikely to be able to give a completion/final certificate.

## The Requirement G4

This Approved Document deals with the following Requirement from Part G of Schedule 1 to the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>Sanitary conveniences and washing facilities</b>	
<b>G4</b> (1) Adequate and suitable sanitary conveniences must be provided in rooms provided to accommodate them or in bathrooms.	
(2) Adequate hand washing facilities must be provided in:	
(a) rooms containing sanitary conveniences; or	
(b) rooms or spaces adjacent to rooms containing sanitary conveniences.	
(3) Any room containing a sanitary convenience, a bidet, or any facility for washing hands provided in accordance with paragraph (2)(b), must be separated from any kitchen or any area where food is prepared.	

# Guidance

## Performance

In the Secretary of State's view Requirement G4 will be met if:

- a. Sanitary conveniences of the appropriate type for the sex and age of the persons using the **building** are provided in sufficient numbers, taking into account the nature of the **building**; and
- b. hand washing facilities are provided in, or adjacent to, rooms containing **sanitary conveniences** and are sited, designed and installed so as not to be prejudicial to health.

## General

**4.1** Attention is also drawn to the requirements for accessible **sanitary conveniences** and hand washing facilities of Part M (Access to and use of buildings) of Schedule 1 to the Building Regulations 2010 and to Approved Document M and to the Regulators' performance specification made under the Water Supply (Water Fittings) Regulations 1999 (SI 1999/1148 as amended) for WC suites.

**4.2** Requirement for ventilation is in Part F (Ventilation) of Schedule 1 to the Building Regulations 2010. Guidance on ventilation of **sanitary accommodation** is given in Approved Document F.

**4.3** The number, type and siting of **sanitary conveniences**, including separate provision for men and women, for staff in workplaces are also subject to the Workplace (Health, Safety and Welfare) Regulations 1992. Attention is drawn to the Approved Code of Practice issued with respect to those Regulations.

**4.4** Further guidance on washbasins associated with **sanitary conveniences** may be found in the Food Standards Agency's Code of Practice *Food hygiene – a guide for businesses*.

**4.5** Guidance on the selection, installation and maintenance of **sanitary appliances** including composting toilets may be found in BS 6465-3:2006 *Sanitary installations. Code of practice for the selection, installation and maintenance of sanitary and associated appliances*.

**4.6** Where hot and cold taps are provided on a **sanitary appliance**, the hot tap should be on the left.

## Scale of provision and layout in dwellings

**4.7** Any dwelling (house or flat) should have at least one **sanitary convenience** and associated hand washing facility. This will include a **WC** provided in accordance with requirement M4(1) (Sanitary conveniences in dwellings) of Schedule 1 to the Building Regulations 2010 and with Approved Document M, Volume 1.

**Note:** Requirement M4(1) requires that a **sanitary convenience** should be located in the principal/entrance storey of a dwelling.

**4.8** Where additional **sanitary conveniences** are provided, each should have an associated hand washing facility.

**4.9** To allow for basic hygiene, hand washing facilities should be located in:

- a. the room containing the **sanitary convenience**; or
- b. an adjacent room or place that provides the sole means of access to the room containing the **sanitary convenience** (provided that it is not used for the **preparation of food**).

**4.10** A place containing a **sanitary convenience** and/or associated hand washing facilities should be separated by a door from any place used for the **preparation of food** (including a **kitchen**) (see Diagrams 2 and 3).

**Note:** In dwellings, a room containing both a **sanitary convenience** and a basin for hand washing does not need a separation lobby between this room and a **kitchen** or food preparation area (Diagram 2). The layout for a room containing a **sanitary convenience** only should be such that the room or space containing its associated hand washing facilities is accessed before entry to a food preparation area, and is separated from that area by a door (Diagram 3).

**4.11** Guidance on the provision of activity space around **sanitary appliances** is given in BS 6465-2:1996 *Sanitary installations. Code of practice for space requirements for sanitary appliances*.

Diagram 2 **Separation between hand washbasin/WC and food preparation area – single room**

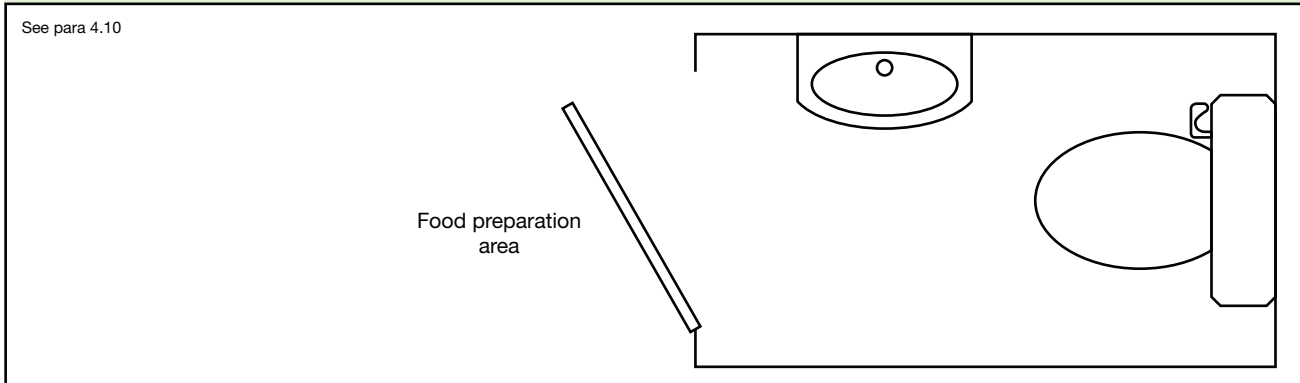
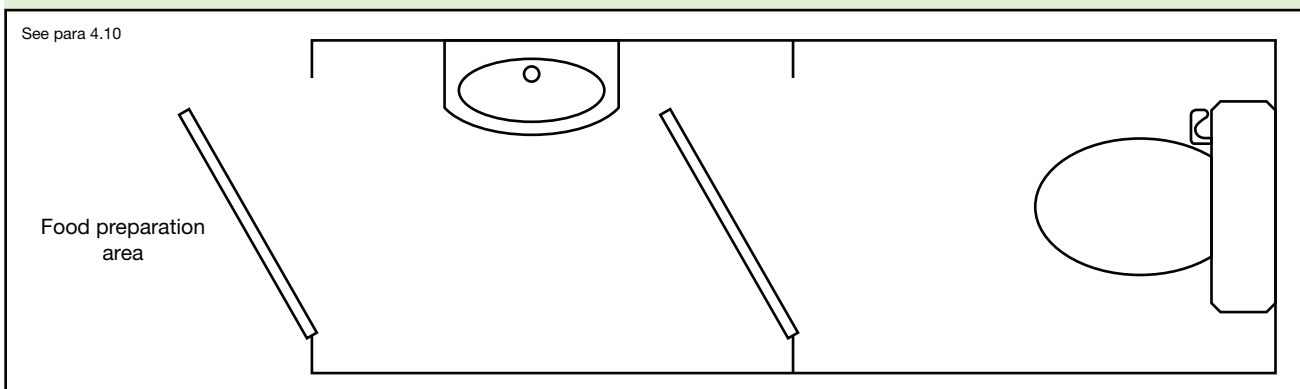


Diagram 3 **Separation between hand washbasin/WC and food preparation area – two rooms**



## Scale of provision and layout in buildings other than dwellings

**4.12** The Workplace (Health, Safety and Welfare) Regulations 1992 require that a minimum number of sanitary conveniences must be provided in workplaces. The Approved Code of Practice (ACOP) that supports those Regulations sets out how to calculate that minimum requirement (guidance on those minimum numbers can be found at <http://www.hse.gov.uk/pubns/indg293.pdf>).

**4.13** Part M of Schedule 1 to the Building Regulations 2010 sets out requirements relating to access to and use of buildings. Approved Document M provides guidance on the provision of suitable **sanitary accommodation**. Such accommodation may form part of the total number of **sanitary conveniences** provided within a **building**.

**4.14** Further guidance on the provision of sanitary conveniences can be found in BS 6465-1:2006 + A1:2009 *Sanitary installations. Code of practice for the design of sanitary facilities and scales of provision of sanitary and associated appliances*. This may be used for those building types not set out in paragraph 4.12 above or for those workplaces where the applicant wishes to provide more than the minimum recommended in the Approved Code of Practice, for example, to deliver equivalent provision for men and women.

**4.15** A **sanitary convenience** may be provided in:

- a self-contained room which also contains hand washing facilities;
- in a cubicle with shared hand washing facilities located in a room containing a number of cubicles; or
- in a self-contained room with hand washing facilities provided in an adjacent room.

**4.16** Urinals, WC cubicles and hand washing facilities may be in the same room.

**4.17** A place containing a **sanitary convenience** and/or associated hand washing facilities should be separated by a door from any place used for the **preparation of food** (including a **kitchen**).

**Note:** For workplaces, the Workplace (Health, Safety and Welfare) Regulations 1992 apply to the separation of a place containing a **sanitary convenience** and/or associated hand washing facilities and a workplace.

**4.18** Guidance on the provision of activity space around **sanitary appliances** is given in BS 6465-2:1996 *Sanitary installations. Code of practice for space requirements for sanitary appliances*.

## Chemical and composting toilets

**4.19** Chemical toilets or composting toilets may be used where:

- a. suitable arrangements can be made for the disposal of the waste either on or off the site; and
- b. the waste can be removed from the premises without carrying it through any living space or food preparation areas (including a **kitchen**); and
- c. no part of the installation would be installed in any places where it might be rendered ineffective by the entry of flood water.

**4.20** There are currently no British or European standards for composting toilets. Appropriate guidance can be found in ANSI/NSF 41:2005 as amended by Addendum 1:2007 *Non-liquid saturated treatment system*.

**4.21** Composting toilets should not be connected to an energy source other than for purposes of ventilation or sustaining the composting process.

## Discharges to drains

**Note:** See Approved Document for requirement H1 *Sanitary pipework and drainage* for guidance on provision for traps, branch discharge pipes, discharge stacks and foul drains.

**4.22** Any **WC** fitted with flushing apparatus should discharge to an adequate system of drainage.

**4.23** A **urinal** fitted with flushing apparatus should discharge through a grating, a trap or mechanical seal and a branch pipe to a discharge stack or a drain.

**4.24** A **WC** fitted with a macerator and pump may be connected to a small bore drainage system discharging to a discharge stack if:

- a. there is also access to a **WC** discharging directly to a gravity system; and
- b. the macerator and pump meets the requirements of BS EN 12050-1:2001 *Wastewater lifting plants for buildings and sites. Principles of construction and testing. Lifting plants for wastewater containing faecal matter* or BS EN 12050-3:2001 *Wastewater lifting plants for buildings and sites. Principles of construction and testing. Lifting plants for wastewater containing faecal matter for limited applications*.

**Note:** Where **greywater** recycling is used, lower overall flows are to be expected and this should be taken into account in drain design. This is particularly relevant at the head of the drain where only one **building** is connected to the drain.

# The Requirement G5

This Approved Document deals with the following requirement from Part G of Schedule 1 to the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>Bathrooms</b> <b>G5</b> A bathroom must be provided containing a wash basin and either a fixed bath or a shower.	Requirement G5 applies only to dwellings and to buildings containing one or more rooms for residential purposes.

# Guidance

## Performance

In the Secretary of State's view Requirement G5 will be met if a bathroom is provided containing a fixed bath or shower, and a washbasin.

## General

**5.1** The Water Supply (Water Fittings) Regulations 1999 (SI 1999/1148) make provisions for appropriate backflow protection on taps including mixer fittings and hose connections.

**5.2** Requirements for ventilation are in Part F of Schedule 1 to the Building Regulations 2010 (Ventilation). Guidance on ventilation of **sanitary accommodation** is given in Approved Document F.

**5.3** Requirements for electrical safety are given in Part P of Schedule 1 to the Building Regulations 2010 (Electrical safety). Guidance is given in Approved Document P.

**5.4** Guidance on the selection, installation and maintenance of **sanitary appliances** may be found in BS 6465-3:2006 *Sanitary installations. Code of practice for the selection, installation and maintenance of sanitary and associated appliances*.

**5.5** Where hot and cold taps are provided on a **sanitary appliance**, the hot tap should be on the left.

## Scale of provision and layout in dwellings

**5.6** Any dwelling (house or flat) must have at least one bathroom with a fixed bath or shower, and a washbasin.

**5.7** Guidance on the provision of activity space around **sanitary appliances** is given in BS 6465-2:1996 *Sanitary installations. Code of practice for space requirements for sanitary appliances*.

## Scale of provision and layout in buildings with rooms for residential purposes

**5.8** The number of fixed baths or showers and washbasins in **buildings** with rooms for residential purposes should be in accordance with BS 6465-1:2006 and A1:2009 *Sanitary installations. Code of practice for the design of sanitary facilities and scales of provision of sanitary and associated appliances*.

## Discharges to drains

**Note:** See Approved Document for Requirement H1 *Sanitary pipework and drainage* for guidance on provision for traps, branch discharge pipes, discharge stacks and foul drains.

**5.9** Any **sanitary appliance** used for personal washing should discharge through a grating, a trap and a branch discharge pipe to an adequate system of drainage.

**5.10** A **sanitary appliance** used for personal washing fitted with a macerator and pump may be connected to a small bore drainage system discharging to a discharge stack if:

- a. there is also access to washing facilities discharging directly to a gravity system; and
- b. the macerator and pump meets the requirements of BS EN 12050-2:2001 *Wastewater lifting plants for buildings and sites. Principles of construction and testing. Lifting plants for faecal-free wastewater*.

## The Requirement G6

This Approved Document deals with the following requirement from Part G of Schedule 1 to the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>Food preparation areas</b>	
<b>G6</b> A suitable sink must be provided in any area where food is prepared.	

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# Guidance

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## Performance

In the Secretary of State's view Requirement G6 will be met if a **sink** is provided in any place used for the **preparation of food** (including a **kitchen**).

Where a dishwasher is provided in a separate room, an additional **sink** need not be provided in that room.

## Scale of provision in dwellings

**6.1** A **sink** should be provided in any **kitchen** or place used for the **preparation of food**.

**6.2** Where a dishwasher is provided in a separate room that is not the principal place for the **preparation of food**, an additional **sink** need not be provided in that room.

## Scale of provision in buildings other than dwellings

**6.3** In all **buildings** other than dwellings, there should be at least the same provision as described in 6.1.

**6.4** In **buildings** where the Food Hygiene (England) Regulations 2006 (SI 2006/14) and the Food Hygiene (Wales) Regulations 2006 (SI 2006/31 W5) apply, separate hand washing facilities may be needed. This is in addition to any hand washing facilities associated with WCs in accordance with Requirement G4.

## Discharges to drains

**Note:** See Approved Document for Requirement H1 *Sanitary pipework and drainage* for guidance on provision for traps, branch discharge pipes, discharge stacks and foul drains.

**6.5** Any **sink** should discharge through a grating, a trap and a branch discharge pipe to an adequate system of drainage.

# Appendix A – Water efficiency calculator for new dwellings

## The water efficiency calculation methodology

**A1** This appendix sets out the water efficiency calculation methodology for assessing the whole house potable water consumption in new dwellings. The calculation methodology is to be used to assess compliance against the water performance targets in Regulation 36 as set out below. It is not a design tool for water supply and drainage systems. It is also not capable of calculating the actual potable water consumption of a new dwelling. Behaviour and changing behaviour can also have an effect on the amount of potable water used throughout a home.

Performance target	Maximum calculated consumption of potable water (litres/person/day)
Regulation 36 para (2)a	125
Regulation 36 optional requirement para (2)b	110

**A2** The calculation methodology requires the use of water consumption figures provided from manufacturers' product details. Before the assessment can be carried out, figures will need to be collected from manufacturers' product information to determine the consumption of each terminal fitting, including:

### a. WCs

- Flushing capacity for the WC suite including consumption at full and part flush for dual flush WCs.
- Where multiple WCs are specified with various flushing capacities, the average effective flushing volume must be used as set out in paragraphs A8 and A11.

### b. Bidets

- Bidets are excluded from the water efficiency calculator for new dwellings due to their minimal water consumption, and although there is insufficient research to quantify this consumption, anecdotal evidence shows that there is evidence that bidets often displace other water consumption rather than increase consumption.

### c. Taps

- Flow rate of each tap, at full flow rate in litres per minute measured at a dynamic pressure of  $3 \pm 0.2$  bar ( $0.3 \pm 0.02$  MPa) for high pressure (Type 1) taps, or at a dynamic pressure of  $0.1 \pm 0.02$  bar ( $0.01 \pm 0.002$  MPa) for low pressure (Type 2) taps (BS EN 200:2008, sanitary

tapware, single taps and combination taps for supply systems of type 1 and 2. General technical specifications) including any reductions achieved with flow restrictions.

- Where multiple taps are to be provided (e.g. separate hot and cold taps) the flow rate of each tap will be needed in order to calculate an average flow rate in accordance with paragraphs A8 to A10.
- For 'click taps' and other taps with a 'water break', the manufacturer's stated full flow rate should be used to perform calculations (measured as described above). Do not use the flow rate at the break point. A factor for percentage of flow rate is already assumed within the use factor for taps. There is currently no research to provide a separate use factor for 'click taps' so a standard use factor is applied.
- Taps on baths should not be included in the calculation as the water consumption from bath taps is taken account of in the use factor for baths.

### d. Baths

- Total capacity of the bath to overflow, in litres (excluding displacement, this is already included in the use factor for baths).
- Where multiple baths are specified with various capacities, the average must be used as set out in paragraphs A8 to A10.
- Spa hot tubs are not included in the water efficiency calculator as they are generally not filled on a daily basis and their water consumption over a year is minimal.

### e. Dishwashers

- Litres per place setting derived from the value quoted on the EU Energy Label, i.e. annual water use  $\div$  ( $280 \times$  number of place settings).
- Where no dishwasher is to be provided and therefore consumption figures are unknown, a figure of 1.25 litres per place setting must be assumed.
- Where multiple dishwashers are specified with various consumptions, the average must be used as set out in paragraphs A8 to A10.

### f. Washing machines

- Litres per kilogram of dry load derived from the value quoted on the EU Energy Label, i.e. annual water use  $\div$  ( $220 \times$  capacity in kg).

- ii. Where no washing machine is to be provided and therefore consumption figures are unknown, a figure of 8.17 litres per kilogram must be assumed.
- iii. Where multiple washing machines are specified with various consumptions, the average must be used as set out in paragraphs A8 to A10.
- g. Showers
  - i. Flow rate of each shower at the outlet using cold water ( $T \leq 30^{\circ}\text{C}$ ), in litres per minute measured at a dynamic pressure of  $3 \pm 0.2$  bar ( $0.3 \pm 0.02$  MPa) for high pressure (Type 1) supply systems, or at a dynamic pressure of  $0.1 \pm 0.05$  bar ( $0.01 \pm 0.005$  MPa) for low pressure (Type 2) supply systems (BS EN 1112:2008, Sanitary tapware. Shower outlets for sanitary tapware for water supply systems type 1 and 2. General technical specifications).
  - ii. Where multiple showers are specified with various flow rates, the average must be used as set out in paragraphs A8 to A10.
- h. Water softeners (where present)
  - i. Percentage of total capacity used per regeneration cycle.
  - ii. Water consumed per regeneration cycle (litres).
  - iii. Average number of regeneration cycles per day.
  - iv. Number of occupants (based on two occupants in the first bedroom and one occupant per additional bedroom assuming two occupants in studio flats).
  - v. Water softeners that do not have a water consumption such as electromagnetic types, are not included in the calculation.
- i. Waste disposal units (where present)
  - i. Where present, a standard consumption of 3.08 litres per person per day must be assumed.
- j. External taps
  - i. Flow rates of external taps are not included in the calculation as a fixed allowance of five litres per person per day is assumed for external water use.
- a. Greywater (in accordance with BS 8525)
  - i. Manufacturer or system designer details on the percentage of used water to be recycled, taking into account the storage capacity of the system.
  - ii. The volume of recycled water collected from waste bath, shower and washhand basin, dishwasher and washing machine usage, with the volume collected calculated in accordance with Table A1 or Tables A4.3, A4.4 and A4.5.
  - iii. The consumption of fittings where greywater is to be used in accordance with Table A1 which can include WCs and washing machines or Tables A4.1 and A4.2 where greywater is just being used in a proportion of fittings.
- b. Rainwater (in accordance with BS 8515)
  - i. Collection area
  - ii. Yield co-efficient and hydraulic filter efficiency
  - iii. Rainfall (average mm/year)
  - iv. Daily non-potable water demand

**A4** Large water consuming installations such as swimming pools and spa hot tubs where the water is replaced over a greater time interval do not need to be included as part of the water calculations.

## Calculation tables

**A5** Figures from manufacturers' product details should be entered into Table A1 to calculate the consumption of each fitting in litres per person per day. Where there are multiple fittings of the same type that have various flow rates or capacities (e.g. hot and cold taps with different flow rates), Tables A2.1 to A2.7 should be used to determine the average flow rate or capacity of such fittings. The consumption of water softeners in litres per person per day is calculated using Table A3. All values throughout the water efficiency calculator should be rounded to two decimal places with the exception of the total water consumption figures, which should be rounded to one decimal place.

**A6** The total calculated use, resulting from Table A1, is the total consumption of all water consuming fittings per person. To calculate the litres of water consumed per person per day, any savings from grey or rainwater need to be deducted from the total calculated use using figures from Tables A4.6 and A5.5. The litres/person/day figure is then multiplied by a normalisation factor to determine the total water consumption per person.

**A7** To calculate the total water consumption, an additional allowance for external water use is added on to the total water consumption. This figure is set at 5 litres/person/day.

**A3** In some cases rainwater harvesting and greywater recycling may be used as a means of reducing water consumption to achieve higher water efficiency performance levels. This may be needed where options for improving the efficiency of terminal fittings (taps, WCs etc.) have been maximised and further savings are still needed:

**Table A1: The water efficiency calculator**

		(1)	(2)	(3)	(4)
Installation type	Unit of measure	Capacity/flow rate	Use factor	Fixed use (litres/person/day)	Litres/person/day = [(1) × (2)] + (3)
<b>WC</b> (single flush)	Flush volume (litres)		4.42	0.00	
<b>WC</b> (dual flush)	Full flush volume (litres)		1.46	0.00	
	Part flush volume (litres)		2.96	0.00	
<b>WCs</b> (multiple fittings)	Average effective flushing volume (litres)		4.42	0.00	
<b>Taps</b> (excluding kitchen/utility room taps)	Flow rate (litres/minute)		1.58	1.58	
<b>Bath</b> (where shower also present)	Capacity to overflow (litres)		0.11	0.00	
<b>Shower</b> (where bath also present)	Flow rate (litres/minute)		4.37	0.00	
<b>Bath only</b>	Capacity to overflow (litres)		0.50	0.00	
<b>Shower only</b>	Flow rate (litres/minute)		5.60	0.00	
<b>Kitchen/utility room sink taps</b>	Flow rate (litres/minute)		0.44	10.36	
<b>Washing machine</b>	Litres/kg dry load		2.1	0.00	
<b>Dishwasher</b>	Litres/place setting		3.6	0.00	
<b>Waste disposal unit</b>	Litres/use	If present = 1 If absent = 0	3.08	0.00	
<b>Water softener</b>	Litres/person/day		1.00	0.00	
	<b>(5)</b>	<b>Total calculated use = (Sum column 4)</b>			
	<b>(6)</b>	Contribution from greywater (litres/person/day) from Table 4.6			
	<b>(7)</b>	Contribution from rainwater (litres/person/day) from Table 5.5			
	<b>(8)</b>	Normalisation factor			0.91
	<b>(9)</b>	Total water consumption = [ (5) – (6) – (7) ] × (8)			
	<b>(10)</b>	External water use			5.0
	<b>(11)</b>	<b>Total water consumption = (9) + (10) (litres/person/day)</b>			

### Consumption from multiple fittings

**A8** Where terminal fittings with varying flow rates and capacities are specified (e.g. hot and cold taps with different flow rates, two types of shower etc.), the average consumption should be calculated as set out in Tables A2.1 to A2.7:

- Enter the full flow rate or volume of each type of fitting into column (a) of the relevant table.
- For taps, where there are separate hot and cold water taps, the flow rate of each tap should be entered separately as two tap types to calculate the average flow rate.
- Calculate the total consumption per fitting type.
- Calculate the average flow rate/volume of the fittings detailed.

- Enter the flow rate/volume of the fitting with the highest flow rate/volume into box (f) with the exception of WCs, where this step is not relevant.
- Calculate the proportionate flow rate/volume by multiplying the highest flow rate/volume by a factor of 0.7 with the exception of WCs, where this step is not relevant.

**A9** Where the average flow rate/volume is lower than the proportionate flow rate/volume, the proportionate figure must be entered into Table A1. The proportionate figure limits the flow rate/volume that can be specified to a proportion equal to 70 per cent of the highest flow rate/volume. This reduces the benefit of specifying ultra low fittings to bring the average flow rate/volume down, where such ultra low fittings may not be acceptable to dwellings occupants.

**A10** The figure which is the greater of the average or proportionate flow rate/volume should be used. This is so that, where the average flow rate/volume is significantly lower than the highest flow rate/volume specified, the calculation sets a limitation for what figure can be assumed.

**Table A2.1: Consumption calculator for multiple taps (excluding kitchen sink taps)**

	(a)	(b)	(c)
Tap fitting type	Flow rate (litres/min)	Quantity (No.)	Total per fitting type = [(a) × (b)]
1			
2			
3			
4			
(d)	Total (Sum of all quantities)		
(e)	Total (Sum of all totals per fitting type)		
Average flow rate (litres/min) = [(e)/(d)]			
(f)	Maximum flow rate (litres/min)		
Proportionate flow rate (litres/min) = [(f) × 0.7]			

**Table A2.2: Consumption calculator for multiple baths**

	(a)	(b)	(c)
Bath fitting type	Capacity to overflow (litres)	Quantity (No.)	Total per fitting type = [(a) × (b)]
1			
2			
3			
4			
(d) Total (Sum of all quantities)			
(e) Total (Sum of all totals per fitting type)			
Average capacity to overflow = [(e)/(d)]			
(f) Highest capacity to overflow (litres)			
Proportionate capacity to overflow (litres) = [(f) × 0.7]			

**Table A2.3: Consumption calculator for multiple taps (kitchen/utility room sink)**

	(a)	(b)	(c)
Tap fitting type	Flow rate (litres/min)	Quantity (No.)	Total per fitting type = [(a) × (b)]
1			
2			
3			
4			
(d)	Total (Sum of all quantities)		
(e)	Total (Sum of all totals per fitting type)		
Average flow rate (litres/min) = [(e)/(d)]			
(f)	Highest flow rate (litres/min) (litres)		
Proportionate flow rate (litres/min) = [(f) × 0.7]			

**Table A2.4: Consumption calculator for multiple dishwashers**

	(a)	(b)	(c)
Type of dishwasher	Litres per place setting	Quantity (No.)	Total per fitting type = [(a) × (b)]
1			
2			
3			
4			
(d)	Total (Sum of all quantities)		
(e)	Total (Sum of all totals per fitting type)		
Average litres per place setting = [(e)/(d)]			
(f)	Highest litres per place setting		
Proportionate litres per place setting = [(f) × 0.7]			

**Table A2.5: Consumption calculator for multiple washing machines**

	(a)	(b)	(c)
Type of washing machine	Litres per kg dry load	Quantity (No.)	Total per fitting type = [(a) × (b)]
1			
2			
3			
4			
(d) Total (Sum of all quantities)			
(e) Total (Sum of all totals per fitting type)			
Average litres per kilogram of dry load = [(e)/(d)]			
(f) Highest litres per kilogram of dry load			
Proportionate litres per kilogram of dry load = [(f) × 0.7]			

**Table A2.6: Consumption calculator for multiple showers**

	(a)	(b)	(c)
Shower fitting type	Flow rate (litres/min)	Quantity (No.)	Total per fitting type = [(a) × (b)]
1			
2			
3			
4			
(d) Total (Sum of all quantities)			
(e) Total (Sum of all totals per fitting type)			
Average flow rate (litres/min) = [(e)/(d)]			
(f) Highest flow rate (litres/min)			
Proportionate flow rate (litres/min) = [(f) × 0.7]			

**A11** Where more than one type of WC is provided, the average effective flushing volume is calculated using Table A2.7 below. The average effective flush volume should then be entered into Table A1 in the row 'WCs (multiple fittings)'.

**Table A2.7: Consumption calculator for multiple WCs**

	(a)	(b)	(c)
WC type	Effective flushing volume* (litres)	Quantity (No.)	Total per fitting type = [(a) × (b)]
1			
2			
3			
4			
(d) Total (Sum of all quantities)			
(e) Total (Sum of all totals per fitting type)			
Average effective flushing volume (litres) = [(e)/(d)]			

\* The effective flushing volume for dual flush WCs is:  
(full flushing volume (litres) × 0.33) + (part flushing volume (litres) × 0.67)

### Ion exchange water softener

**A12** Ion exchange water softeners use water in order to clean the resin that is used to absorb the mineral content of the dwelling's water supply. This cleaning process is referred to as the regeneration cycle, which occurs on a frequency dependent on the type of water softener specified and the hardness of the water. The water efficiency calculator looks at the water consumed per regeneration cycle that is beyond a level of good practice. The good practice level has been determined at a level of water consumption as a percentage of the water softener's total capacity which is set at 4 per cent.

**A13** The figure entered into the calculator is the volume of water consumed beyond this level of good practice to promote the use of more efficient water softeners. Where the water softener achieves a percentage that is equal to, or lower than this good practice benchmark figure, zero can be entered into Table A1 of the calculator for water softeners. The following formula is used to determine the litres of water consumed per person per day that is beyond the good practice level of 4 per cent.

**A14** Litres of water consumed per person per day beyond the 4 per cent good practice level:

$$= [1 - (4 / (a))] \times ((b) \times (c))$$

Where:

(a) = % of total capacity\* used per regeneration

(b) = Litres of water consumed per regeneration

(c) = Average number of regeneration cycles per day

\*the total capacity is the volume of water that flows through the water softener between regeneration cycles. This volume is dependent on the hardness of the water and the total capacity used in this calculation needs to reflect the hardness of water specific to the geographic location of the specific development. This figure should be determined from manufacturer's product details.

**A15** To calculate the litres of water consumed per person per day beyond the 4 per cent good practice level, enter details of the water softener into Table A3. Where the result indicates zero or a negative figure, zero should be entered into Table A1 for water softeners. The number of occupants entered into the table should be based on two in the first bedroom and one in each additional room. Studio flats should assume for two occupants.

**Table A3: Water softener consumption calculation**

(a) Total capacity used per regeneration (%)	
(b) Water consumed per regeneration (litres)	
(c) Average number of regeneration cycles per day (No.)	
(d) Number of occupants served by the system (No.)	
(e) Water consumed beyond 4% (litres/day) = $[1 - [4/(a)]] \times [(b) \times (c)]$	
(f) Water consumed beyond 4% (litres/person/day) = $[(e)/(d)]$	

### Greywater calculations

Greywater demand calculation

**A16** Where all WCs and/or washing machines are being supplied with greywater, the consumption values should be copied from Column 4 of Table A1 and entered into Table A4.6 to calculate the greywater savings.

**A17** Where greywater is only being supplied to a proportion of fittings such as just to one WC or washing machine, the proportion is calculated by entering details into Tables A4.1 and A4.2.

**Table A4.1: Greywater demand calculations – WCs**

(a)	(b)	(c)	(d)
Effective flushing volume (litres)	Number of fittings present	Quantity using greywater	Greywater demand = $[(a) \times (c)]$
(e) Total fittings = Sum of (b)		(f) Total greywater demand = Sum of (d)	
Average greywater demand from WCs		= $(f)/(e) \times 4.42$	

**Table A4.2: Greywater demand calculations – washing machines**

(a)	(b)	(c)	(d)
Litres per kg	Number of fittings present	Quantity using greywater	Greywater demand = $[(a) \times (c)]$
(e) Total fittings = Sum of (b)		(f) Total greywater demand = Sum of (d)	
Average greywater demand from washing machines		= $[(f)/(e)] \times 2.1$	

### Greywater collection calculations

**A18** Where greywater is to be collected from all fittings including the shower, bath and wash hand basin taps, the total water consumption of the fittings calculated in Table A1 represents the total greywater collected, the sum of the consumption figures for fittings from which greywater is collected (from column 4 of Table A1) should be entered into Table A4.6. Where greywater is only being collected from a proportion of fittings, such as just some of the taps, the calculations in Tables A4.3 to A4.5 should be followed and the results entered into Table A4.6.

**Table A4.3: Greywater collection calculations – taps**

(a)	(b)	(c)	(d)
Litres per minute	Number of fittings present	Quantity supplying greywater	Greywater supply = [(a) × (c)]
<b>(e)</b> Total fittings = Sum of (b)		<b>(f)</b> Total greywater supply = Sum of (d)	
Average greywater supply from taps		= [(f)/(e)] × 1.58 + 1.58	

**Table A4.4: Greywater collection calculations – showers**

(a)	(b)	(c)	(d)
Litres per minute	Number of fittings present	Quantity supplying greywater	Greywater supply = [(a) × (c)]
<b>(e)</b> Total fittings = Sum of (b)		<b>(f)</b> Total greywater supply = Sum of (d)	
Average greywater supply from showers (where bath present)		= [(f)/(e)] × 4.37	
Average greywater supply from showers (shower only)		= [(f)/(e)] × 5.60	

**Table A4.5: Greywater collection calculations – baths**

(a)	(b)	(c)	(d)
Litres per minute	Number of fittings present	Quantity supplying greywater	Greywater supply = [(a) × (c)]
<b>(e)</b> Total fittings = Sum of (b)		<b>(f)</b> Total greywater supply = Sum of (d)	
Average greywater supply from baths (where shower present)		= [(f)/(e)] × 0.11	
Average greywater supply from baths (bath only)		= [(f)/(e)] × 0.50	

#### Greywater savings calculations

**A19** Where greywater is to be reused within the dwelling, the savings from greywater can be calculated by entering the following details into Table A4.6:

- Calculate the water to be recycled from Table A1 and/or using the method set out in section A18 where just a proportion of fittings are being collected from.
- Determine the percentage of greywater collected to be recycled based upon manufacturer or system designer details of the system specified.
- Determine the water demand of the fittings to be provided with greywater which can include WCs and washing machines depending on the quality of the treated water. This is determined from the WC and washing machine consumption from Table A1 or Tables A4.1 and A4.2 in paragraphs A16 and A17.
- Multiply the volume of water to be recycled with the percentage of recycled water (determined in b. above) which will determine the actual volume of greywater available. Where the greywater supply is greater than the demand, the greywater savings are equal to the demand. Where the demand is greater than the greywater supply, the savings are equal to the supply.
- Enter the greywater saving figure from Table A4.6 into Table A1.

Table A4.6: Greywater collection calculation

(a)	(b)	(c)	(d)	(e)
Bath, shower and wash hand basin usage (litres/person/day)	Percentage of used water (a) to be recycled (%)	Greywater available for use (litres/person/day) $= (a) \times [(b)/100]$	Greywater demand (litres/person/day) (from Table A1 or A4.2 and A4.3)	Greywater savings (litres/person/day)  Where (c) is greater than (d), (e) = (d), otherwise (e) = (c)

**A20** Where a communal greywater system is to be provided supplying more than one home, Tables A4.1 to A4.5 can be used in the same way. The figures entered into Table A4.6 need to be entered on an individual dwelling basis and not using figures to reflect the communal system as a whole. The percentage collected figure will, however, need to be based on manufacturer or system designer details of the communal system specified.

### Rainwater calculations

#### Rainwater collection calculations

**A21** Where rainwater is to be used, the following calculation method should be followed by entering the relevant details into Table A5.1 or Table A5.2 to calculate the rainwater collection volume.

**A22** For Table A5.1 using the intermediate approach from BS 8515:

- Calculate the volume of water collected using the collection area, yield coefficient and hydraulic filter efficiency and average rainfall with guidance from BS 8515.
- Calculate the daily rainwater collection in box (d) using the collection area, yield coefficient, hydraulic filter efficiency and rainfall.
- Enter the number of occupants into box (e), which can be based on two occupants in the first bedroom and one occupant in each additional bedroom. A studio flat should assume two occupants.
- Where a communal rainwater system is to be provided supplying more than one home, Table A5.1 can be used in the same way calculating the total volume collected for the communal system and dividing it by the total number of occupants served by the system. This figure should then be entered in Table A5.5.

Table A5.1: Rainwater collection calculation – BS 8515 intermediate approach

(a) Collection area (m <sup>2</sup> )	
(b) Yield coefficient and hydraulic filter efficiency e.g. 0.7	
(c) Rainfall (average mm/year)	
(d) Daily rainwater collection (litres) $= [(a) \times (b) \times (c)]/365$	
(e) Number of occupants	
(f) Daily rainwater per person (litres) $= [(d)/(e)]$	

**A23** For Table A5.2 using the detailed approach as described in BS 8515, enter details of the total daily rainwater collection (litres) and the number of occupants to calculate the daily rainwater per person (litres) and enter into Table A5.5.

Table A5.2: Rainwater collection calculation – BS 8515 detailed approach

(a) Daily rainwater collection (litres)	
(b) Number of occupants	
(c) Daily rainwater per person (litres) $= [(a)/(b)]$	

**A24** The calculation detailed above in Table A5.2 is sufficient for evaluating the principles of the proposed system in the proposed development. However, for sizing of storage capacity and all other design and installation details, BS 8515 should be followed.

#### Rainwater demand calculations

**A25** Where all WCs and/or washing machines are being supplied with rainwater, the consumption should be taken from Table A1 and entered into Table A5.5 to calculate the rainwater savings.

**A26** Where rainwater is only being supplied to a proportion of fittings, such as just to one WC or washing machine, the proportion is calculated using Table A5.3 and A5.4. This rainwater demand can then be entered into Table A5.5 to calculate the rainwater savings.

**Table A5.3: Rainwater demand calculations – WCs**

(a)	(b)	(c)	(d)
Effective flushing volume (litres)	Number of fittings present	Quantity using rainwater	Rainwater demand = [(a) × (c)]
(e) Total fittings = Sum of (b)		(f) Total rainwater demand = Sum of (c)	
Average rainwater demand from WCs = [(f)/(e)] × 4.42			

**Table A5.4: Rainwater demand calculations – washing machines**

(a)	(b)	(c)	(d)
Litres per kg	Number of fittings present	Quantity using rainwater	Rainwater demand = [(a) × (c)]
(e) Total fittings = Sum of (b)		(f) Total rainwater demand = Sum of (c)	
Average rainwater demand from washing machines = [(f)/(e)] × 2.1			

**Table A5.5: Rainwater saving calculations for new dwellings**

	Litres per person per day
(a) Rainwater collected	
(b) Rainwater demand	
(c) Rainwater savings* = [(a)/(b)] or (b)	

\*where the amount collected (a) is greater than the demand (b), the rainwater savings (c) are equal to the demand (b)

## Fittings approach

**A28** The fittings approach given in G2 uses the methodology described in this appendix to calculate the water consumption of ranges of fittings that meet the performance targets.

### Rainwater saving calculations

**A27** Enter the total volume of rainwater collected per person per day from Table A5.1 or Table A5.2 depending on the BS 8515 approach followed. Enter the total consumption of fittings using rainwater (demand) from column 4 of Table A1, where rainwater is to be used in all WCs and/or washing machines. Where rainwater is only being used in a proportion of fittings, enter the total demand of WCs and washing machines from Table A5.3 and Table A5.4. This figure should then be entered into Table A1 to calculate the internal water consumption.

# Appendix B – Wholesome water

**B1** For ease of reference, the provisions on the wholesomeness of water in legislation made under section 67 of the Water Industry Act 1991 are set out below. This legislation is subject to Crown copyright protection, and is available in its original form on [www.legislation.gov.uk](http://www.legislation.gov.uk).

**B2** For convenience, the relevant regulations and amendments concerned are reproduced here in a consolidated form with some deletions or additional text where it is considered it would assist comprehension. These are only extracts of the legislation, and in any case of doubt the original regulations and amendments should be consulted.

**B3** For reasons of brevity the Schedules and Tables of these Regulations are not reproduced here.

## Water Supply (Water Quality) Regulations 2000 (SI 2000/3184)

**Note:** The Water Supply (Water Quality) Regulations 2001 (SI 2001/3911) which apply in Wales contain equivalent requirements.

### Wholesomeness

#### 4. (1) Water supplied:

- a. for such domestic purposes as consist in or include, cooking, drinking, food preparation or washing; or
- b. to premises in which food is produced, shall, subject to paragraphs (4) and (5), be regarded as wholesome for the purposes of Chapter III [(quality and sufficiency of supplies) of Part III (water supply) of the Water Industry Act 1991], as it applies to the supply of water for those domestic purposes, if the requirements of paragraph (2) are satisfied.

#### (2) The requirements of this paragraph are:

- a. that the water does not contain:
  - i. any micro-organism (other than a parameter listed in Schedule I) or parasite; or
  - ii. any substance (other than a parameter listed in Schedule I), at a concentration or value which would constitute a potential danger to human health;
- b. that the water does not contain any substance (whether or not a parameter) at a concentration or value which, in conjunction with any other substance it contains (whether or not a parameter) would constitute a potential danger to human health;

- c. that the water does not contain concentrations or values of the parameters listed in Tables A and B in Schedule 1 in excess of or, as the case may be, less than, the prescribed concentrations or values;
  - d. that the water satisfies the formula  $\frac{[\text{nitrate}]}{50} + \frac{[\text{nitrite}]}{3} \leq 1$ , where the square brackets signify the concentrations in mg/l for nitrate ( $\text{NO}_3$ ) and nitrite ( $\text{NO}_2$ ).
- (3) The point at which the requirements of paragraph (2), in so far as they relate to the parameters set out in Part I of Table A and in Table B in Schedule 1 are to be complied with, is:
- a. in the case of water supplied from a tanker, the point at which the water emerges from the tanker;
  - b. in any other case, the consumer's tap.
- (4) Water supplied for regulation 4(1) purposes shall not be regarded as wholesome for the purposes of Chapter III if, on transfer from a treatment works for supply for those purposes:
- a. it contains a concentration of the coliform bacteria or E. coli parameter (items 1 and 2 in Part II of Table A in Schedule 1) in excess of the prescribed concentrations; or
  - b. it contains a concentration of nitrite in excess of  $0.1 \text{ mgNO}_2/\text{l}$ .
- (5) Subject to paragraph (6), water supplied for regulation 4(1) purposes shall not be regarded as wholesome for the purposes of Chapter III if, on transfer from a service reservoir for supply for those purposes, it contains a concentration of the coliform bacteria or E. coli parameter in excess of the prescribed concentrations.
- (6) Water transferred from a service reservoir for supply for regulation 4(1) purposes shall not be regarded as unwholesome for the purposes of Chapter III because the maximum concentration for the coliform bacteria parameter is exceeded if, as regards the samples taken in any year in which the reservoir in question is in use, the results of analysis for that parameter establish that in at least 95 per cent of those samples coliforms were absent.

## Private Water Supplies Regulations 2009 (SI 2009/3101)

**Note:** The Private Water Supplies (Wales) Regulations (SI 2010/66) which apply in Wales contain equivalent requirements.

### Wholesomeness

4. Water is wholesome if all the following conditions are met:
- a. it does not contain any micro-organism, parasite or substance, alone or in conjunction with any other substance, at a concentration or value that would constitute a potential danger to human health;
  - b. it complies with the concentrations or values specified in Part 1 of Schedule 1; and
  - c. in the water:

$$\frac{\text{nitrate (mg/l)}}{50} + \frac{\text{nitrate (mg/l)}}{3} \leq 1$$

# Appendix C – References

## Relevant legislation

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The Building Regulations 2010

## Drainage and waste disposal



### APPROVED DOCUMENT

<b>H1</b>	<b>Foul water drainage</b>
<b>H2</b>	<b>Wastewater treatment systems and cesspools</b>
<b>H3</b>	<b>Rainwater drainage</b>
<b>H4</b>	<b>Building over sewers</b>
<b>H5</b>	<b>Separate systems of drainage</b>
<b>H6</b>	<b>Solid waste storage</b>

## **MAIN CHANGES IN THE 2015 EDITION**

This approved document supports Part H of Schedule 1 to the Building Regulations 2010. It takes effect on 1 October for use in England\*. The 2002 edition as amended, will continue to apply to work started before 1 October 2015 or work subject to a building notice, full plans application or initial notice submitted before that date.

The main changes are:

- Additional guidance on solid waste storage in H6 and reference updated.
- Consequential amendment of limits of application of requirement H3 due to amendment of Part M.

\*This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No 2) Order 2009.

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# Use of guidance

## THE APPROVED DOCUMENTS

This document is one of a series that has been approved and issued by the Secretary of State for the purpose of providing practical guidance with respect to the requirements of Schedule 1 to and Regulation 7 of the Building Regulations 2010 (SI 2010/2214) for England and Wales.

**At the back of this document is a list of all the documents that have been approved and issued by the Secretary of State for this purpose.**

Approved Documents are intended to provide guidance for some of the more common building situations. However, there may well be alternative ways of achieving compliance with the requirements.

**Thus there is no obligation to adopt any particular solution contained in an Approved Document if you prefer to meet the relevant requirement in some other way.**

### Other requirements

The guidance contained in an Approved Document relates only to the particular requirements of the Regulations which the document addresses. The building work will also have to comply with the requirements of any other relevant paragraphs in Schedule 1 to the Regulations.

There are Approved Documents which give guidance on each of the Parts of Schedule 1 and on Regulation 7.

## LIMITATION ON REQUIREMENTS

In accordance with Regulation 8, the requirements in Parts A to K and N (except for paragraphs H2 and J6) of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings).

Paragraphs H2 and J7 are excluded from Regulation 8 because they deal directly with prevention of the contamination of water. Parts L and M are excluded because they respectively address the conservation of fuel and power and access and facilities for disabled people. These matters are amongst the purposes, other than health and safety, that may be addressed by Building Regulations.

## MATERIALS AND WORKMANSHIP

Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations shall be carried out in accordance with regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in Approved Document 7.

Building Regulations are made for specific purposes, primarily the health and safety, welfare and convenience of people and for energy conservation. Standards and other technical specifications may provide relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance or matters which, although they relate to health and safety etc., are not covered by the Building Regulations.

When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

## THE WORKPLACE (HEALTH, SAFETY AND WELFARE) REGULATIONS 1992

The Workplace (Health, Safety and Welfare) Regulations 1992 contain some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see *Workplace health, safety and welfare. Workplace (Health, Safety and Welfare) Regulations 1992. Approved Code of Practice L24*. Published by HSE Books 1992 (ISBN 0 7176 0413 6).

The Workplace (Health, Safety and Welfare) Regulations 1992 apply to the common parts of flats and similar buildings if people such as cleaners and caretakers are employed to work in these common parts. Where the requirements of the Building Regulations that are covered by this Part do not apply to dwellings, the provisions may still be required in the situations described above in order to satisfy the Workplace Regulations.

## SAFE WORKING IN DRAINS AND SEWERS

Laying and maintaining drains are hazardous operations. Appropriate safety codes should be followed including procedures for working in confined spaces. Safe working procedures and permits to work may be required in some situations.

Relevant statutory requirements can be found in the Construction (Health, Safety and Welfare) Regulations 1996, SI 1996/1592, the Construction (Design and Management) Regulations 1994, SI 1994/3140 and the Confined Spaces Regulations 1997, SI 1997/1713.

The Health and Safety Executive operates an Information Line on 08701 545500, and produces the following advisory codes and information leaflets related to earthworks, drainage and working in confined spaces which are available from HSE Books, Tel 01787 881165.

*Health and Safety in Excavation – be safe and shore*, Booklet HSG 185.

*Safe Work in Confined Spaces – Approved Code of Practice, Regulations and Guidance*, Booklet L101.

## The Requirement

This Approved Document, which took effect on 1 April 2002, deals with the following Requirement which is contained in the Building Regulations 2010

<i>Requirement</i>	<i>Limits on application</i>
<p><b>Foul water drainage</b></p> <p><b>H1.</b> (1) An adequate system of drainage shall be provided to carry foul water from appliances within the building to one of the following, listed in order of priority:</p> <ul style="list-style-type: none"><li>(a) a public sewer; or, where that is not reasonably practicable,</li><li>(b) a private sewer communicating with a public sewer; or, where that is not reasonably practicable,</li><li>(c) either a septic tank which has an appropriate form of secondary treatment or another wastewater treatment system; or, where that is not reasonably practicable,</li><li>(d) a cesspool.</li></ul> <p>(2) In this Part ‘foul water’ means waste water which comprises or includes:</p> <ul style="list-style-type: none"><li>(a) waste from a sanitary convenience, bidet or appliance used for washing receptacles for foul waste; or</li><li>(b) water which has been used for food preparation, cooking or washing.</li></ul>	<p>Requirement H1 does not apply to the diversion of water which has been used for personal washing or for the washing of clothes, linen or other articles to collection systems for re-use.</p>

## Guidance

### Performance

In the Secretary of State’s view the requirement of H1 will be met if a foul water drainage system:

- a. conveys the flow of foul water to a foul water outfall (a foul or combined sewer, a cesspool, septic tank or holding tank);
- b. minimises the risk of blockage or leakage;
- c. prevents foul air from the drainage system from entering the building under working conditions;
- d. is ventilated;
- e. is accessible for clearing blockages; and
- f. does not increase the vulnerability of the building to flooding.

### Introduction to provisions

**0.1** The capacity of the system should be large enough to carry the expected flow at any point.

**0.2** The capacity depends on the size and gradient of the pipes. Minimum sizes and gradient limits are given in the text.

**0.3** The pipe sizes quoted in this document are nominal sizes used as a numerical designation in convenient round numbers approximately equal to a manufacturer’s size. Equivalent pipe sizes for individual pipe standards will be found in the standards listed in Tables 4, 7 and 14.

# Section 1: Sanitary pipework

**1.1** The provisions in this section are applicable to domestic buildings and small non-domestic buildings. Further guidance on larger buildings is given in Appendix A. Complex systems in larger buildings should be designed in accordance with BS EN 12056 (see paragraph 1.39).

**1.2** The guidance in these provisions is applicable for WCs with major flush volumes of 5 litres or more. Where WCs with major flush volumes less than 5 litres are used, consideration should be given to the increased risk of blockages. Guidance on the design of sanitary pipework suitable for use with WCs with major flush volumes as low as 4 litres can be found in BS EN 12056 (see paragraph 1.39).

## Traps

**1.3** All points of discharge into the system should be fitted with a trap (e.g. a water seal trap) to prevent foul air from the system entering the building. Under working and test conditions traps should retain a minimum seal of 25mm of water or equivalent.

**1.4** Table 1 gives minimum trap sizes and seal depths for the appliances which are most used (for other appliances see Appendix paragraph A4).

**1.5 Pressure fluctuation** – To prevent the water seal from being broken by the pressures which can develop in the system the branch discharge pipes should be designed as described in paragraphs 1.7 to 1.25.

**1.6 Access for clearing blockages** – If a trap forms part of an appliance the appliance should be removable. All other traps should be fitted directly after the appliance and should be removable or be fitted with a cleaning eye.

**Table 1 Minimum trap sizes and seal depths**

Appliance	Diameter of trap (mm)	Depth of seal (mm of water or equivalent)
Washbasin <sup>1</sup> Bidet	32	75
Bath <sup>2</sup> Shower <sup>2</sup>	40	50
Food waste disposal unit Urinal bowl Sink Washing machine <sup>2</sup> Dishwashing machine <sup>2</sup>	40	75
WC pan – outlet <80mm WC pan – outlet >80mm	75 100	50 50

<sup>1</sup> The depth of seal may be reduced to 50mm only with flush grated wastes without plugs on spray tap basins.

<sup>2</sup> Where these appliances discharge directly to a gully the depth of seal may be reduced to not less than 38mm.

<sup>3</sup> Traps used on appliances with flat bottom (trailing waste discharge) and discharging to a gully with a grating may have a reduced water seal of not less than 38mm.

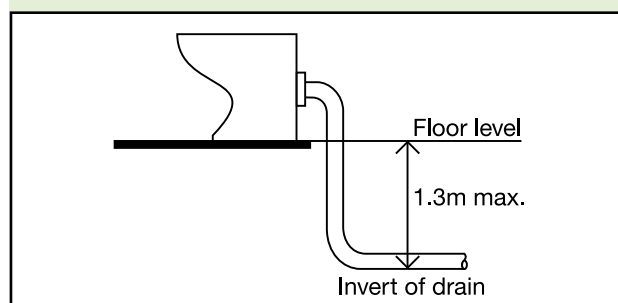
## Branch discharge pipes

**1.7** Branch pipes should discharge into another branch pipe or a discharge stack unless the appliances discharge to a gully. Gullies are generally at ground floor level, but may be at basement level. Branch pipes should not discharge into open hoppers.

**1.8** If the appliances are on the ground floor the pipe(s) may discharge to a stub stack or discharge stack, directly to a drain or (if the pipe carries only wastewater) to a gully. (See paragraphs 1.11 and 1.30.)

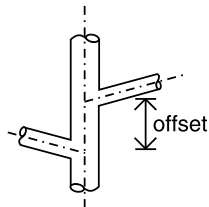
**1.9** A branch pipe from a ground floor closet should only discharge directly to a drain if the depth from the floor to the drain is 1.3m or less (see Diagram 1).

**Diagram 1 Direct connection of ground floor WC to a drain**



**Diagram 2 Branch connection to stacks – crossflow prevention**

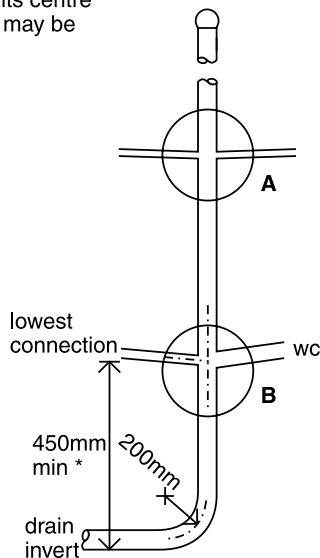
A branch creates a no connection zone on a stack  
No other branch may be fitted such that its centre line falls inside a zone but its centre line may be on the boundary of the zone



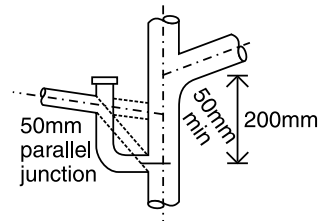
Key

**A** opposed connections without swept entries not exceeding 65mm should be offset  
110mm on a 100mm diameter stack  
250mm on a 150mm diameter stack

Opposed connections larger than 65mm (without swept entries) should be offset at least 200mm irrespective of stack diameter  
Unopposed connections may be at any position



Opposed branch connection in the horizontal plane should be avoided



**B** Angled connection or 50mm diameter parallel junction where a branch discharge pipe would enter the WC no connection zone

NB A waste (branch discharge pipe) manifold may be a suitable alternative

\* This should be increased in buildings over 3 storeys

**1.10** A branch pipe should not discharge into a stack in a way which could cause crossflow into any other branch pipe. (See Diagram 2.)

**1.11** A branch discharge pipe should not discharge into a stack lower than 450mm above the invert of the tail of the bend at the foot of the stack in single dwellings of up to 3 storeys (see Diagram 2). (For multi-storey buildings this should be increased, see Appendix paragraphs A5 and A6.)

**1.12** Branch pipes may discharge into a stub stack. (See paragraph 1.30.)

**1.13** A branch pipe discharging to a gully should terminate between the grating or sealing plate and the top of the water seal.

**1.14** Condensate drainage from boilers may be connected to sanitary pipework. The connection should be made using pipework of minimum diameter 22mm through a 75mm condensate trap. If an additional trap is provided externally to the boiler to provide the 75mm seal, an air gap should be provided between the boiler and the trap.

- The connection should preferably be made to an internal stack with a 75mm condensate trap.
- If the connection is made to a branch pipe, the connection should be made downstream of any sink waste connection.

- All sanitary pipework receiving condensate should be made from materials resistant to a pH value of 6.5 and lower. The installation should be in accordance with BS 6798.

**1.15** Sizes of branch pipes – Pipes serving a single appliance should have at least the same diameter as the appliance trap (see Table 1). If a pipe serves more than one appliance, and is unventilated, the diameter should be at least the size shown in Table 2.

**1.16** Bends in branch pipes should be avoided if possible. Where they cannot they should have as large a radius as possible.

**1.17** Junctions on branch pipes of about the same diameter should be made with a sweep of 25mm radius or at 45°. Connection of branch pipes of 75mm diameter or more to a stack of equal diameter should be made with a sweep of 50mm minimum radius or at 45°.

**1.18** Branch pipes up to 40mm diameter joining branch pipes 100mm diameter or greater should, if practicable, connect to the upper part of the pipe wall of the larger branch.

**1.19** Ventilation of branch pipes – separate ventilation will not be needed to prevent the water seals in traps from being lost by pressures which can develop in the system if the length and slope of the branch discharge pipes do not exceed those shown in Table 2 or Diagram 3.

**Table 2 Common branch discharge pipes (unventilated)**

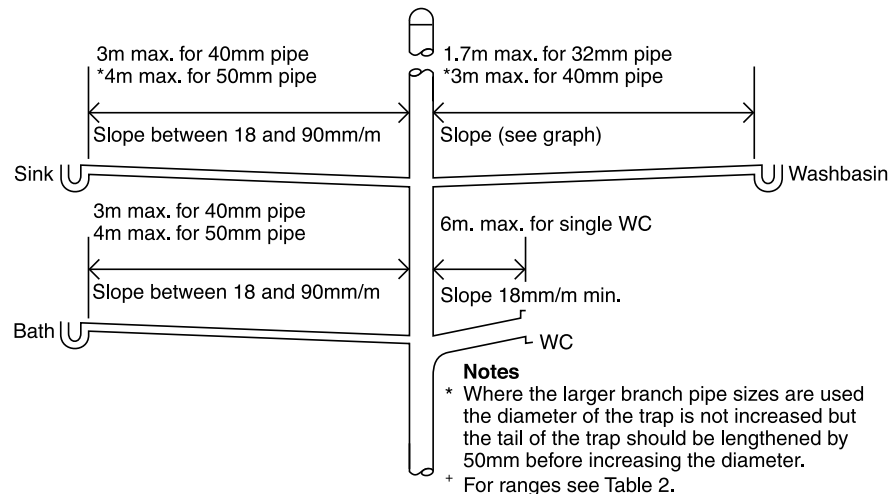
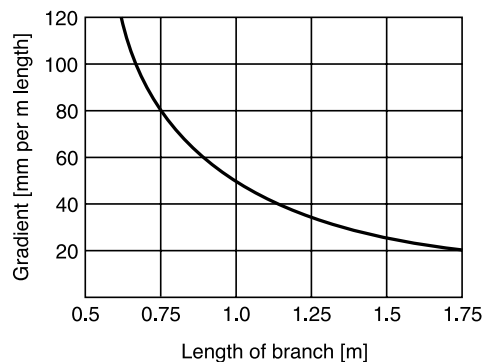
Appliance	Max. no. to be connected	Max. length of branch pipe (m)	Min. size of pipe (mm)	Gradient limits (mm fall per metre)
WC outlet > 80mm	8	15	100	18 <sup>2</sup> to 90
WC outlet < 80mm	1	15	75 <sup>3</sup>	18 to 90
Urinal – bowl		3 <sup>1</sup>	50	
Urinal – trough		3 <sup>1</sup>	65	18 to 90
Urinal – slab		3 <sup>1</sup>		
Washbasin or bidet	3	1.7	30	18 to 22
		1.1	30	18 to 44
		0.7	30	18 to 87
		3.0	40	18 to 44
	4	4.0	50	18 to 44

<sup>1</sup> Should be as short as possible to prevent deposition.

<sup>2</sup> May be reduced to 9mm on long drain runs where space is restricted, but only if more than one WC is connected.

<sup>3</sup> Not recommended where disposal of sanitary towels may take place via the WC, as there is an increased risk of blockages.

<sup>4</sup> Slab urinals longer than seven persons should have more than one outlet.

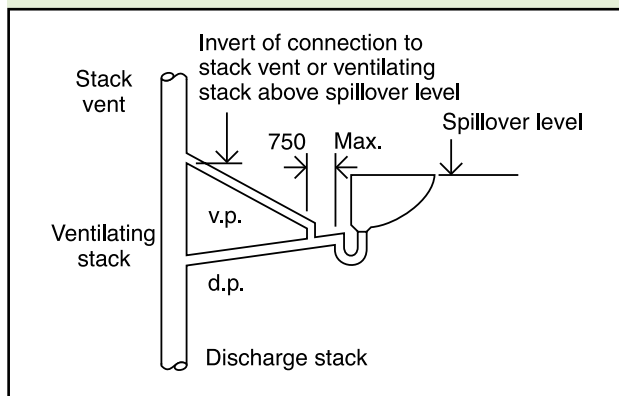
**Diagram 3 Branch connections**

**(a) Unvented branch connections to stacks**

**(b) Design curve for 32mm washbasin waste pipes**

**1.20** If the figures in Table 2 and Diagram 3 are exceeded the branch pipe should be ventilated by a branch ventilating pipe to external air, to a ventilating stack (ventilated branch system) or internally by use of an air admittance valve.

**1.21** A separate ventilating stack is only likely to be preferred where the numbers of sanitary appliances and their distance to a discharge stack are large. (See Appendix paragraphs A7 to A9.)

**1.22 Branch ventilating pipes** – should be connected to the discharge pipe within 750mm of the trap and should connect to the ventilating stack or the stack vent, above the highest ‘spillover’ level of the appliances served (see Diagram 4). The ventilating pipe should have a continuous incline from the discharge pipe to the point of connection to the ventilating stack or stack vent.

**Diagram 4 Branch ventilation pipes**



**1.23** Branch ventilating pipes which run direct to outside air should finish at least 900mm above any opening into the building nearer than 3m (see Diagram 6 and paragraph 1.31).

**1.24** Branch ventilating pipes to branch pipes serving one appliance should be at least 25mm diameter or where the branch is longer than 15m or has more than 5 bends, should be at least 32mm.

**1.25** Rodding points should be provided to give access to any lengths of discharge pipe which cannot be reached by removing traps or appliances with internal traps (see paragraph 1.6).

## Discharge stacks

**1.26** All stacks should discharge to a drain. The bend at the foot of the stack should have as large a radius as possible and at least 200mm at the centre line.

**1.27** Offsets in the ‘wet’ portion of a discharge stack should be avoided. If they are unavoidable then in a building of not more than 3 storeys there should be no branch connection within 750mm of the offset. In a building over 3 storeys a ventilation stack may be needed with connections above and below the offset. In buildings over

3 storeys discharge stacks should be located inside the building.

**1.28 Sizes of stacks** – Stacks should have at least the diameter shown in Table 3 and should not reduce in the direction of flow. Stacks serving urinals should be not less than 50mm, stacks serving closets with outlets less than 80mm should be not less than 75mm and stacks serving closets with outlets greater than 80mm should be not less than 100mm. The internal diameter of the stack should be not less than that of the largest trap or branch discharge pipe. For larger buildings the maximum flow should be checked. (See paragraphs A.1 to A.3.)

**Table 3 Minimum diameters for discharge stacks**

Stack size (mm)	Max. capacity (litres/sec)
50*	1.2
65*	2.1
75†	3.4
90	5.3
100	7.2

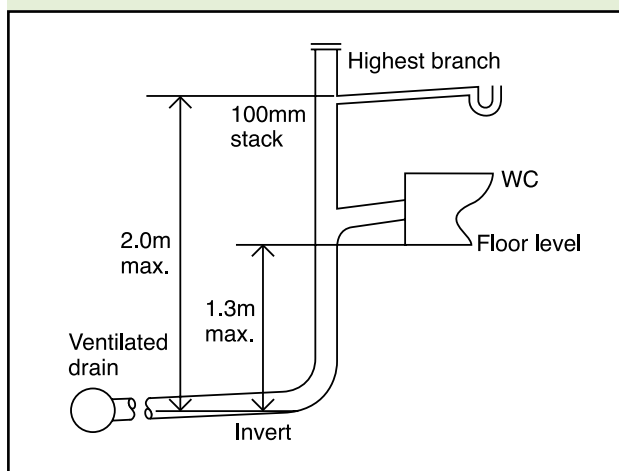
**Notes:**

\* No WCs.

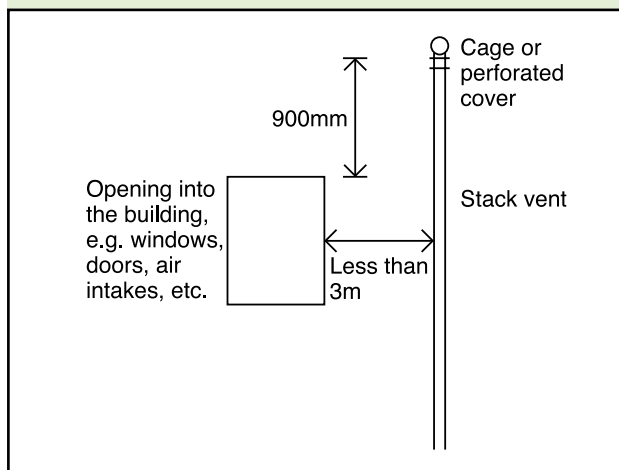
† Not more than 1 WC with outlet size <80mm.

**1.29 Ventilation of discharge stacks** – To prevent water seals in the traps from being lost by pressures which can develop in the system, discharge stacks should be ventilated. Discharge stacks connected to drains liable to surcharging or near an intercepting trap require ventilating pipes of not less than 50mm diameter connected to the base of the stack above the likely flood level.

**1.30 Stub stacks** – A stub stack may be used if it connects into a ventilated discharge stack or into a ventilated drain not subject to surcharging and no connected water closet has a floor level more than 1.3m and no other branch into the stub stack has a centreline more than 2m to the centre line above the invert of the connection or drain (see Diagram 5).

Diagram 5 **Stub stack**


**1.31** Ventilating pipes open to outside air should finish at least 900mm above any opening into the building within 3m and should be finished with a wire cage or other perforated cover, fixed to the end of the ventilating pipe, which does not restrict the flow of air (see Diagram 6). In areas where rodent control is a problem (see paragraph 2.22) these should be metallic.

Diagram 6 **Termination of ventilation stacks or ventilation part of discharge**


**1.32** **Sizes of stack ventilation pipes** – stack ventilation pipes (the dry part above the highest branch) may be reduced in size in one and two storey houses, but should be not less than 75mm.

**1.33** Ventilated discharge stacks may be terminated inside a building when fitted with air admittance valves complying with BS EN 12380:2002. Where these valves are used they should not adversely affect the amount of ventilation necessary for the below ground system which is normally provided by open stacks of the sanitary pipework. Air admittance valves should be located in areas which have

adequate ventilation, should be accessible for maintenance and should be removable to give access for clearance of blockages. Air admittance valves should not be used outside buildings or in dust laden atmospheres. Where there is no open ventilation on a drainage system or through connected drains, alternative arrangements to relieve positive pressures should be considered.

**1.34** **Access for clearing blockages** – rodding points should be provided in discharge stacks to give access to any lengths of pipe which cannot be reached from any other part of the system. All pipes should be reasonably accessible for repair. Rodding points in stacks should be above the spillover level of appliances.

## Materials for pipes, fittings and joints

**1.35** Any of the materials shown in Table 4 may be used (the references are to British Standard or European Standard Specifications). Where necessary different metals should be separated by non-metallic material to prevent electrolytic corrosion. Care should be taken to ensure continuity of any electrical earth bonding requirements. Pipes should be firmly supported without restricting thermal movement. *Attention is also drawn to the requirement of Part B of Schedule 1 to the Building Regulations 2000 and guidance in the Approved Document relating to penetration of fire separating elements and fire stopping provisions.*

Table 4 **Materials for sanitary pipework**

Material	British Standard
<b>Pipes</b>	
Cast iron	BS 416, BS EN 877
Copper	BS EN 1254, BS EN 1057
Galvanised steel	BS 3868
PVC-U	BS EN 1329
Polypropylene (PP)	BS EN 1451
ABS	BS EN 1455
Polyethylene (PE)	BS EN 1519
Styrene copolymer blends (PVC + SAN)	BS EN 1565
PVC-C	BS EN 1566
<b>Traps</b>	BS EN 274, BS 3943
<b>Note:</b> Some of these materials may not be suitable for carrying trade effluent or condensate from boilers.	

**1.36** Sanitary pipework connected to WCs should not allow light to be visible through the pipe wall, as this is believed to encourage damage by rodents.

## Workmanship

**1.37** Good workmanship is essential. Workmanship should be in accordance with BS 8000 *Workmanship on Building Sites* Part 13: *Code of practice for above ground drainage*.

## Air tightness

**1.38** The pipes, fittings and joints should be capable of withstanding an air test of positive pressure of at least 38mm water gauge for at least 3 minutes. Every trap should maintain a water seal of at least 25mm. Smoke testing may be used to identify defects where a water test has failed. Smoke testing is not recommended for PVC-U pipes.

## Alternative approach

**1.39** The requirement can also be met by following the relevant recommendations of BS EN 12056 *Gravity drainage systems inside buildings*. Relevant clauses are in Part 1: *General and performance requirements*, Clauses 3–6; Part 2 *Sanitary pipework, layout and calculation*, Clauses 3 to 6 and National Annexes NA to NG (System III is traditionally in use in the UK); Part 5 *Installation and testing, instructions for operation, maintenance and use*, Clauses 4–6, 8, 9 and 11. BS EN 12109 *Vacuum Drainage Systems Inside Buildings*.

## Section 2: Foul drainage

**2.1** This section gives guidance on the construction of underground drains and sewers from buildings to the point of connection to an existing sewer or a cesspool or wastewater treatment system and includes any drains or sewers outside the curtilage of the building. Disused and defective pipework is known to harbour rats (see Appendix H1-B).

**2.2** Some public sewers may carry foul water and rainwater in the same pipes. If the drainage system is also to carry rainwater to such a sewer, the following provisions still apply but the pipe sizes may need to be increased to carry the combined flows (see paragraph 2.35). In some circumstances, separate drainage should still be provided (see Approved Document H5).

### Outlets

**2.3** Foul drainage should be connected to a public foul or combined sewer wherever this is reasonably practicable. For small developments connection should be made to a public sewer where this is within 30m provided that the developer has the right to construct the drainage over any intervening private land. Where levels do not permit drainage by gravity a pumping installation should be provided (see paragraphs 2.36 to 2.39).

**2.4** For larger developments it may be economic to connect to a public sewer even where the sewer is some distance away. For developments comprising more than one curtilage, the developer may requisition a sewer from the sewerage undertaker who has powers to construct sewers over private land (see Appendix H1-C, C.4).

**2.5** The sewerage undertaker should be notified at least three weeks before it is intended to connect to the public sewer (see Appendix H1-C, C.7).

**2.6** Where it is not reasonably practicable to connect to a public sewer, it may be possible to connect to an existing private sewer that connects with a public sewer. The permission of the owner or owners of the sewer will be required. The sewer should be in satisfactory condition and have sufficient capacity to take the additional flows.

**2.7** Where none of these options is reasonably practicable, a wastewater treatment system or cesspool should be provided (see Approved Document H2).

### Surcharging of drains

**2.8** Combined and rainwater sewers are designed to surcharge (i.e. the water level in the manhole rises above the top of the pipe) in heavy rainfall. Some foul sewers also receive rainwater and therefore surcharge. For low-lying sites (where the ground level of the site or the level of a basement is below the ground level at the point

where the drainage connects to the public sewer) care should be taken to ensure that the property is not at increased risk of flooding. In all such cases the sewerage undertaker should be consulted to determine the extent and possible frequency of the likely surcharge.

**2.9** For basements containing sanitary appliances, where the risk of flooding due to surcharge of the sewer is considered by the sewerage undertaker to be high, the drainage from the basement should be pumped (see paragraphs 2.36 to 2.39). Where the risk is considered to be low an anti-flooding valve should be installed on the drainage from the basement.

**2.10** For other low-lying sites (i.e. not basements) where risk is considered low, sufficient protection for the building may be possible by provision of a gully outside the building at least 75mm below the floor level. This should be positioned so that any flooding from the gully will not damage any buildings. In higher risk areas an anti-flooding valve should be provided, or the drainage system pumped (see paragraph 2.36 to 2.39).

**2.11** Anti-flooding valves should preferably be of the double valve type, and should be suitable for foul water and have a manual closure device. They should comply with the requirements of prEN 13564. A single valve should not normally serve more than one building. A notice should be provided inside the building to indicate that the system is drained through such a valve. This notice should also indicate the location of any manual override, and include advice on necessary maintenance.

**2.12** All drainage unaffected by surcharge should by-pass the protective measures and discharge by gravity.

### Layout

**2.13** The layout of the drainage system should be kept simple. Changes of direction and gradient should be minimised and as easy as practicable. Access points should be provided only if blockages could not be cleared without them.

**2.14** Connection of drains to other drains or private or public sewers, and of private sewers to public sewers, should be made obliquely, or in the direction of flow.

**2.15** Connections should be made using prefabricated components. Where holes are cut in pipes a drilling device should be used to avoid damaging the pipe.

**2.16** Where connections made to existing drains or sewers involve removal of pipes and insertion of a junction, repair couplings should be used to ensure a watertight joint and the junction should be carefully packed to avoid differential settlement with adjacent pipes.

**2.17** Sewers (serving more than one property) should be kept as far as is practicable away from the point on a building where a future extension is likely (e.g. rear of a house, or side of house where there is room for a side extension).

**2.18** The system should be ventilated by a flow of air. A ventilating pipe should be provided at or near the head of each main drain. An open ventilating pipe (without an air admittance valve) should be provided on any drain fitted with an intercepting trap (particularly on a sealed system), and on any drain subject to surcharge. Ventilated discharge stacks may be used (see paragraphs 1.27 and 1.29). Ventilating pipes should not finish near openings in buildings (see paragraph 1.31).

**2.19** Pipes should be laid to even gradients and any change of gradient should be combined with an access point (see paragraph 2.49).

**2.20** Pipes should also be laid in straight lines where practicable but may be laid to slight curves if these can still be cleared of blockages. Any bends should be limited to positions in or close to inspection chambers or manholes (see paragraph 2.49) and to the foot of discharge and ventilating stacks. Bends should have as large a radius as practicable.

**2.21** Drainage serving kitchens in commercial hot food premises should be fitted with a grease separator complying with BS EN 1825-1:2004 and designed in accordance with BS EN 1825-2:2002 or other effective means of grease removal.

## Special protection – rodent control

**2.22** Where the site has been previously developed the local authority should be consulted to determine whether any special measures are necessary for control of rodents. Special measures which may be taken include the following.

- a. Sealed drainage – drainage having access covers to the pipework in the inspection chamber instead of an open channel. These should only be used in inspection chambers, where maintenance can be carried out from the surface without personnel entry.
- b. Intercepting traps – These are susceptible to blockage and require frequent maintenance. Intercepting trap stoppers should be of the locking type that can be easily removed from the chamber surface and securely replaced after blockage clearance. It is important that stoppers are replaced after maintenance. These should only be used in inspection chambers where maintenance can be carried out from the surface without personnel entry.

- c. Rodent barriers – a number of rodent barrier devices are used in other countries; these include: enlarged sections on discharge stacks to prevent rats climbing, flexible downward facing fins in the discharge stack, or one way valves in underground drainage.
- d. Metal cages on ventilator stack terminals should also be used to discourage rats from leaving the drainage system (see paragraph 1.31).
- e. Covers and gratings to gullies may be displaced or attacked by rats. Solid plastic covers or metal gratings which can be fixed in place should be used to discourage rats from leaving the system.

## Protection from settlement

**2.23** A drain may run under a building if at least 100mm of granular or other flexible filling is provided round the pipe. On sites where excessive subsidence is possible additional flexible joints may be advisable or other solutions such as suspended drainage, particularly where the pipe is adjacent to structures or where soil conditions change in the course of the pipe run. Where the crown of the pipe is within 300mm of the underside of the slab, special protection should be provided (see paragraph 2.44).

**2.24** At any points where pipes are built into a structure, including an inspection chamber, manhole, footing, ground beam or wall, suitable measures should be taken to prevent damage or misalignment. This may be achieved by either:

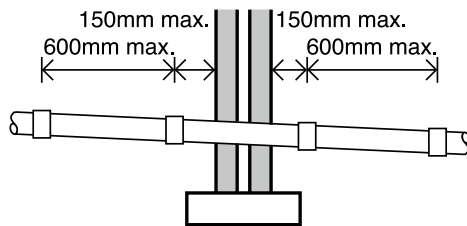
- a. building in a length of pipe (as short as possible) with its joints as close as possible to the wall faces (within at most 150mm) and connected on each side of rocker pipes by a length of at most 600mm and flexible joints (see Diagram 7(a)); or
- b. forming an opening to give at least 50mm clearance all round the pipe and the opening masked with rigid sheet material to prevent ingress of fill or vermin. It is important that the void is also filled with a compressible sealant to prevent ingress of gas (see Diagram 7(b)).

**2.25** A drain trench should not be excavated lower than the foundations of any building nearby (see Diagram 8) unless either:

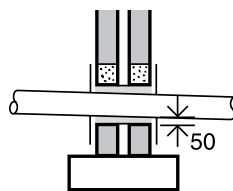
- a. where the trench is within 1m of the foundation the trench is filled with concrete up to the lowest level of the foundation; or
- b. where the trench is further than 1m from the building, the trench is filled with concrete to a level below the lowest level for the building equal to the distance from the building, less 150mm.

Diagram 7 Pipes penetrating walls

- (a) Short length of pipe bedded in wall, joints formed within 150mm of either wallface. Adjacent rocker pipes of max. length 600mm with flexible joints



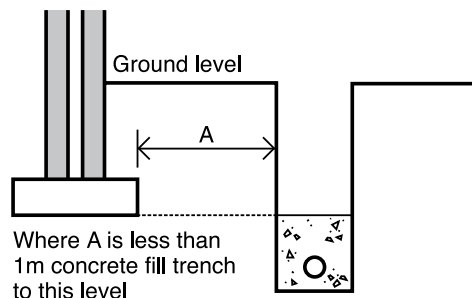
- (b) Arch or lintelled opening to give 50mm space all round the pipe



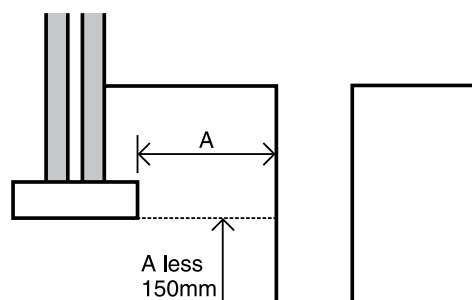
Mask opening both sides with rigid sheet material to prevent entry of fill or vermin

**Important** Fill void with compressible sealant to prevent entry of gas

Diagram 8 Pipe runs near buildings



Where A is less than 1m concrete fill trench to this level



Where A is 1m or more concrete fill trench to this level

**2.26** Where pipes are to be laid on piles or beams or in a common trench, or where the ground may prove unstable particularly where there is a high water table, advice may be found in *TRL A guide to the design loadings for buried rigid pipes*. The local authority may be able to provide information regarding the site.

## Depth of pipe cover

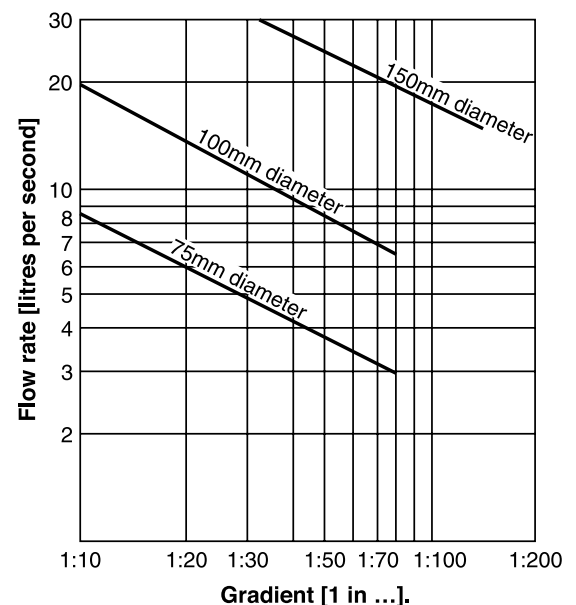
**2.27** The depth of cover will usually depend on the levels of the connections to the system, the gradients at which the pipes should be laid and the ground levels.

**2.28** Pipes also need to be protected from damage and if the limits of cover are not attainable it may be possible to choose another pipe strength and pipe bedding class combination (Guidance is given in BS EN 1295-1 National Annex NA). Alternatively special protection can be provided (see paragraphs 2.41 to 2.45).

## Pipe gradients and sizes

**2.29** Drains should have enough capacity to carry the flow. The flow depends on the appliances connected (see paragraphs 0.1–0.3 and Table 5) and the capacity depends on the size and gradient of the pipes (see Diagram 9).

Diagram 9 Discharge capacities of foul drains running 0.75 proportional depth



**Table 5 Flow rates from dwellings**

Number of dwellings	Flow rate (litres/sec)
1	2.5
5	3.5
10	4.1
15	4.6
20	5.1
25	5.4
30	5.8

**2.30** Sewers (i.e. a drain serving more than one property) should normally have a minimum diameter of 100mm when serving no more than 10 dwellings. Sewers serving more than 10 dwellings should normally have a minimum diameter of 150mm. See also Table C1.

**2.31** The flow depends on the type, number and grouping of appliances.

**2.32** Appliances are seldom in use simultaneously and the minimum drain sizes in normal use are capable of carrying the flow from quite large numbers of appliances. Table 5 shows approximate flow rates resulting from the typical household group of 1 WC, 1 bath, 1 or 2 washbasins, 1 sink and 1 washing machine used for design purposes in BS EN 12056.

**2.33** A drain carrying foul water should have an internal diameter of at least 75mm. A drain carrying effluent from a WC or trade effluent should have an internal diameter of at least 100mm.

**2.34** Table 6 shows the flattest gradients at which drains should be laid (depending on the flow and the appliances connected to them) and the capacity they will then have (see also paragraphs 0.1–0.3).

**Table 6 Recommended minimum gradients for foul drains**

Peak flow (litres/sec)	Pipe size (mm)	Minimum gradient (1 in ...)	Maximum capacity (litres/sec)
< 1	75	1:40	4.1
	100	1:40	9.2
> 1	75	1:80	2.8
	100	1:80*	6.3
	150	1:150†	15.0

**Notes:**

\* Minimum of 1 WC

† Minimum of 5 WCs

**2.35 Combined systems** – the capacity of systems carrying foul water and rainwater should take account of the combined peak flow (see Approved Document H3 Rainwater drainage paragraph 3.8).

## Pumping installations

**2.36** Where gravity drainage is impracticable, or protection against flooding due to surcharge in downstream sewers is required, a pumping installation will be needed.

**2.37** Package pumping installations are available which are suitable for installation within buildings. Floor mounted units may be particularly suited for installation in basements. These should conform to BS EN 12050. Pumping installations for use inside buildings should be designed in accordance with BS EN 12056-4.

**2.38** Package pumping installations suitable for installation outside buildings are also available. Guidance on the design of pumping installations for use outside buildings may be found in BS EN 752-6.

**2.39** Where foul water drainage from a building is to be pumped, the effluent receiving chamber should be sized to contain 24-hour inflow to allow for disruption in service. The minimum daily discharge of foul drainage should be taken as 150 litres per head per day for domestic use. For other types of building, the capacity of the receiving chamber should be based on the calculated daily demand of the water intake for the building. Where only a proportion of the foul sewage is to be pumped, then the capacity should be based pro-rata. In all pumped systems the controls should be so arranged to optimise pump operation.

## Materials for pipes and jointing

**Table 7 Materials for below ground gravity drainage**

Material	British Standard
<b>Rigid pipes</b>	
Vitrified clay	BS 65, BS EN 295
Concrete	BS 5911
Grey iron	BS 437
Ductile iron	BS EN 598
<b>Flexible pipes</b>	
UPVC	BS EN 1401+
PP	BS EN 1852+
Structure walled plastic pipes	BS EN 13476

+ Application area code UD should normally be specified

**Note:** Some of these materials may not be suitable for conveying trade effluent

**2.40** Any of the materials shown in Table 7 may be used (the references are to British Standard Specifications). Joints should be appropriate to the material of the pipes. To minimise the effects of any differential settlement pipes should have flexible joints. All joints should remain watertight under working and test conditions and nothing in the pipes, joints or fittings should project into the pipe line or cause an obstruction. Different metals should be separated by non-metallic materials to prevent electrolytic corrosion.

## Bedding and backfilling

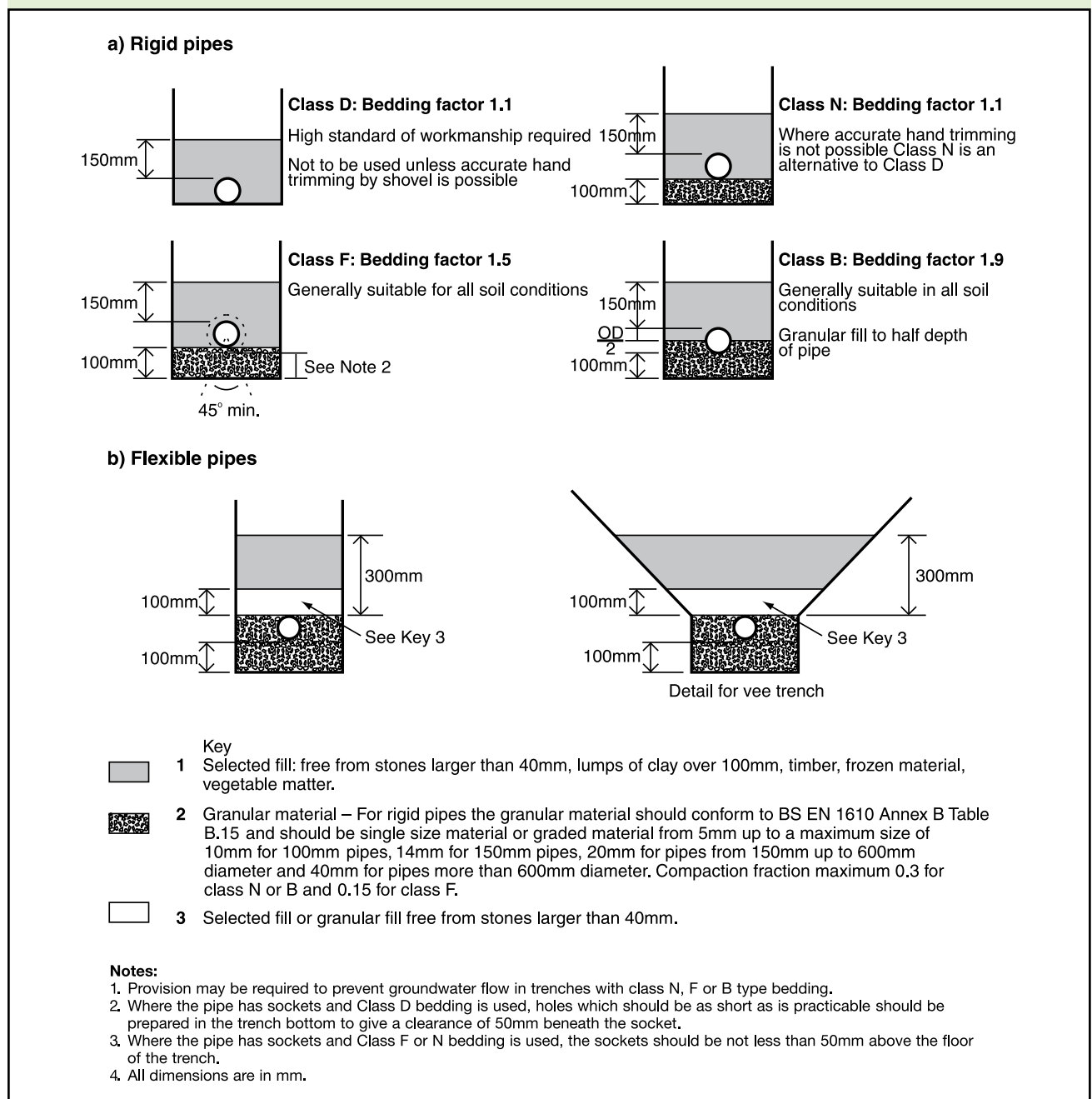
**2.41** The choice of bedding and backfilling depends on the depth at which the pipes are to be laid and the size and strength of the pipes.

**2.42 Rigid pipes** – The types of bedding and backfilling which should be used for rigid pipes of standard strength laid in a trench of any width are shown in Diagram 10 and Tables 8 and 9. Minimum and maximum depths of cover are also shown for each type.

**2.43 Flexible pipes** – These will become deformed under load and require support to limit the deformation. The bedding and backfilling should be as shown in Diagram 10. Minimum and maximum depths of cover are also shown in Table 10.

**2.44** Where pipes have less than the minimum recommended cover in Table 8, 9 or 10, the pipes should, where necessary, be protected from damage by a reinforced concrete cover slab with a

Diagram 10 Bedding for pipes



flexible filler and at least 75mm of granular material between the top of the pipe and the underside of the flexible filler below the slabs (see Diagram 11 and paragraphs 2.28, 2.42 and 2.43).

**2.45** Where it is necessary to backfill the trench with concrete in order to protect nearby foundations (see paragraph 2.25) movement joints formed with compressible board should be provided at each socket or sleeve joint face (see Diagram 12).

**Table 8 Limits of cover for class 120 clayware pipes in any width of trench**

Nominal size	Laid in fields	Laid in light roads	Laid in main roads
100mm	0.6m – 8+m	1.2m – 8+m	1.2m – 8m
225mm	0.6m – 5m	1.2m – 5m	1.2m – 4.5m
400mm	0.6m – 4.5m	1.2m – 4.5m	1.2m – 4m
600mm	0.6m – 4.5m	1.2m – 4.5m	1.2m – 4m

**Notes:**

1. All pipes assumed to be Class 120 to BS EN 295; other strengths and sizes of pipe are available, consult manufacturers.
2. Bedding assumed to be Class B with bedding factor of 1.9; guidance is available on use of higher bedding factors with clayware pipes.
3. Alternative designs using different pipe strengths and/or bedding types may offer more appropriate or economic options using the procedures set out in BS EN 1295.
4. Minimum depth in roads set to 1.2m irrespective of pipe strength.

**Table 9 Limits of cover for class M concrete pipes in any width of trench**

Nominal size	Laid in fields	Laid in light roads	Laid in main roads
300mm	0.6m – 3m	1.2m – 3m	1.2m – 2.5m
450mm	0.6m – 3.5m	1.2m – 3.5m	1.2m – 2.5m
600mm	0.6m – 3.5m	1.2m – 3.5m	1.2m – 3m

**Notes:**

1. All pipes assumed to be Class M to BS 5911; other strengths and sizes of pipe are available, consult manufacturers.
2. Bedding assumed to be Class B with bedding factor of 1.9.
3. Alternative designs using different pipe strengths and/or bedding types may offer more appropriate or economic options using the procedures set out in BS EN 1295.
4. Minimum depth in roads set to 1.2m irrespective of pipe strength.

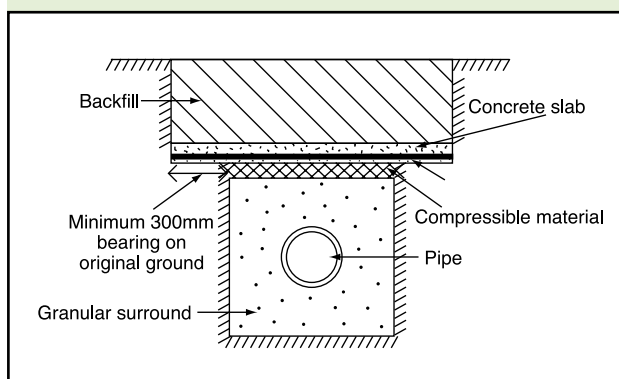
**Table 10 Limits of cover for thermoplastics (nominal ring stiffness SN4) pipes in any width of trench**

Nominal size	Laid in fields	Laid in light roads	Laid in main roads
100mm – 300mm	0.6m – 7m	0.9m – 7m	0.9m – 7m

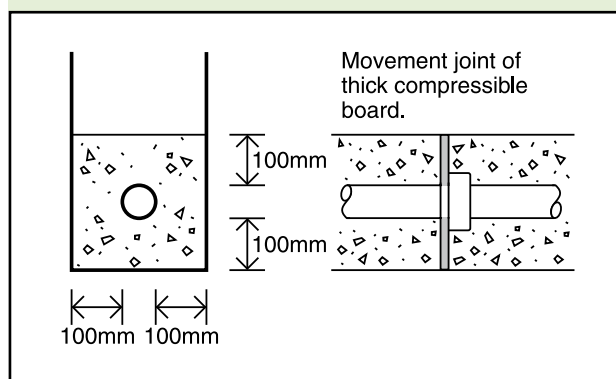
**Notes:**

1. For drains and sewers less than 1.5m deep and there is a risk of excavation adjacent to the drain and depth, special calculation is necessary, see BS EN 1295.
2. All pipes assumed to be to in accordance with the relevant standard listed in Table 7 with nominal ring stiffness SN4; other strengths and sizes of pipe are available, consult manufacturers.
3. Bedding assumed to be Class S2 with 80% compaction and average soil conditions.
4. Alternative designs using different pipe strengths and/or bedding types may offer more appropriate or economic options using the procedures set out in BS EN 1295.
5. Minimum depth is set to 1.5m irrespective of pipe strength to cover loss of side support from parallel excavations.

**Diagram 11 Protection for pipes laid at shallow depths (minimum sizes)**



**Diagram 12 Joints for concrete encased pipes (minimum sizes)**



## Clearance of blockages

**2.46** Sufficient and suitable access points should be provided for clearing blockages from drain runs which cannot be reached by any other means. The siting, spacing and type of the access points will depend on the layout, depth and size of the runs.

**2.47** The provisions described below are for normal methods of rodding (which need not be in the direction of flow) and not mechanical means of clearing.

**2.48** Access points should be one of four types. Tables 11 and 12 show the depth at which each type should be used and the recommended dimensions it should have. The dimensions should be increased at junctions if they do not allow enough space for branches. The types are:

- rodding eyes – capped extensions of the pipes;
- access fittings – small chambers on (or an extension of) the pipes but not with an open channel;
- inspection chambers – chambers with working space at ground level;
- manholes – deep chambers with working space at drain level.

**2.49 Siting of access points** – access should be provided at the following points:

- on or near the head of each drain run, and
- at a bend and at a change of gradient, and
- at a change of pipe size (but see below if it is at a junction), and
- at a junction unless each run can be cleared from an access point (some junctions can only be rodded through from one direction).

**Table 11 Minimum dimensions for access fittings and inspection chambers**

Type	Depth to invert from cover level (m)	Internal sizes		Cover sizes	
		Length x width (mm x mm)	Circular (mm)	Length x width (mm x mm)	Circular (mm)
Rodding eye		As drain but min. 100			Same size as pipework <sup>1</sup>
Access fitting					
small	150 diam.	0.6 or less, except where situated in a chamber	150 x 100	150	150 x 100 <sup>1</sup>
large	225 x 100		225 x 100	225	225 x 100 <sup>1</sup>
Inspection chamber					
shallow	0.6 or less	225 x 100	190 <sup>2</sup>	–	190 <sup>1</sup>
deep	1.2 or less	450 x 450	450	Min. 430 x 430	430
	> 1.2	450 x 450	450	Max. 300 x 300 <sup>3</sup>	Access restricted to max. 350 <sup>3</sup>

**Notes:**

- The clear opening may be reduced by 20mm in order to provide proper support for the cover and frame.
- Drains up to 150mm.
- A larger clear opening cover may be used in conjunction with a restricted access. The size is restricted for health and safety reasons to deter entry.

**Table 12 Minimum dimensions for manholes**

Type	Size of largest pipe (DN)	Min. internal dimensions <sup>1</sup>		Min. clear opening size <sup>1</sup>	
		Rectangular length and width	Circular diameter	Rectangular length and width	Circular diameter
Manhole					
< 1.5m deep to soffit	≤ 150	750 x 675 <sup>7</sup>	1000 <sup>7</sup>	750 x 675 <sup>2</sup>	na <sup>3</sup>
	225	1200 x 675	1200	1200 x 675 <sup>2</sup>	
	300	1200 x 750	1200		
	>300	1800 x (DN+450)	The larger of 1800 or (DN+450)		
>1.5m deep to soffit	≤ 225	1200 x 1000	1200	600 x 600	600
	300	1200 x 1075	1200		
	375-450	1350 x 1225	1200		
	>450	1800 x (DN+775)	The larger of 1800 or (DN+775)		
Manhole shaft <sup>4</sup>					
> 3.0m deep to soffit of pipe	Steps <sup>5</sup>	1050 x 800	1050	600 x 600	600
	Ladder <sup>5</sup>	1200 x 800	1200		
	Winch <sup>6</sup>	900 x 800	900	600 x 600	600

**Notes:**

1. Larger sizes may be required for manholes on bends or where there are junctions.
2. May be reduced to 600 by 600 where required by highway loading considerations, subject to a safe system of work being specified.
3. Not applicable due to working space needed.
4. Minimum height of chamber in shafted manhole 2m from benching to underside of reducing slab.
5. Min. clear space between ladder or steps and the opposite face of the shaft should be approximately 900mm.
6. Winch only – no steps or ladders, permanent or removable.
7. The minimum size of any manhole serving a sewer (i.e. any drain serving more than one property) should be 1200mm x 675mm rectangular or 1200mm diameter.

**2.50** Access should be provided to long runs. The distances between access points depend on the types of access used but should not be more than shown in Table 13 for drains up to and including 300mm.

**2.51** Access points to sewers (serving more than one property) should be in places where they are accessible and apparent for use in an emergency. Examples of suitable locations include highways, public open space, unfenced front gardens and shared or unfenced driveways.

**2.52 Construction of access points** – these should contain the foul water under working and test conditions and resist the entry of groundwater and rainwater. Any of the materials shown in Table 14 may be used.

**2.53** Where half round channels are used in inspection chambers and manholes the branches up to and including 150mm diameter should discharge into the channel in the direction of flow at or above the level of the horizontal diameter. A branch with a diameter >150mm should be set with the soffit level with that of the main drain. Where the angle of the branch is more than 45° a three quarter section branch should be used. Channels and branches should be benched up at least to the top of the outgoing pipe and at a slope of 1 in 12. The benching should be rounded at the channel with a radius of at least 25mm.

Table 13 Maximum spacing of access points in metres

From	To Access Fitting		To Junction	To Inspection chamber	To Manhole
	Small	Large			
Start of external drain <sup>1</sup>	12	12	–	22	45
Rodding eye	22	22	22	45	45
Access fitting: small 150 diam. and 150 x 100	–	–	12	22	22
large 225 x 100	–	–	22	45	45
Inspection chamber shallow	22	45	22	45	45
Manhole and inspection chamber deep	–	–	–	45	90 <sup>2</sup>

**Notes:**

1. Stack or ground floor appliance
2. May be up to 200 for man-entry size drains and sewers

Table 14 Materials for access points

Material	British Standard
<b>1. Inspection chambers and manholes</b>	
Clay, bricks and blocks	BS 3921
Vitrified clay	BS EN 295, BS 65
Concrete – precast	BS 5911
Concrete – in situ	BS 8110
Plastics	BS 7158
<b>2. Rodding eyes and access fittings</b> (excluding frames and covers)	as pipes see Table 7 ETA Certificates

**2.54** Inspection chambers and manholes should have removable non-ventilating covers of durable material (such as cast iron, cast or pressed steel, precast concrete or plastics) and be of suitable strength. Small lightweight access covers should be secured (for example with screws) to deter unauthorised access (for example by children). Inspection chambers and manholes in buildings should have mechanically fixed airtight covers unless the drain itself has watertight access covers. Manholes deeper than 1m should have metal step irons or fixed ladders.

## Workmanship

**2.55** Good workmanship is essential. Workmanship should be in accordance with BS 8000 *Workmanship on Building Sites Part 14: Code of practice for below ground drainage*.

**2.56** During construction, drains and sewers which are left open should be covered when work is not in progress to prevent entry by rats.

**2.57** Any drain or sewer should be protected from damage by construction traffic and heavy machinery. Protection may be provided by providing barriers to keep such traffic away from the line of the sewer. Heavy materials should not be stored over drains or sewers.

**2.58** Where piling works are being carried out care should be taken to avoid damage to any drain or sewer. The position of the drain or sewer should be established by survey. If the drain or sewer is within 1m of the piling, trial holes should be excavated to establish the exact position of the sewer. The location of any connections should also be established. Piling should not be carried out where the distance from the outside of the sewer to the outside of the pile is less than two times the diameter of the pile.

## Testing and inspection

**2.59 Water tightness** – after laying, including any necessary concrete or other haunching or surrounding and backfilling, gravity drains and private sewers should be tested for water tightness using either an air test or a water test. Information on test requirements is given in paragraphs 2.60 and 2.61 for pipe sizes up to 300mm. For further information and for larger sizes see BS 8000 Part 14 or BS EN 1610.

**2.60 Air test** – for pipes up to 300mm diameter, the pipe should be pressurised up to a pressure of 110mm water gauge and held for approximately 5 minutes prior to testing. Following this the pipe should be able to hold an initial 100mm pressure with a maximum loss of head on a manometer of 25mm in a period of 7 minutes.

**2.61 Water test** – For pipes up to 300mm diameter the system should be filled with water up to a depth of 5m above the lowest invert in the test section and a minimum depth of 1m measured at the highest invert in the test section. This may then be left for a period (one hour is generally sufficient) to condition the pipe. The test pressure should then be maintained for a period of 30 minutes, by topping up the water level as necessary so that it is within 100mm of the required level throughout the test. The losses per square metre of surface area should not exceed 0.15 litres for test lengths with only pipelines or 0.20 litres for test lengths including pipelines and manholes, or 0.40 litres for tests with only manholes and inspection chambers alone (i.e. no pipelines).

**2.62 Connectivity** – Where separate drainage systems are provided (see Approved Document H5), connections should be proven to ensure that they are connected to the correct system.

## Alternative approach

**2.63** The requirement can also be met by following the relevant recommendations of BS EN 752. The relevant clauses are in Part 3, Part 4 and Part 6. BS EN 752, together with BS EN 1610 and BS EN 1295, contains additional information about design and construction. BS EN 12056 describes the discharge unit method of calculating flows. Also by providing systems meeting the requirements of BS EN 1091 *Vacuum sewerage systems outside buildings*, or BS EN 1671 *Pressure sewerage systems outside buildings*.

# Appendix H1-A: Additional guidance for larger buildings

## Capacity of pipes

(see paragraph 1.28)

**A.1** The flow depends on the type, number and grouping of appliances.

**A.2** Appliances are seldom in use simultaneously and the minimum stack sizes in normal use are capable of carrying the flow from quite large numbers of appliances. Table A1 shows approximate flow rates resulting from the typical household group of 1 WC, 1 bath, 1 or 2 washbasins, 1 sink and 1 washing machine used for design purposes in BS EN 12056.

**Table A1 Flow rates from dwellings**

Number of dwellings	Flow rate (litres/sec)
1	2.5
5	3.5
10	4.1
15	4.6
20	5.1
25	5.4
30	5.8

**A.3** Flow rates for other commonly used appliances not covered in Table A1 are shown in Table A2.

**Table A2 Flow rates from appliances**

Appliance	Flow rate (litres/sec)
Spray tap basin	0.06
Washing machine	0.70
Dishwashing machine	0.25
Urinal (per person)	0.15

## Traps

(see paragraph 1.4)

**A.4** Minimum trap sizes and seal depths for appliances not listed in Table A2 are shown in Table A3.

**Table A3 Minimum trap sizes and seal depths additional to Table 2**

Appliance	Diam. of trap (mm)	Depth of seal (mm)
Sanitary towel macerator	40	75
Food waste disposal unit (industrial type)	50	75
Urinal stall (1 to 6 person position)	65	50

## Branch discharge pipes

(see paragraph 1.10)

**A.5** A branch pipe should not discharge into a stack less than 750mm above the invert of the tail of the bend at the foot of the stack in a multi-storey building up to 5 storeys. Alternatively a branch pipe serving any ground floor appliance may discharge direct to a drain or into its own stack.

**A.6** If the building has more than 5 storeys ground floor appliances, unless discharging to a gully or drain, should discharge into their own stack. If the building has more than 20 storeys ground floor appliances, unless discharging to a gully or drain, and first floor appliances should discharge into their own stack.

## Ventilating stacks

(see paragraph 1.21)

**A.7** A dry stack may provide ventilation for branch ventilation pipes as an alternative to carrying them to outside air or to a ventilated discharge stack (ventilated system).

**A.8** Ventilation stacks serving buildings with not more than 10 storeys and containing only dwellings should be at least 32mm diameter (for all other buildings see paragraph 1.29).

**A.9** The lower end of a stack may be connected directly to a ventilated discharge stack below the lowest branch discharge pipe connection and above the bend at the foot of the stack or to the crown of the lowest branch discharge pipe connection providing it is  $\geq 75$ mm diameter.

## **Greywater recovery systems**

**A.10** Sanitary pipework and underground drainage used to collect greywater for recovery and re-use within the building should be designed and constructed in accordance with the guidance in this Approved Document.

**A.11** All pipework carrying greywater for re-use should be clearly marked with the word 'GREYWATER' in accordance with Water Regulations Advisory Scheme Information Guidance Note 09-02-05 *Marking and Identification of Pipework for Reclaimed and Grey Water Systems*.

**A.12** Guidance on external storage tanks is given in Approved Document H2.

**A.13** Further guidance on greywater recovery systems can be found in the Water Regulations Advisory Scheme leaflet No. 09-02-04 *Reclaimed Water Systems. Information about installing, modifying or maintaining reclaimed water systems*.

# Appendix H1-B: Repairs, alterations and discontinued use of drains and sewers

## Legislation

**B.1** Although the Building Regulations do not include requirements for the continuing maintenance or repair of drains and sewers, local authorities and sewerage undertakers have powers to ensure that adequate maintenance is carried out, that repairs and alterations are carried out properly, and that disused drains and sewers are sealed.

## Power to examine and test

**B.2** Under Section 48 (Power of local authority to examine and test drains etc. believed to be defective) of the Public Health Act 1936 the local authority may test any drain or sewer where it appears to them that they have reasonable grounds for believing that is in such a condition:

- a. as to be prejudicial to health or a nuisance (for example it is harbouring rats); or
- b. (for those drains or sewers indirectly connecting to a public sewer) is so defective that groundwater leaks into it.

**B.3** Under Section 114 (Power to investigate defective drain or sewer) of the Water Industry Act 1991, sewerage undertakers may examine and test any drain or private sewer connecting with a public sewer, where it appears to them that they have reasonable grounds for believing that is in such a condition:

- a. as to be injurious or likely to cause injury to health or be a nuisance; or
- b. is so defective that subsoil water leaks into it.

## Power to require repairs

**B.4** Under Section 59 (Drainage of building) of the Building Act 1984 the local authority may require the owner of a building to carry out remedial works where a soil pipe, drain or private sewer is:

- a. insufficient;
- b. in such a condition as to be prejudicial to health or a nuisance; or
- c. so defective that subsoil water leaks into it.

## Power to repair drains or private sewers

**B.5** Under Section 17 (Power to repair drains etc. and to remedy stopped up drains etc.) of the Public Health Act 1961, as amended, local authorities have powers to repair or remove blockages on drains or private sewers which are not sufficiently maintained or kept in good repair or are stopped up, provided the cost does not exceed £250. They must first give notice to the

owner. The costs may be recovered from the owner or owners of the drain or sewer.

## Repair, reconstruction or alterations to underground drains or sewers

**B.6** Although repairs, reconstruction or minor alterations to drains or sewers are not normally covered under the Building Regulations, local authorities have other powers to control such works.

**B.7** Material alterations to existing drains and sewers are, however, covered under the Building Regulations.

**B.8 Notice to be given before repairs or alterations are carried out.** Under Section 61 (Repair etc. of drain) of the Building Act 1984, any person intending to repair, reconstruct or alter a drain must, except in an emergency, give 24 hours notice to the local authority of their intention to carry out the works. Where the works are carried out in an emergency they shall not cover over the work without giving such notice. They must also give free access to the local authority to inspect the works.

**B.9** The local authority may, if appropriate, use their powers under Section 48 of the 1936 Public Health Act (see paragraph B.2) to test the drain, or under Section 59 of the Building Act 1984 (see paragraph B.4) to require remedial works.

## Sealing or removal of disused drains or sewers

**B.10** Disused drains and sewers offer ideal harbourage to rats and frequently offer a route for them to move between sewers and the surface. They could also collapse causing subsidence.

**B.11** Under Section 62 (Disconnection of drain) of the Building Act 1984, any person who carries out works which result in any part of a drain becoming permanently disused, they shall seal the drain at such points as the local authority may direct.

**B.12** Section 82 (Notices about demolition) of the Building Act 1984 allows the local authority to require any person demolishing a building to remove or seal any sewer or drain to which the building was connected.

**B.13** Under Section 59 (Drainage of building) of the Building Act 1984, the local authority can require the owner of a building to remove, or otherwise render innocuous, any disused drain or sewer which is prejudicial to health or a nuisance.

## Guidance

**B.14** Paragraphs B.15 to B.19 give guidance on the appropriate methods associated with the repair and alteration of drains and sewers, and the removal or sealing of disused drains and sewers.

## Repairs and alterations

**B.15** Repairs, reconstruction and alterations to existing drains and sewers should be carried out to the same standards as new drains and sewers (see Approved Document H1 Section 2).

**B.16** Where new pipework is connected to existing pipework, particular consideration should be given to the following points.

- a. Ensuring that the existing pipework is not damaged, for example by using proper cutting equipment.
- b. Ensuring that the resulting joint is water tight, for example by using purpose made repair couplings.
- c. Ensuring that differential settlement does not occur between the existing and new pipework, for example by proper bedding of the pipework.

## Sealing disused drains

**B.17** Disused drains or sewers provide ideal nesting sites for rats. In order to prevent this disused drains or sewers should be disconnected from the sewer system as near as possible to the point of connection. This should be done in a manner which does not damage any pipe which is still in use and ensures that the sewer system is water tight. This may be carried out, for example, by removing the pipe from a junction and placing a stopper in the branch of the junction fitting. Where the connection was to a public sewer the sewerage undertaker should be consulted.

**B.18** Drains or sewers less than 1.5m deep which are in open ground should as far as is practicable be removed. Other pipes should be sealed at both ends and at any point of connection, and grout filled to ensure that rats cannot gain access.

**B.19** Larger pipes (225mm and above) should be grout filled to prevent subsidence or damage to buildings or services in the event of collapse.

# Appendix H1-C: Adoption of sewers and connection to public sewers

**C.1** There are a number of different ways in which a sewer may become a public sewer. Drains serving only one curtilage cannot be adopted by the sewerage undertaker.

## An agreement with the sewerage undertaker to adopt sewers on completion

**C.2** Under Section 104 (Agreements to adopt sewer or sewage disposal works at future date) of the Water Industry Act 1991, a sewerage undertaker may enter into an agreement with a developer to adopt a sewer at some time in the future subject to certain conditions. In cases of dispute appeals may be made to the Director General of Water Services.

**C.3** Sewerage undertakers normally require the work to be carried out in accordance with their standards which are published in *Sewers for Adoption*.

## Requisition of a sewer from the sewerage undertaker

**C.4** Under Section 98 (Requisition of public sewer) of the Water Industry Act 1991, the owner or occupier of a building or proposed building or a local authority may requisition a sewer from the sewerage undertaker. The sewer is constructed by the sewerage undertaker who may use its rights of access to land. The person requisitioning the sewer may be required to contribute towards the cost of the sewer over a period of 12 years.

## Adoption by the sewerage undertaker at the request of the owner

**C.5** Under Section 102 (Adoption of sewers and disposal works) of the Water Industry Act 1991, a person may request a sewerage undertaker to adopt an existing sewer. The sewer should be in good condition and accessible. In cases of dispute, appeals may be made to the Director General of Water Services.

## Adoption by the sewerage undertaker at its own volition

**C.6** Under Section 102 (Adoption of sewers and disposal works) of the Water Industry Act 1991, a sewerage undertaker may decide to adopt an existing sewer of its own volition. The sewer should be in good condition and accessible. In cases of dispute, appeals may be made to the Director General of Water Services.

## Making connections to public sewers

**C.7** Under Section 106 (Right to communicate with public sewer) of the Water Industry Act 1991, the owner or occupier of a building has a right to connect to a public sewer subject to the following restrictions.

- Where the public sewer is designated as either a foul sewer or a surface water sewer, the right is limited to connection of foul drains or surface water drains as appropriate.
- The manner of the connection would not be prejudicial to the public sewer system.
- 21 days notice is given to the sewerage undertaker of the intention to make the connection.

**C.8** Under Section 107 (Right of undertaker to undertake making of communication with public sewers) of the Water Industry Act 1991, the sewerage undertaker may undertake the work of making the connection and recover their reasonable costs. Alternatively they may allow the developer to undertake to carry out the work under their supervision.

**C.9** Guidance on making connections to existing sewers is given in paragraphs 2.15 and 2.16.

## Drains which could be used to drain other developments

**C.10** Section 112 of the Water Industry Act 1991 enables the sewerage undertaker to require that a drain or sewer be constructed in a different manner so that it may form part of the general system of drainage. The sewerage undertaker repays the person constructing the drain or sewer the additional costs of complying with the undertaker's requirement.

Where land or property neighbouring the applicant's site is likely to be developed, it would be prudent for the applicant to discuss the possibilities with the planning authority and the sewerage undertaker.

## Adoption of surface water sewers by the Highway Authority

**C.11** Under Section 37 (Highway created by dedication may become maintainable at public expense) or Section 38 (Power of highway authorities to adopt by agreement) of the Highways Act 1980, a highway authority may adopt, or agree to adopt in the future the drainage associated with a highway. Under Section 115 (Use of highway drains as sewers and vice versa) of the Water Industry Act 1991, the highway authority may agree that a highway drain may be used to drain rainwater from buildings. This power is discretionary.

**Table C1 Characteristics that should be considered when designing or laying a shared drain/sewer so that it meets the basic requirements for adoption**

a. Sewers should be designed and constructed in accordance with the Protocol on Design Construction and Adoption of Sewers in England and Wales	Protocol on Design, Construction and Adoption of Sewers in England and Wales, Defra, 2002
b. Sewers should be laid at an appropriate distance from buildings so as to avoid damage to the foundations	H1-2.17, H1-2.25 and Diagram 8. The distance from foundation to any drain is set out in H1-2.25.  When building over a sewer the recommended minimum distance is 3m (H4-1.6)
c. The manholes and chambers, especially in private land, should be located so that they are, and continue to be, easily accessible manually or, if necessary, with maintenance equipment such as pipe jettors or mini-excavators. This is of particular importance where the depth would justify mechanical excavation to undertake repair work  Although design codes indicate that access points may be up to 200m apart, it is unlikely that it would be possible to rod or safely pressure jet small-diameter pipes over such a distance; 100m is more appropriate	H1-2.51. Consult sewerage undertaker about access for plant
d. The last access point on the house drain should be sized to allow man entry and should be located in an accessible position. This access point should, as far as practicable, be located adjacent to the curtilage and preferably form an interface with the connection to the lateral where it runs outside the curtilage of the property to discharge into a sewer in a highway, into public open space or into third-party land  As this final manhole is likely to be in position where vehicle or plant loading is anticipated, its construction should accord with Sewers for Adoption	H1-2.51
e. House 'collector' drains serving each property should normally discharge into the sewer via a single junction or a manhole	H1-2.13 to 2.16
f. Sewers should not be laid deeper than necessary, but in all cases the structural integrity of the pipe needs to be maintained. This can normally be done by providing a cover to the top of the pipe barrel of 1.2m or 0.9m in highways or private land respectively. If these depths are not practicable, special protection measures such as a concrete slab should be provided	H1-2.27 and BS EN 1295-1
g. Sizing and design of manholes and chambers should depend on the depth and on whether man entry is required. Manholes on or near highways or other roads need to be of robust construction	H1-2.48
h. Sewers should be laid in straight lines in both vertical and horizontal alignments	H1-2.19
j. The first preference should be to provide separate foul and surface water sewerage systems. Where 'combined' or 'partially combined' sewerage is unavoidable, the sizing and the design of that sewer should be enhanced in accordance with the current codes and design methodologies to make additional provisions to deal with the runoff	Requirement H5, H1-2.35 and H3-3.5. See also BS EN 752 Parts 3 and 4, particularly note Annex ND in BS EN 752 Part 4

# The Requirement

This Approved Document, which took effect on 1 April 2002, deals with the following Requirement which is contained in the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>Wastewater treatment systems and cesspools</b>	
<b>H2.</b> (1) Any septic tank and its form of secondary treatment, other wastewater treatment system or cesspool shall be so sited and constructed that: <ul style="list-style-type: none"> <li>(a) it is not prejudicial to the health of any person;</li> <li>(b) it will not contaminate any watercourse, underground water or water supply;</li> <li>(c) there are adequate means of access for emptying and maintenance; and</li> <li>(d) where relevant, it will function to a sufficient standard for the protection of health in the event of a power failure.</li> </ul>	
(2) Any septic tank, holding tank which is part of a wastewater treatment system or cesspool shall be: <ul style="list-style-type: none"> <li>(a) of adequate capacity;</li> <li>(b) so constructed that it is impermeable to liquids; and</li> <li>(c) adequately ventilated.</li> </ul>	
(3) Where a foul water drainage system from a building discharges to a septic tank, wastewater treatment system or cesspool, a durable notice shall be affixed in a suitable place in the building containing information on any continuing maintenance required to avoid risks to health.	

## Guidance

### Performance

In the Secretary of State's view the requirements of H2 will be met if:

- a. wastewater treatment systems:
  - i. have sufficient capacity to enable breakdown and settlement of solid matter in the wastewater from the buildings;
  - ii. are sited and constructed so as to prevent overloading of the receiving water.
- b. cesspools have sufficient capacity to store the foul water from the building until they are emptied;
- c. wastewater treatment systems and cesspools are sited and constructed so as not to:
  - i. be prejudicial to health or a nuisance;
  - ii. adversely affect water sources or resources;
  - iii. pollute controlled waters;
  - iv. be in an area where there is a risk of flooding.
- d. septic tanks and wastewater treatment systems and cesspools are constructed and sited so as to:
  - i. have adequate ventilation;
  - ii. prevent leakage of the contents and ingress of subsoil water.
- e. having regard to water table levels at any time of the year and rising groundwater levels, drainage fields are sited and constructed so as to:

- i. avoid overloading of the soakage capacity and
- ii. provide adequately for the availability of an aerated layer in the soil at all times.
- f. a notice giving information as to the nature and frequency of maintenance required for the cesspool or wastewater treatment system to continue to function satisfactorily is displayed within each of the buildings.

### Introduction to provisions

**0.1** A wastewater treatment system may be a septic tank, together with a drainage field or other means of secondary treatment, or other wastewater treatment system.

**0.2** Paragraphs 1.1 to 1.72 give guidance only on the general principles relating to capacity, siting and ventilation of cesspools and wastewater treatment systems.

**0.3 Any discharge from a wastewater treatment system is likely to require a consent from the Environment Agency.**

**Note:** Initial contact with the Environment Agency is normally made as part of the planning procedures for non-mains drainage. Where there have not previously been such discussions with the Environment Agency, those seeking Building Regulations approval for non-mains drainage should contact the area office of the Environment Agency in order to determine whether a consent to discharge is required and what parameters apply. This should be done before an application is made for Building Regulations approval as it may have a direct bearing on the type of system that may be installed. Further information is available in the Environment Agency's Pollution Prevention Guideline No. 4 *Disposal of sewage where no mains drainage is available*.

**0.4** Specialist knowledge is advisable in the detailed design and installation of small sewage treatment works and guidance is given in BS 6297:1983 *Code of practice for design and installation of small sewage treatment works and cesspools* (see also paragraph 1.72).

### Options

**1.1** The use of non-mains foul drainage, such as wastewater treatment systems or cesspools, should only be considered where connection to mains drainage is not practicable (see Approved Document H1).

**1.2 Septic tanks** provide suitable conditions for the settlement, storage and partial decomposition of solids which need to be removed at regular intervals. The discharge can, however, still be harmful and will require further treatment from either a drainage field/mound or constructed wetland.

**1.3** Septic tanks with some form of secondary treatment will normally be the most economic means of treating wastewater from small developments (e.g. 1 to 3 dwellings). Appropriate forms of secondary treatment for use with septic tanks (drainage fields, drainage mounds or constructed wetlands) are described in paragraphs 1.4 to 1.10 below.

**1.4** Drainage fields typically consist of a system of sub-surface irrigation pipes which allow the effluent to percolate into the surrounding soil. Biological treatment takes place naturally in the aerated layers of soil.

**1.5** Drainage fields may be used to provide secondary treatment in conjunction with septic tanks. They may be used where the subsoil is sufficiently free-draining and the site is not prone to flooding or waterlogging at any time of year.

**1.6** The Environment Agency does not permit drainage fields or drainage mounds in prescribed Zone 1 groundwater source-protection zones.

**1.7** Drainage mounds are essentially drainage fields placed above the natural surface of the ground providing an aerated layer of soil to treat the discharge.

**1.8** Drainage mounds may be used where the subsoil is occasionally waterlogged, but where drainage fields would otherwise be suitable.

**1.9** Constructed wetlands (for example reed beds) are man-made systems which exploit the natural treatment capacity of certain wetland plants.

**1.10** Constructed wetlands discharging to a suitable watercourse may be used to treat septic tank effluent where drainage fields are not practical. The consent of the Environment Agency may be required.

**1.11 Packaged treatment works** – This term is applied to a range of systems engineered to treat a given hydraulic and organic load using prefabricated components which can be installed with minimal site work. They use a number of processes which are different in detail, all treat effluent to a higher standard than septic tank systems and this normally allows direct discharge to a watercourse.

**1.12** Packaged treatment works discharging to a suitable watercourse will normally be more economic for larger developments than septic tanks. They should also be considered where space is limited or where other options are not possible.

**1.13 Cesspools** – A cesspool is a watertight tank, installed underground, for the storage of sewage. No treatment is involved.

**1.14** Where no other option is feasible a cesspool may be acceptable.

## Septic tanks

**1.15** Septic tanks should only be used in conjunction with a form of secondary treatment (e.g. a drainage field, drainage mound or constructed wetland).

### Siting

**1.16** Septic tanks should be sited at least 7m from any habitable parts of buildings, and preferably downslope.

**1.17** Where they are to be emptied using a tanker, the septic tank should be sited within 30m of a vehicle access provided that the invert level of the septic tank is no more than 3m below the level of the vehicle access. This distance may need to be reduced where the depth to the invert of the tank is more than 3m. There should also be a clear route for the hose such that the tank can be emptied and cleaned without hazard to the building occupants and without the contents being taken through a dwelling or place of work.

### Design and construction

**1.18** Septic tanks should have a capacity below the level of the inlet of at least 2,700 litres (2.7m<sup>3</sup>) for up to 4 users. The size should be increased by 180 litres for each additional user.

**1.19** Factory-made septic tanks are available in glass reinforced plastics, polyethylene or steel and should meet the requirements of BS EN 12566-1. Particular care is necessary in ensuring stability of these tanks.

**1.20** Septic tanks may also be constructed in brickwork or concrete, roofed with heavy concrete slabs. Brickwork should be of engineering bricks and be at least 220mm thick. The mortar should be a mix of 1:3 cement–sand ratio. In situ concrete should be at least 150mm thick of C/25/P mix (see BS 5328).

**1.21** Septic tanks should prevent leakage of the contents and ingress of subsoil water and should be ventilated. Ventilation should be kept away from buildings.

**1.22** The inlet and outlet of a septic tank should be designed to prevent disturbance to the surface scum or settled sludge and should incorporate at least two chambers or compartments operating in series. Where the width of the tank does not exceed 1200mm the inlet should be via a dip pipe. To minimise turbulence, provision should be made to limit the flow rate of the incoming foul water. For steeply laid drains up to 150mm the velocity may be limited by laying the last 12m of the incoming drain at a gradient of 1 in 50 or flatter.

**1.23** The inlet and outlet pipes of a septic tank should be provided with access for sampling and inspection (see Approved Document H1, paragraph 2.48).

**1.24** Septic tanks should be provided with access for emptying and cleaning. Access covers should be of durable quality having regard to the corrosive nature of the tank contents. The access should be lockable or otherwise engineered to prevent personnel entry.

### Marking

**1.25** A notice should be fixed within the building describing the necessary maintenance. An example of such wording is:

‘The foul drainage system from this property discharges to a septic tank and a <insert type of secondary treatment>. The tank requires monthly inspections of the outlet chamber or distribution box to observe that the effluent is free-flowing and clear. The septic tank requires emptying at least once every 12 months by a licensed contractor. The <insert type of secondary treatment> should be <insert details of maintenance of secondary treatment>. The owner is legally responsible to ensure that the system does not cause pollution, a health hazard or a nuisance.’

## Drainage fields and drainage mounds

**1.26** Paragraphs 1.27 to 1.44 give guidance on design and construction of drainage fields and drainage mounds to provide secondary treatment to the discharge from a septic tank or package treatment plant.

### Siting

**1.27** A drainage field or mound serving a wastewater treatment plant or septic tank should be located:

- at least 10m from any watercourse or permeable drain;
- at least 50m from the point of abstraction of any groundwater supply and not in any Zone 1 groundwater protection zone;
- at least 15m from any building;
- sufficiently far from any other drainage fields, drainage mounds or soakaways so that the overall soakage capacity of the ground is not exceeded.

**1.28** The disposal area should be downslope of groundwater sources.

**1.29** No water supply pipes or underground services other than those required by the disposal system itself should be located within the disposal area.

**1.30** No access roads, driveways or paved areas should be located within the disposal area.

## Ground conditions

**1.31** Well drained and well aerated subsoils are usually brown, yellow or reddish in colour. Examples of subsoils with good percolation characteristics are sand, gravel, chalk, sandy loam and clay loam. It is important that the percolation characteristics are suitable in both summer and winter conditions. Poorly drained or saturated subsoils are often grey or blue in colour. Brown and grey mottling usually indicates periodic saturation. Examples of subsoils with poor percolation characteristics are sandy clay, silty clay and clay.

**1.32** A preliminary assessment should be carried out including consultation with the Environment Agency and local authority to determine the suitability of the site. The natural vegetation on the site should also give an indication of its suitability for a drainage field.

**1.33** A trial hole should be dug to determine the position of the standing groundwater table. The trial hole should be a minimum of 1m<sup>2</sup> in area and 2m deep, or a minimum of 1.5m below the invert of the proposed drainage field pipework. The groundwater table should not rise to within 1m of the invert level of the proposed effluent distribution pipes. If the test is carried out in summer, the likely winter groundwater levels should be considered. A percolation test should then be carried out to assess the further suitability of the proposed area.

**1.34 Percolation test method** – A hole 300mm square should be excavated to a depth 300mm below the proposed invert level of the effluent distribution pipe. Where deep drains are necessary the hole should conform to this shape at the bottom, but may be enlarged above the 300mm level to enable safe excavation to be carried out. Where deep excavations are necessary a modified test procedure may be adopted using a 300mm earth auger. Bore the test hole vertically to the appropriate depth taking care to remove all loose debris.

**1.35** Fill the 300mm square section of the hole to a depth of at least 300mm with water and allow it to seep away overnight.

**1.36** Next day, refill the test section with water to a depth of at least 300mm and observe the time, in seconds, for the water to seep away from 75% full to 25% full level (i.e. a depth of 150mm). Divide this time by 150. The answer gives the average time in seconds ( $V_p$ ) required for the water to drop 1mm.

**1.37** The test should be carried out at least three times with at least two trial holes. The average figure from the tests should be taken. The test should not be carried out during abnormal weather conditions such as heavy rain, severe frost or drought.

**1.38** Drainage field disposal should only be used when percolation tests indicate average values of  $V_p$  of between 12 and 100 and the preliminary site assessment report and trial hole tests have been favourable. This minimum value ensures that untreated effluent cannot percolate too rapidly into groundwater. Where  $V_p$  is outside these limits effective treatment is unlikely to take place in a drainage field. However, provided that an alternative form of secondary treatment is provided to treat the effluent from the septic tanks, it may still be possible to discharge the treated effluent to a soakaway.

## Design and construction

**1.39** Drainage fields or mounds (see Diagrams 1 and 2) should be designed and constructed to ensure aerobic contact between the liquid effluent and the subsoil.

**1.40** Drainage fields should be constructed using perforated pipe, laid in trenches of a uniform gradient which should be not steeper than 1:200.

**1.41** Pipes should be laid on a 300mm layer of clean shingle or broken stone graded between 20mm and 50mm.

Diagram 1 Drainage field

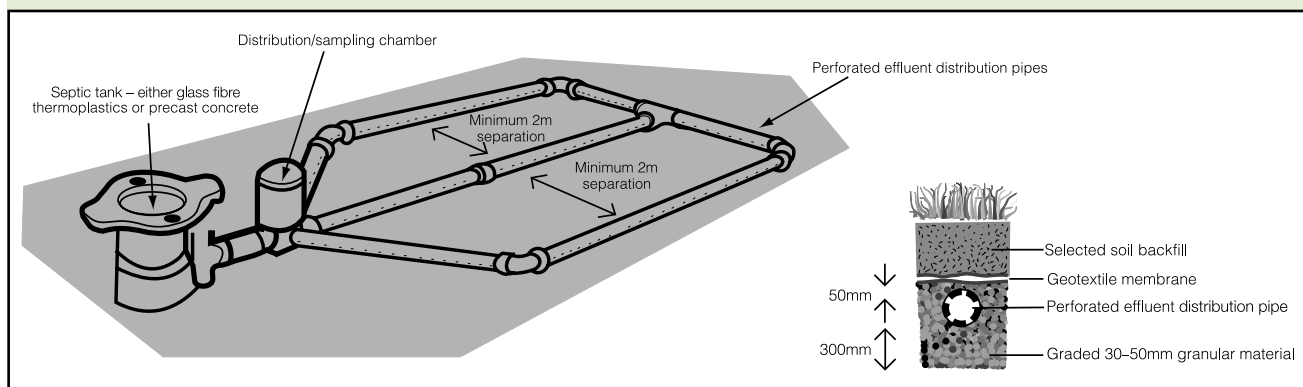
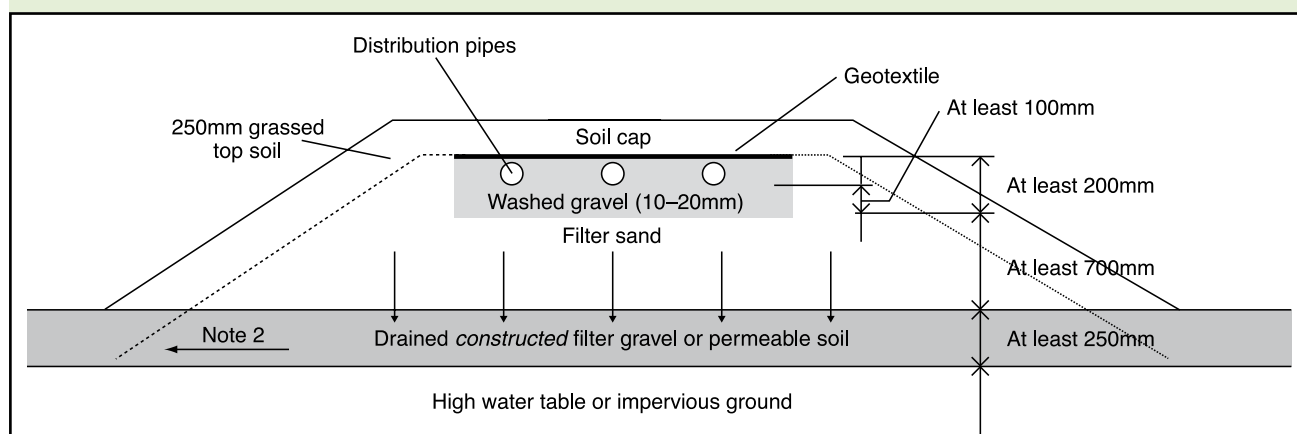


Diagram 2 Drainage mound



## Notes:

1. To provide venting of the filter, the upstream ends of the distribution pipes may be extended vertically above mound level and capped with a cowl or grille.
2. Surface water runoff and uncontaminated seepage from the surrounding soil may be cut off by shallow interceptor drains and diverted away from the mound. There must be no seepage of wastewater to such an interceptor drain.
3. Where the permeable soil is slow draining and overlaid on an impervious layer, the mound filter system should be constructed on a gently sloping site.

**1.42** Trenches should be filled to a level 50mm above the pipe and covered with a layer of geotextile to prevent the entry of silt. The remainder of the trench can be filled with soil; the distribution pipes should be laid at a minimum depth of 500mm below the surface.

Drainage trenches should be from 300mm to 900mm wide, with areas of undisturbed ground 2m wide being maintained between parallel trenches (see Diagram 1).

**1.43** An inspection chamber should be installed between the septic tank and the drainage field.

**1.44** Drainage fields should be set out as a continuous loop fed from the inspection chamber (see Diagram 1). To calculate the floor area of the drainage field ( $A_t$  in  $m^2$ ), the following formula should be used:

$$A_t = p \times V_p \times 0.25$$

where  $p$  is the number of persons served by the tank,  $V_p$  is the percolation value (secs/mm) obtained as described in paragraphs 1.34–1.38.

## Constructed wetlands/reed beds

**1.45** Reed bed treatment systems or other constructed wetland treatment systems can be used to provide secondary or tertiary treatment of effluent from septic tanks or packaged treatment works. The systems purify wastewater as it moves through the gravel bed around the rhizomes and roots, by removing organic matter (BOD), oxidising ammonia, reducing nitrate and removing a little phosphorus. The mechanisms are complex and involve bacterial oxidation, filtration, sedimentation and chemical precipitation.

**1.46** Reed beds generally use the common reed (*Phragmites australis*); other types of plants used in constructed wetlands include the reed maces (*Typha latifolia*), the rush (*Juncus effusus*),

the true bulrush (*Schoenoplectus lacustris*) as well as members of the sedge family (*Carex*) and the yellow flag (*Iris pseudacorus*).

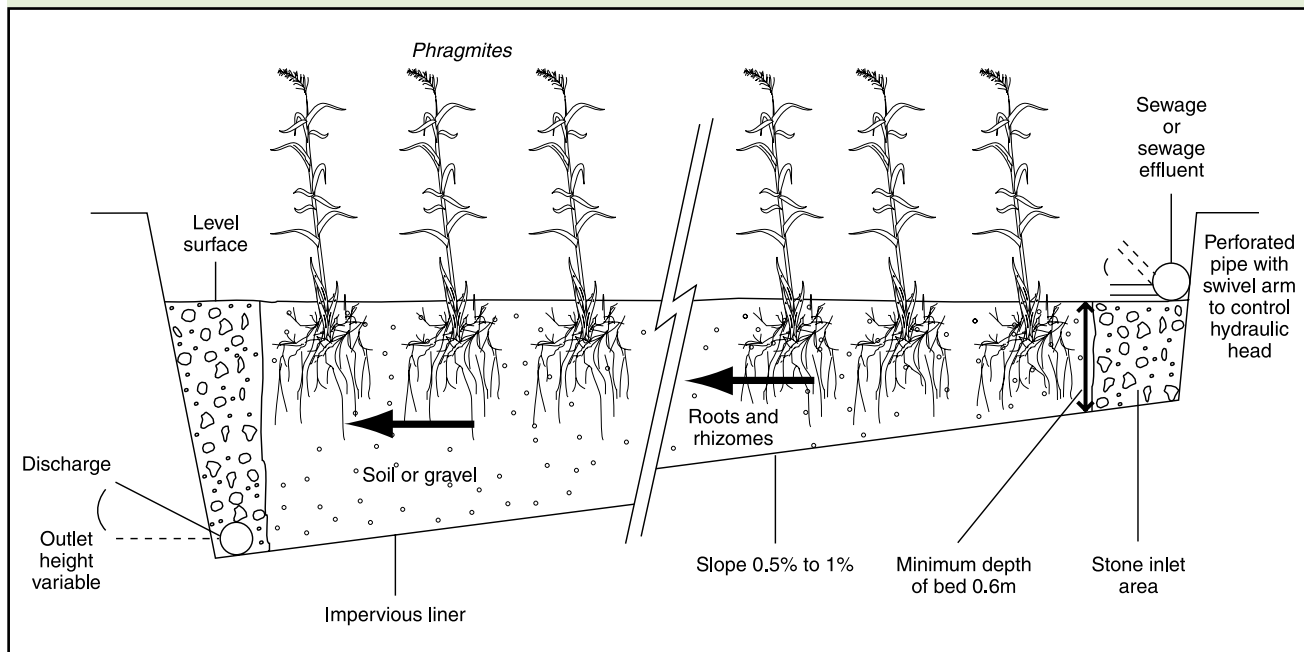
**1.47** Constructed wetlands should not be constructed in the shade of trees or buildings as this will result in poor or patchy growth. Although winter performance is generally similar with respect to removal of BOD and suspended solids, it tends to be poorer than in summer for removal of ammonia due to lower temperatures. This should be taken into consideration during the design stage.

**1.48** There are two main designs of constructed wetland system, horizontal flow and vertical flow.

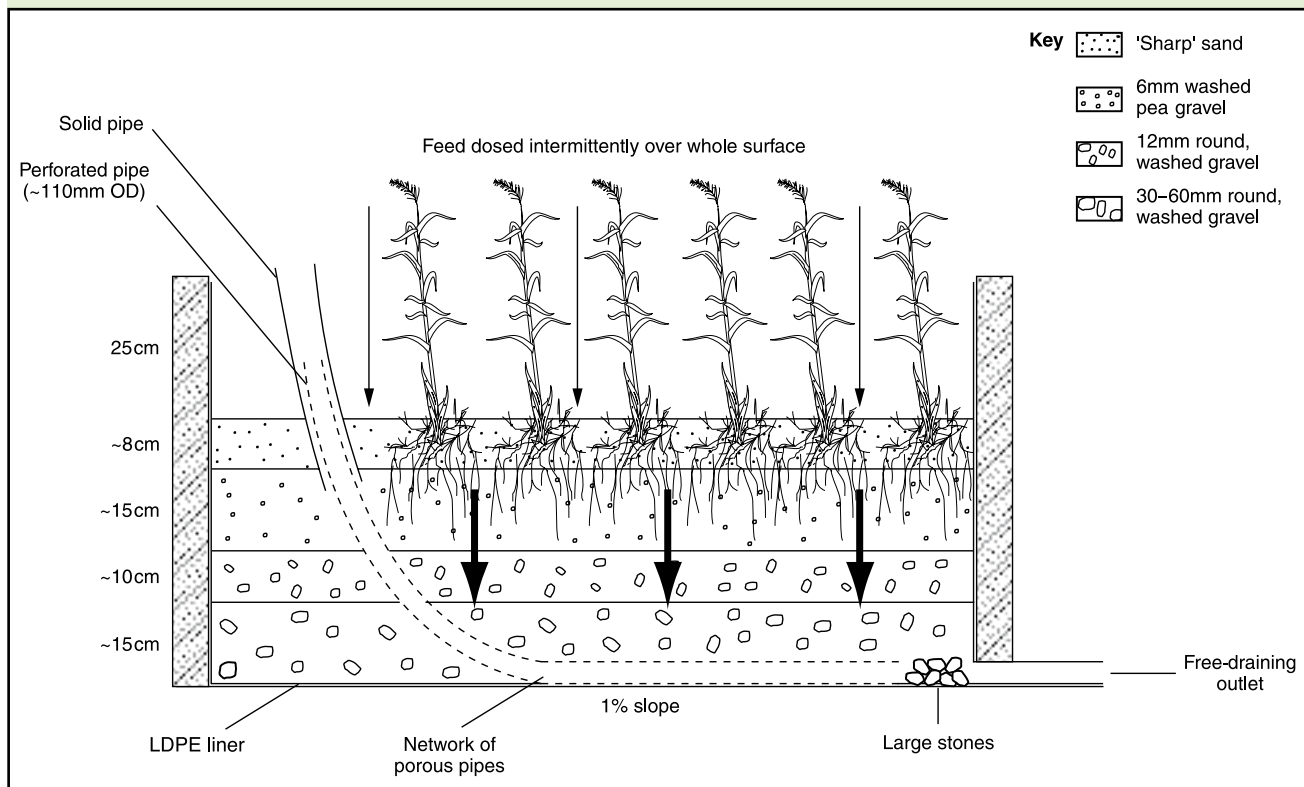
**1.49 Horizontal flow systems** are continuously fed with wastewater from one end. The effluent flows horizontally through the gravel bed over the full width of the bed to the outlet end (see Diagram 3). Horizontal flow systems tend to be oxygen limited and they therefore tend not to be able to completely treat concentrated effluents, particularly those with high levels of ammonia. Horizontal flow systems require a level site. As they only use a single bed less maintenance is required than with vertical flow systems.

**1.50 Vertical flow systems** are intermittently fed with wastewater from the top flooding the surface followed by a period of rest. For this reason two or more beds are normally provided so that they can be used in rotation. The flow is predominantly downward to an outlet at the bottom (see Diagram 4) and is collected by a drainage network at the base. They therefore require a fall of between 1m and 2m. Vertical flow systems can achieve much better oxygen transfer than horizontal flow systems and therefore achieve more complete treatment, particularly of ammonia. They generally require more maintenance than horizontal systems.

**Diagram 3 Typical horizontal flow reed bed treatment system**



**Diagram 4 Typical vertical flow reed bed treatment system**



**1.51** Reed bed treatment systems should be designed and constructed in accordance with BRE Good Building Guide No. 42. Other forms of constructed wetland treatment system should be designed and constructed by specialists.

### Marking

**1.52** A notice should be fixed within the building describing the necessary maintenance. An example of such wording is:

'The foul drainage system from this building discharges to a <insert type of primary treatment> and a constructed wetland. The <insert type of primary treatment> requires <insert details of maintenance of the primary treatment>. The constructed wetland system requires <insert details of maintenance of the constructed wetland>.'

**1.53** Guidance on maintenance requirements for reed bed treatment systems is given in BRE Good Building Guide No. 42.

## Packaged treatment works

### Siting

**1.54** The discharge from the wastewater treatment plant should be sited at least 10m away from watercourses and any other buildings.

### Design and construction

**1.55** Packaged treatment works should be type-tested in accordance with BS 7781 or otherwise tested by a notified body.

**1.56** If the packaged treatment works requires power to operate it should be able to adequately function without power for up to 6 hours or have an uninterruptable power supply.

### Marking

**1.57** A notice should be fixed within the building describing the necessary maintenance. An example of such wording is:

'The foul drainage system from this property discharges to a packaged treatment works. Maintenance is required <insert frequency> and should be carried out by the owner in accordance with the manufacturer's instructions. The owner is legally responsible to ensure that the system does not cause pollution, a health hazard or a nuisance.'

## Cesspools

### Siting

**1.58** The site of the cesspool should preferably be on ground sloping away from and sited lower than any existing building in the immediate vicinity.

**1.59** Cesspools should be sited at least 7m from any habitable parts of buildings and preferably downslope.

**1.60** Cesspools should be sited within 30m of a vehicle access and at such levels that they can be emptied and cleaned without hazard to the building occupants or the contents being taken through a dwelling or place of work. Access may be through a covered space which may be lockable.

### Design and construction

**1.61** Cesspools should have a capacity below the level of the inlet of at least 18,000 litres (18m<sup>3</sup>) for 2 users. This size should be increased by 6800 litres (6.8m<sup>3</sup>) for each additional user.

**1.62** Cesspools should have no openings except for the inlet, access for emptying and ventilation.

**1.63** Cesspools should prevent leakage of the contents and ingress of subsoil water and should be ventilated.

**1.64** Cesspools should be provided with access for emptying and cleaning. Access covers should be of durable quality having regard to the corrosive nature of the tank contents. The access should be lockable or otherwise engineered to prevent personnel entry.

**1.65** Factory-made cesspools are available in glass reinforced plastics, polyethylene or steel and should meet the relevant requirements of BS EN 12566-1. Particular care is necessary in ensuring stability of these tanks.

**1.66** Cesspools may be constructed in brickwork or concrete, roofed with heavy concrete slabs. Brickwork should be of engineering bricks and be at least 220mm thick. The mortar should be a mix of 1:3 cement-sand ratio. In situ concrete should be at least 150mm thick of C/25/P mix (see BS 5328).

**1.67** The inlet of a cesspool should be provided with access for inspection (see Approved Document H1 Section 2).

### Marking

**1.68** A notice should be fixed within the building describing the necessary maintenance. An example of such wording is:

'The foul drainage system from this property is served by a cesspool. The system should be emptied approximately every <insert design emptying frequency> by a licensed contractor and inspected fortnightly for overflow. The owner is legally responsible to ensure that the system does not cause pollution, a health hazard or a nuisance.'

### Greywater and rainwater storage tanks

**1.69** Paragraphs 1.70 to 1.71 give guidance on tanks for the storage of greywater or rainwater for re-use within the building. It does not apply to water butts used for the storage of rainwater for garden use.

**1.70** Greywater and rainwater tanks should:

- a. prevent leakage of the contents and ingress of subsoil water, and should be ventilated;
- b. have an anti-backflow device on any overflow connected to a drain or sewer to prevent contamination of the stored greywater or rainwater in the event of surcharge in the drain or sewer;
- c. be provided with access for emptying and cleaning. Access covers should be of durable quality having regard to the corrosive nature of the tank contents. The access should be lockable or otherwise engineered to prevent personnel entry.

**1.71** Further guidance on systems for greywater and rainwater re-use can be found in the Water Regulations Advisory Scheme leaflet No. 09-02-04. *Reclaimed Water Systems. Information about installing, modifying or maintaining reclaimed water systems.*

### Alternative approach

**1.72** The requirement can also be met by following the relevant recommendations of BS 6297:1983 *Code of practice for design and installation of small sewage treatment works and cesspools*. The relevant clauses are in Section 1, Section 2, Section 3 (Clauses 6–11), Section 4 and Appendices.

# Appendix H2-A: Maintenance of wastewater treatment systems and cesspools

## Legislation

**A.1** Local authorities have powers to ensure that wastewater treatment systems or cesspools are adequately maintained.

## Power to examine and test

**A.2** Under Section 48 (Power of local authority to examine and test drains etc. believed to be defective) of the Public Health Act 1936, the local authority may test any cesspool, septic tank or settlement tank where it appears to them that they have reasonable grounds for believing that it is in such a condition as to be prejudicial to health or a nuisance.

## Power in respect of overflowing or leaking cesspools, septic tanks, etc.

**A.3** Under Section 50 (Overflowing and leaking cesspools) of the Public Health Act 1936, the local authority can take action against any person who has caused by their action, default or sufferance, a septic tank, settlement tank or cesspool to leak or overflow. They may require the person to carry out repairs or to periodically empty the tank.

**A.4** This does not apply to the overflow of treated effluent or flow from a septic tank into a drainage field, provided the overflow is not prejudicial to health or a nuisance.

**A.5** It should be noted that under this section action could be taken against a builder who had caused the problem, and not just against the owner.

## Power to require repairs

**A.6** Under Section 59 (Drainage of building) of the Building Act 1984, the local authority may require the owner or occupier of a building to carry out remedial works where a septic tank, settlement tank or cesspool is:

- a. insufficient;
- b. in such a condition as to be prejudicial to health or a nuisance; or
- c. so defective that groundwater leaks into it.

## Disused septic tanks, cesspools, etc.

**A.7** Also under Section 59 (Drainage of building) of the Building Act 1984, where a disused cesspool, septic tank or settlement tank is prejudicial to health or a nuisance, the local authority may require either the owner or the occupier to fill or remove the tank or otherwise render it innocuous.

## Powers of the Environment Agency

**A.8** The Environment Agency has powers under Section 85 (Offences of polluting controlled waters) of the Water Resources Act 1991 to prosecute anyone causing or knowingly permitting pollution of any stream, river, lake, etc. or any groundwater.

**A.9** They also have powers under Section 161A (Notices requiring persons to carry out anti-pollution works and operations) of the Water Resources Act 1991 (as amended by the Environment Act 1995) to take action against any person causing or knowingly permitting a situation in which pollution of a stream, river, lake, etc. or groundwater is likely. They can require such a person to carry out works to prevent the pollution.

## GUIDANCE ON MAINTENANCE

**A.10** Paragraphs A.11 to A.22 give guidance on the appropriate maintenance of wastewater treatment systems and cesspools.

## Septic tanks

**A.11** Septic tanks should be inspected monthly to check they are working correctly. The effluent in the outlet from the tank should be free-flowing and clear. The flow in the inlet chamber should also be free-flowing.

**A.12** If the flow is incorrect, the tank should be emptied by a licensed contractor. Some contractors offer annual maintenance contracts at reduced rates.

**A.13** The septic tank should be emptied at least once a year. It is recommended that not all sludge is removed as it can act as an anaerobic seed.

**A.14** If the tank is not adequately maintained and solids are carried into a drainage field/mound, the sediments can block the pores in the soil, necessitating the early replacement of the drainage field/mound. Occasionally, it can render the site unsuitable for future use as drainage field/mound.

## Drainage fields and mounds

**A.15** The drainage field/mound should be checked on a monthly basis to ensure that it is not waterlogged and that the effluent is not backing up towards the septic tank.

## Packaged treatment works

**A.16** The outlet of the works should be inspected regularly. The effluent should be free-flowing and clear.

**A.17** Maintenance will vary depending on the type of plant; regular maintenance and inspection should be carried out in accordance with the manufacturer's instructions.

**A.18** Where the treatment works serve more than one property, the developer may seek to get it adopted by the sewerage undertaker under Section 102 (Adoption of sewers and disposal works) or Section 104 (Agreements to adopt a sewer or disposal works at a future date) of the Water Industry Act 1991 (see Approved Document H1, Appendix H1-B).

### **Constructed wetlands/reed beds**

**A.19** Guidance on maintenance of reed beds can be found in BRE Good Building Guide No. 42.

### **Cesspools**

**A.20** Cesspools should be inspected fortnightly for overflow and emptied as required.

**A.21** Typically they require emptying on a monthly basis by a licensed contractor.

**A.22** Emptying frequencies may be estimated by assuming a filling rate of 150 litres per person per day. If the cesspool does not fill within the estimated period, the tank should be checked for leakage.

# The Requirement

This Approved Document, which took effect on 1 April 2002, deals with the following Requirement which is contained in the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>Rainwater drainage</b>	
<b>H3.</b> (1) Adequate provision shall be made for rainwater to be carried from the roof of the building.	
(2) Paved areas around the building shall be so constructed as to be adequately drained.	Requirement H3(2) applies only to paved areas: <ul style="list-style-type: none"> <li>(a) which provide access to the building pursuant to requirement M1 (access and use of buildings other than dwellings), or requirement M2 (access to extensions to buildings other than dwellings), or requirement M4(1), (2) or (3) (access to and use of dwellings);</li> <li>(b) which provide access to or from a place of storage pursuant to requirement H6(2) (solid waste storage); or</li> <li>(c) in any passage giving access to the building, where this is intended to be used in common by the occupiers of one or more other buildings.</li> </ul>
(3) Rainwater from a system provided pursuant to subparagraphs (1) or (2) shall discharge to one of the following, listed in order of priority: <ul style="list-style-type: none"> <li>(a) an adequate soakaway or some other adequate infiltration system; or, where that is not reasonably practicable,</li> <li>(b) a watercourse; or, where that is not reasonably practicable,</li> <li>(c) a sewer.</li> </ul>	Requirement H3(3) does not apply to the gathering of rainwater for re-use.

## Guidance

### Performance

In the Secretary of State's view the requirements of H3 will be met if:

- a. rainwater from roofs and paved areas is carried away from the surface either by a drainage system or by other means;
- b. a rainwater drainage system:
  - i. carries the flow of rainwater from the roof to an outfall (a soakaway, a watercourse, a surface water or a combined sewer),
  - ii. minimises the risk of blockage or leakage,
  - iii. is accessible for clearing blockages.
- c. rainwater soaking into the ground is distributed sufficiently so that it does not damage the foundations of the proposed building or any adjacent structure.

## Introduction to provisions

**0.1** The provisions in this document in relation to the drainage of paved areas apply only to paved areas:

- a. within the curtilage of a building which are
  - i. provided in accordance with requirements M2 and M4, to provide access to the principal entrance (see Approved Document M volume 2 section 1 for buildings other than dwellings and Approved Document M volume 1 sections 1A, 2A and 3A for dwellings);
  - ii. provided in accordance with requirement H6 to give access from the building to the place for storing refuse, and from the place of storage to the collection point (see Approved Document H6);

- b. which are yards or other forms of access intended to be used in common by more than one building.

The provisions of H3 only apply if these surfaces are paved.

**0.2** Methods of drainage other than connection to a public surface water sewer are encouraged where they are technically feasible.

**0.3** The capacity of the drainage system should be large enough to carry the expected flow at any point in the system.

**0.4** The flow depends on the area to be drained and the intensity of the rainfall.

**0.5** The capacity depends on the size and gradient of the gutters and pipes. Capacities and minimum sizes are given in the text.

**0.6** Rainwater or surface water should not be discharged to a cesspool or septic tank.

# Section 1: Gutters and rainwater pipes

## Design rainfall intensities

**1.1** For eaves, gutters the rainfall intensity should be obtained from Diagram 1.

**1.2** Where the design incorporates valley gutters, parapet gutters, siphonic or drainage systems from flat roofs, and where over-topping of these systems would have particularly high consequences such as water entering the building, wetting of insulation or other dampness the design should be carried out in accordance with BS EN 12056 (see paragraph 1.17).

## Gutters

**1.3** The flow into a gutter depends on the area of surface being drained and whether the surface is flat or pitched (and, if it is pitched, on the angle of pitch). Table 1 shows a way of allowing for the pitch by working out an effective area.

**Table 1 Calculation of drained area**

Type of surface	Effective design area
1 Flat roof	plan area of relevant portion
2 Pitched roof at 30° Pitched roof at 45° Pitched roof at 60°	plan area of portion x 1.29 plan area of portion x 1.50 plan area of portion x 1.87
3 Pitched roof over 70° or any wall	elevational area x 0.5

**1.4** Table 2 shows the largest effective area which should be drained into the gutter sizes which are most often used. These sizes are for a gutter which is laid level, half round in section with a sharp edged outlet at only one end and where the distance from a stop end to the outlet is not more than 50 times the water depth. At greater distances the capacity of the gutter should be reduced. The Table shows the smallest size of outlet which should be used with the gutter.

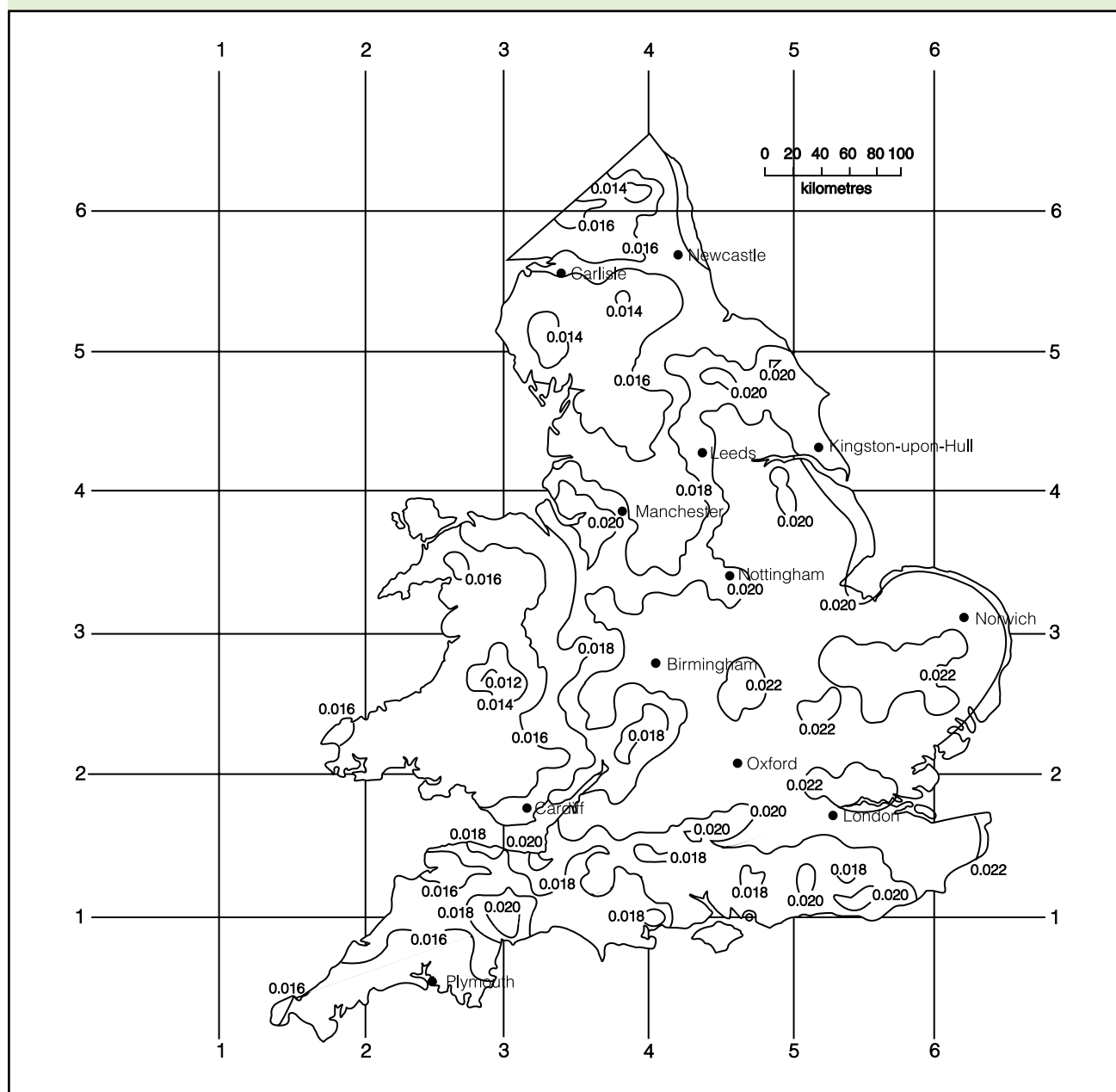
**1.5** Where the outlet is not at the end, the gutter should be of the size appropriate to the larger of the areas draining into it. Where there are two end outlets they may be up to 100 times the depth of flow apart.

**Table 2 Gutter sizes and outlet sizes**

Max. effective roof area (m <sup>2</sup> )	Gutter size (mm diam.)	Outlet size (mm diam.)	Flow capacity (litres/sec)
6.0	–	–	–
18.0	75	50	0.38
37.0	100	63	0.78
53.0	115	63	1.11
65.0	125	75	1.37
103.0	150	89	2.16

**Note:** Refers to nominal half round eaves gutters laid level with outlets at one end sharp edged. Round edged outlets allow smaller downpipe sizes.

**Diagram 1 Rainfall intensities for design of gutter and rainfall pipes  
(litres per second per square metre)**



**1.6** Gutters should be laid with any fall towards the nearest outlet. Where there is a fall or the gutter has a section which gives it larger capacity than a half-round gutter or the outlet is round edged it may be possible to reduce the size of the gutter and pipe.

Paragraph 1.17 gives a reference to some detailed recommendations which make reductions possible.

**1.7** Gutters should also be laid so that any overflow in excess of the design capacity, caused by conditions such as above normal rainfall, will be discharged clear of the building, reducing the risk of overspilling of rainwater into the building or structural overload. On flat roofs, valley gutter, and parapet gutters, additional outlets may be necessary.

## Rainwater pipes

**1.8** Rainwater pipes should discharge into a drain or gully but may discharge to another gutter or onto another surface if it is drained. Any rainwater pipe which discharges into a combined system should do so through a trap (see Approved Document H1).

**1.9** Where a rainwater pipe discharges onto a lower roof or paved area, a pipe shoe should be fitted to divert water away from the building. Where rainwater from a roof with an effective area greater than 25m<sup>2</sup> discharges through a single downpipe onto a lower roof, a distributor pipe should be fitted to the shoe to ensure that the flow width at the receiving gutter is sufficient so that it does not over-top the gutter.

**1.10** The size of a rainwater pipe should be at least the size of the outlet from the gutter. A down pipe which serves more than one gutter should have an area at least as large as the largest of the contributing outlets and should be of sufficient size to take the flow from the whole contributing area.

### Siphonic roof drainage systems

**1.11** Siphonic roof drainage systems should be designed in accordance with BS EN 12056-3 (see paragraph 1.17) and should take particular account of the following:

- a. The need to take account of surcharge in the downstream drainage system as this can reduce the flow in the downpipe.
- b. For long gutters the time taken for the system to prime the siphonic action may be excessive. Overflow arrangements should be provided to prevent gutters from over-topping.

**1.12** Further information on the design of siphonic drainage systems can be found in Hydraulics Research Ltd Report SR 463 *Performance of Syphonic Drainage Systems for Roof Gutters*.

### Eaves drop systems

**1.13** Eaves drop systems allow rainwater from roofs to drop freely to the ground. Where these are used, they should be designed taking into account the following:

- a. the protection of the fabric of the building from ingress of water, caused by water splashing on the external walls;
- b. the need to prevent water from entering doorways and windows;
- c. the need to protect persons using doorways, etc. from falling water;
- d. the need to protect persons and the fabric of the building from rainwater as it hits the ground by splashing, for example by provision of a gravel layer or angled concrete apron deflecting the water away from the building;
- e. the protection of foundations from concentrated discharges such as those from valleys or valley gutters or from excessive flows due to large roofs (i.e. where the area of roof per unit length of eaves is high).

### Rainwater recovery systems

**1.14** Rainwater drainage systems used to collect water for re-use within the building (rainwater recovery systems) should take account of the following:

- a. storage tanks should comply with requirement H2 (see Approved Document H2 paragraphs 1.69 to 1.71);
- b. pipework, washouts and valves should be clearly identified on marker plates (see Water Regulations Advisory Scheme Information Guidance Note 09-02-05 *Marking and Identification of Pipework for Reclaimed and Grey Water Systems*).

**1.15** Further guidance on rainwater recovery systems can be found in the Water Regulations Advisory Scheme leaflet No. 09-02-04. *Reclaimed Water Systems. Information about installing, modifying or maintaining reclaimed water systems*.

### Materials for gutters, rainwater pipes and joints

**1.16** The materials used should be of adequate strength and durability, and

- a. all gutter joints should remain water tight under working conditions. Pipes inside a building should be capable of withstanding the air tightness test described in paragraph 1.32 of Approved Document H1, and
- b. pipework in siphonic roof drainage systems should be able to resist to negative pressures in accordance with the design, and
- c. gutters and rainwater pipes should be firmly supported without restricting thermal movement, and
- d. different metals should be separated by non-metallic material to prevent electrolytic corrosion.

### Alternative approach

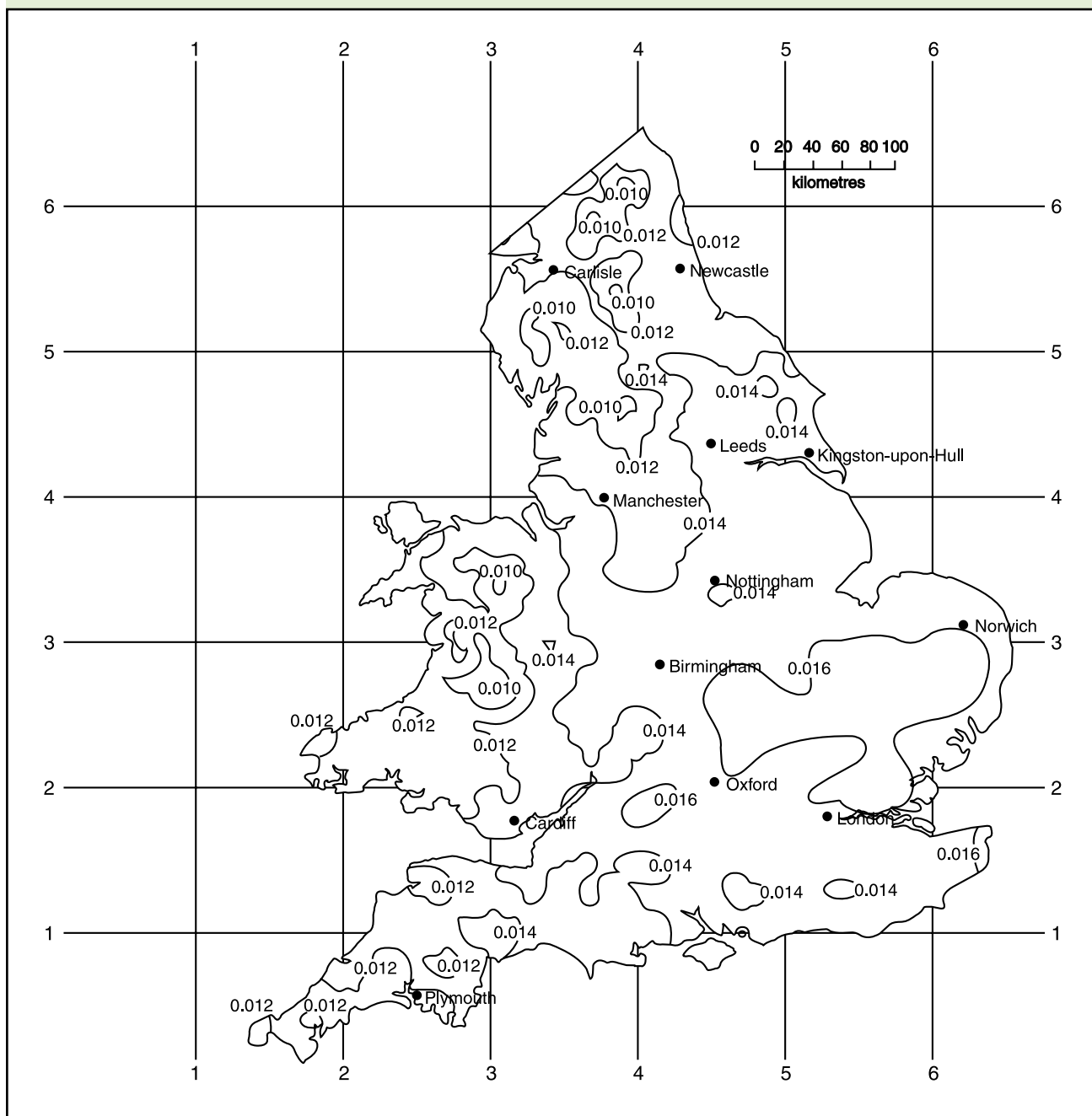
**1.17** The performance can also be met by following the relevant recommendations of BS EN 12056 *Gravity drainage systems inside buildings*. The relevant clauses are in Part 3 *Roof drainage layout and calculation*, Clauses 3 to 7, annex A and National Annexes, and in Part 5 *Installation, testing instructions for operation maintenance and use*, Clauses 3, 4, 6 and 11. These standards contain additional detailed information about design and construction.

## Section 2: Drainage of paved areas

**2.1** This section gives guidance on the design of paved areas for rainwater drainage systems. It is applicable to the drainage of paved areas around buildings and small car parks up to 4,000m<sup>2</sup>. For the design of systems serving larger catchments, reference should be made to BS EN 752-4 (see paragraph 2.19).

**2.2** Surface gradients should direct water draining from a paved area away from buildings. Where the levels would otherwise cause water to concentrate along the wall of a building, a reverse gradient should be created, for at least 500mm from the wall of the building, to divert the water away from the wall.

**Diagram 2 Rainfall intensities for design of drainage from paved areas and underground rainwater drainage (litres per second per square metre)**



**2.3** Gradients on impervious surfaces should be designed to permit the water to drain quickly from the surface. A gradient of at least 1 in 60 is recommended. The gradient across a path should not exceed 1 in 40.

### Design rainfall intensities

**2.4** Design rainfall intensities of 0.014 litres/second/m<sup>2</sup> may be assumed for normal situations. Where ponding of rainfall is undesirable rainfall intensities should be obtained from Diagram 2.

**2.5** For very high risk areas, where ponding would lead to flooding of buildings, the drainage should be designed in accordance with BS EN 752-4 (see paragraph 2.19).

### Freedraining surfaces

**2.6** Paths, driveways and other narrow areas of paving should be freedraining to a pervious area such as grassland, provided that:

- a. the water is not discharged adjacent to buildings where it could damage foundations; and
- b. the soakage capacity of the ground is not overloaded.

**2.7** Where water is to be drained onto the adjacent ground the edge of the paving should be finished above or flush with the surrounding ground to allow the water to runoff.

**2.8** Where the surrounding ground is not sufficiently permeable to accept the flow, filter drains may be provided (see paragraph 3.33).

### Pervious paving

**2.9** Pervious paving consists of a porous or permeable surface overlying a granular layer which acts as a storage reservoir, retaining peak flows while the water soaks into the underlying subsoil. They should be considered for larger paved areas where it is not possible to drain the rainwater to an adjacent pervious area. The design of the storage layer is undertaken on a similar basis to the design of the storage volume in soakaways (see paragraphs 3.24–3.28). Where infiltration is not possible (see paragraph 3.25), they may also be used with an impermeable barrier below the storage layer as a detention tank prior to flows discharging to a drainage system (see paragraph 3.35).

**2.10** For steeply sloping surfaces, a check should be made to ensure that the water level can rise sufficiently in the granular storage layer to allow the storage capacity to be mobilised. A check should also be made to ensure that the stored water will not accumulate around the foundations of the building. Where infiltration is not possible (see paragraph 3.25), they may also be used with an impermeable barrier below the storage layer as a detention tank prior to flows discharging to a drainage system (see paragraph 3.35).

**2.11** Pervious paving should not be used where excessive amounts of sediment are likely to enter the pavement and block the pores.

**2.12** Pervious paving should not be used in oil storage areas, or where runoff may be contaminated with pollutants. Surface water should not be allowed to soak into the ground where ground conditions are not suitable (see paragraph 3.25).

**2.13** Further information on pervious paving can be obtained from CIRIA report C522 – *Sustainable urban drainage systems – design manual for England and Wales*.

### Drainage systems

**2.14** Where it is not possible for surfaces to be freedraining, or to use pervious paving, impervious paving should be used with gullies or channels discharging to a drainage system.

**2.15** Gullies should be provided at low points where water would otherwise pond. Intermediate gullies should be provided at intervals to ensure that gullies are not overloaded and the depth of flow in channels is not excessive.

**2.16** Gully gratings should be set approximately 5mm below the level of the surrounding paved area in order to allow for settlement.

**2.17** Provision should be made to prevent silt and grit entering the system, either by provision of gully pots of suitable size or by catchpits.

**2.18** Drainage from large paved areas should be designed in accordance with BS EN 752-4 (see 2.19).

### Alternative approach

**2.19** The performance can also be met by following the relevant recommendations of BS EN 752-4:1998 *Drain and sewer systems outside buildings, Part 4 Hydraulic design and environmental aspects*. The relevant clauses are

Clause 11 and National Annexes ND and NE.

## Section 3: Surface water drainage

**3.1** This section gives guidance on the design of surface water drainage systems. It is applicable to the drainage of small catchments with impervious areas up to 2 hectares. For the design of systems serving larger catchments, reference should be made to BS EN 752-4 (see paragraph 3.36).

### Outlets

**3.2** Surface water drainage should discharge to a soakaway or other infiltration system where practicable.

**3.3** Discharge to a watercourse may require a consent from the Environment Agency, who may limit the rate of discharge. Maximum flow rates can be limited by provision of detention basins (see paragraph 3.35).

**3.4** Where other forms of outlet are not practicable, discharge should be made to a sewer.

### Combined systems

**3.5** Some sewers carry both foul water and surface water (combined systems) in the same pipe. Where they do the sewerage undertaker can allow surface water to discharge into the system if the sewer has enough capacity to take the added flow (see Approved Document H1 paragraph 2.1). Some private sewers (drains serving more than one building that have not been adopted by the sewerage undertaker) also carry both foul water and surface water. If a sewer operated as a combined system does not have enough capacity, the surface water should be run in a separate system with its own outfall.

**3.6** In some circumstances, where a sewer is operated as a combined system and has sufficient capacity, separate drainage should still be provided (see Approved Document H5).

**3.7** Surface water drainage connected to combined sewers should have traps on all inlets.

### Design rainfall intensities

**3.8** Design rainfall intensities of 0.014 litres/second/m<sup>2</sup> may be assumed for normal situations. Alternatively the rainfall intensity may be obtained from Diagram 2.

**3.9** Where low levels of surface flooding could cause flooding of buildings the rainfall intensities should be obtained from BS EN 752-4 (see paragraph 3.36).

### Design

**3.10** Where there is evidence of a liability to surcharging from sewers, or levels in the building or on the site make gravity connection impracticable, surface water lifting equipment will be needed (see Approved Document H1 paragraphs 2.8 to 2.12).

### Layout

**3.11** Refer to paragraphs 2.13 to 2.21 of Approved Document H1.

### Depth of pipes

**3.12** Refer to paragraphs 2.27 and 2.28 of Approved Document H1.

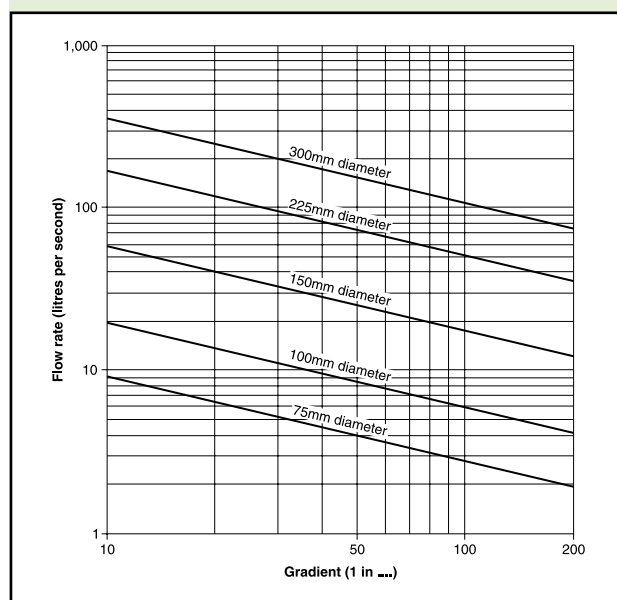
### Pipe gradients and sizes

**3.13** Drains should have enough capacity to carry the flow. The capacity depends on the size and gradients of the pipes.

**3.14** Drains should be at least 75mm diameter. Surface water sewers (serving more than one building) should have a minimum size of 100mm. Diagram 3 shows the capacities of drains of various sizes at different gradients. However the capacity can be increased by increasing the gradient, or by using larger pipes.

**3.15** 75mm and 100mm rainwater drains should be laid at not less than 1:100. 150mm drains and sewers should be laid at gradients not less than 1:150 and 225mm drains should be laid at gradients not less than 1:225. For minimum gradients for larger pipes see BS EN 752-4 (see paragraph 3.36).

**Diagram 3 Discharge capacities of rainwater drains running full**



## Materials for pipes and jointing

**3.16** See paragraph 2.40 of Approved Document H1.

## Bedding and backfilling

**3.17** See paragraphs 2.41 to 2.45 of Approved Document H1.

## Clearance of blockages

**3.18** See paragraphs 2.46 to 2.54 of Approved Document H1.

## Workmanship

**3.19** See paragraphs 2.55 to 2.58 of Approved Document H1.

## Testing and inspection

**3.20** See paragraphs 2.59 to 2.62 of Approved Document H1.

## Contaminated runoff

**3.21** Where any materials which could cause pollution are stored or used, separate drainage systems should be provided. This should include an appropriate form of separator or treatment system or the flow should be discharged into a system suitable for receiving polluted effluent.

**3.22** On car parks, petrol filling stations or other areas where there is likely to be leakage or spillage of oil, drainage systems should be provided with oil interceptors (see Appendix H3-A).

## Soakaways and other infiltration drainage systems

**3.23** Infiltration devices include soakaways, swales, infiltration basins and filter drains.

**3.24** Further information on the design of infiltration drainage systems can be found in CIRIA Report 156 – *Infiltration drainage – Manual of good practice*.

**3.25** Infiltration drainage is not always possible. Infiltration devices should not be built:

- a. within 5m of a building or road or in areas of unstable land (see Planning Policy Guidance Note 14 Annex 1);
- b. in ground where the water table reaches the bottom of the device at any time of the year;
- c. sufficiently far from any drainage fields, drainage mounds or other soakaways so that the overall soakage capacity of the ground is not exceeded and the effectiveness of any drainage field is not impaired (see Approved Document H2);
- d. where the presence of any contamination in the runoff could result in pollution of a groundwater source or resource.

**3.26 Soakaways** for areas less than 100m<sup>2</sup> are generally formed from square or circular pits, filled with rubble or lined with dry-jointed masonry or perforated ring units. Soakaways serving larger areas are generally lined pits or trench type soakaways.

**3.27** Soakaways should be designed to a return period of once in ten years. The design should be carried out with storms of differing durations to determine the duration which gives the largest storage volume. For small soakaways serving 25m<sup>2</sup> or less a design rainfall of 10mm in 5 minutes may be assumed to give the worst case. For soakaways serving larger areas reference should be made to the sources listed in paragraph 3.30. Where the ground is marginal overflow drains can be acceptable.

**3.28** Percolation tests should be carried out to determine the capacity of the soil (see Approved Document H2 paragraphs 1.34 to 1.38). Where the test is carried out in accordance with Approved Document H2, the soil infiltration rate (*f*) is related to the value *V<sub>p</sub>* derived from the test by the equation:

$$f = \frac{10^{-3}}{3V_p}$$

**3.29** The storage volume should be calculated so that, over the duration the storm, it is sufficient to contain the difference between the inflow volume and the outflow volume. The inflow volume is calculated from the rainfall depth (see paragraph 3.26) and the area drained. The outflow volume (*O*) is calculated from the equation:

$$O = a_{s50} \times f \times D$$

Where *a<sub>s50</sub>* is the area of the side of the storage volume when filled to 50% of its effective depth, and *D* is the duration of the storm in minutes.

**3.30** Soakaways serving larger areas should be designed in accordance with BS EN 752-4 (see paragraph 3.36), or BRE Digest 365 *Soakaway design*.

## Other types of infiltration system

**3.31 Swales** are grass-lined channels which transport rainwater from a site as well as controlling flow and quality of surface runoff. Some of the flow infiltrates into the ground. There may be an overflow at the end into another form of infiltration device or a watercourse. They are particularly suitable for treatment of runoff from small residential developments, parking areas and roads.

**3.32 Infiltration basins** are dry grass-lined basins designed to promote infiltration of surface water to the ground.

**3.33 Filter drains** or french drains consist of the trench, lined with a geotextile membrane and filled with gravel. Much of the flow infiltrates into the ground. A perforated pipe is often laid through the gravel to assist drainage.

**3.34** Flow enters the top of the filter drain directly from runoff, or is discharged into it through drains.

### Detention ponds

**3.35** Detention ponds are used to attenuate the flow from a drainage system, to limit the peak rate of flow into a sewer system or watercourse. Further information on design may be found in the references given in paragraph 3.36 and in *Sustainable Urban Drainage Systems – A Design Manual for England and Wales* published by CIRIA.

### Alternative approach

**3.36** The requirement can also be met by following the relevant recommendations of BS EN 752-4 *Drain and sewer systems outside buildings*. The relevant clauses are in Part 4 *Hydraulic design and environmental considerations* Clauses 3 to 12 and National Annexes NA, NB and ND to NI. BS EN 752, together with BS EN 1295 and BS EN 1610, contains additional detailed information about design and construction.

## Appendix H3-A: Oil separators

### Legislation

**A.1** Under Section 85 (Offences of polluting controlled waters) of the Water Resources Act 1991, it is an offence to discharge any noxious or polluting material into a watercourse, coastal water or underground water. Most surface water sewers discharge to watercourses.

**A.2** Under Section 111 (Restrictions on use of public sewers) of the Water Industry Act 1991, it is an offence to discharge petrol into any drain or sewer connected to a public sewer.

**A.3** Premises keeping petrol must be licensed under the Petroleum (Consolidation) Act 1928. Conditions may be placed on licences.

**A.4** The Environment Agency issues guidance notes on the provision of oil separators.

**A.5** The Health and Safety Executive issues guidance notes on the storage of oil.

### Technical guidance

**A.6** For most paved areas around buildings or car parks where a separator is required, a by-pass separator should be provided which has a nominal size (NSB) equal to 0.0018 times the contributing area. In addition it should have a silt storage volume in litres equal to 100 times NSB.

**A.7** In fuel storage areas and other high risk areas full retention separators are required. These should have a nominal size (NS) equal to 0.018 times the contributing area. In addition it should have a silt storage volume in litres equal to 100 times NS.

**A.8** Separators discharging to infiltration devices or surface water sewers should be Class I.

**A.9** Separators should be leak tight. Inlet arrangements should not be direct to the water surface. Adequate ventilation should be provided.

**A.10** Separators should comply with the requirements of the Environment Agency and with BS EN 858-2002 A1 2004 and BS EN 858-2:2003. In addition, where the Petroleum Act applies, they should comply with the requirements of the licensing authority.

**A.11** Separators should be maintained regularly to ensure their continued effectiveness. Provision should be made for access for inspection and maintenance.

**A.12** Further information on provision of separators is available in *Use and design of oil separators in surface drainage systems*, Pollution Prevention Guideline No. 3. This can be obtained from the Environment Agency.

# The Requirement

This Approved Document, which took effect on 1 April 2002, deals with the following Requirement which is contained in the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<p><b>Building over sewers</b></p> <p><b>H4.</b> (1) The erection or extension of a building or work involving the underpinning of a building shall be carried out in a way that is not detrimental to the building or building extension or to the continued maintenance of the drain, sewer or disposal main.</p> <p>(2) In this paragraph ‘disposal main’ means any pipe, tunnel or conduit used for the conveyance of effluent to or from a sewage disposal works, which is not a public sewer.</p> <p>(3) In this paragraph and paragraph H5 ‘map of sewers’ means any records kept by a sewerage undertaker under section 199 of the Water Industry Act 1991 (a).</p>	<p>Requirement H4 applies only to work carried out:</p> <p>(a) over a drain, sewer or disposal main which is shown on any map of sewers; or</p> <p>(b) on any site or in such a manner as may result in interference with the use of, or obstruction of the access of any person to, any drain, sewer or disposal main which is shown on any map of sewers.</p>

(a) 1991 c. 56; Section 199 was amended by Section 97 of the Water Act 2003 (c. 37).

## Guidance

### Performance

In the Secretary of State’s view the requirements of H4 will be met if:

- a. the building or extension or work involving underpinning:
  - i. is constructed or carried out in a manner which will not overload or otherwise cause damage to the drain, sewer or disposal main either during or after the construction;
  - ii. will not obstruct reasonable access to any manhole or inspection chamber on the drain, sewer or disposal main;
- b. in the event of the drain, sewer or disposal main requiring replacement, there is a satisfactory diversionary route or the building or the extension will not unduly obstruct work to replace the drain, sewer or disposal main, on its present alignment;

- c. the risk of damage to the building as a result of failure of the drain, sewer or disposal main is not excessive having regard to:
  - i. the nature of the ground;
  - ii. the condition, location or construction of the drain, sewer or disposal main;
  - iii. the nature, volume and pressure of the flow in the drain, sewer or disposal main;
  - iv. the design and construction of the foundations of the building.

### Introduction to provisions

**0.1** These provisions apply to the construction, extension or underpinning of a building over or within 3m of the centreline of an existing drain, sewer or disposal main shown on the sewerage undertaker’s sewer records whether that sewer is a public sewer or not.

**0.2** Copies of the sewer record maps are held by the sewerage undertaker and by local authorities. These are available for inspection during office hours.

**0.3** Where it is proposed to construct a building over or near a drain or sewer shown on any map of sewers, the developer should consult the owner of the drain or sewer, if the owner is not the developer himself. In the case of a public sewer the owner is the sewerage undertaker, who may be able to advise on the condition of the sewer or arrange an inspection.

**0.4** If repair or replacement of a public sewer is required it will be carried out by the sewerage undertaker.

**0.5** Where it is proposed to construct a building or extension over a sewer which is intended for adoption, it is advisable to consult the sewerage undertaker.

## Undue risk in the event of failure of the drain or sewer

**1.1** Some soils are easily eroded by groundwater leaking into the drain or sewer. Examples of such soils include fine sands, fine silty sands, saturated silts and peat. Buildings should not be constructed over or within 3m of drains or sewers in such soils unless special measures are taken in the design and construction of foundations to prevent undue risk to the building in the event of failure of the drain or sewer. Special measures will not be needed if the invert of the drain or sewer is:

- a. above the level of the foundations; and
- b. above the groundwater level; and
- c. no more than 1m deep.

**1.2** A building constructed over or within 3m of:

- a. any rising main (except those used solely to drain the building);
- b. any drain or sewer constructed from brick or masonry;
- c. any drain or sewer in poor condition (e.g. the pipes are cracked, fractured, deformed more than 5% or misaligned)

would be exposed to a high level of risk in the event of failure of the drain or sewer. Buildings should not be constructed in such a position unless special measures are taken.

## Maintaining access

**1.3** Buildings or extensions should not be constructed over a manhole or inspection chamber or other access fitting on any sewer (serving more than one property). Approved Document H1 Section 2, paragraph 2.53 provides that access points to sewers (serving more than one property) should be in places where they are accessible and apparent for use in an emergency. Buildings and extensions should not be located where they would remove such a provision where this already exists, unless an alternative access point can be provided on the line of the sewer at a location acceptable to the owner (i.e. the sewerage undertaker in the case of a public sewer).

**1.4** A satisfactory diversionary route should be available so that the drain or sewer could be reconstructed without affecting the building. This route should not pass within 3m from the building. Where the drain or sewer is more than 1.5m deep and the drain or sewer is accessible to mechanical excavators the alternative route should also have such access.

**1.5** The length of drain or sewer under a building should not exceed 6m except with the permission of the owners of the drain or sewer (i.e. the sewerage undertaker in case of a public sewer).

**1.6** Buildings or extensions should not be constructed over or within 3m of any drain or sewer more than 3m deep, or greater than 225mm in diameter except with the permission of the owners of the drain or sewer (i.e. the sewerage undertaker in the case of a public sewer).

## Protection of the drain or sewer during construction

**1.7** Any drain or sewer should be protected from damage by construction traffic and heavy machinery. Protection may be provided by providing barriers to keep such traffic away from the line of the sewer. Heavy materials should not be stored over drains or sewers.

**1.8** Where piling works are being carried out care should be taken to avoid damage to any drain or sewer. The position of the drain or sewer should be established by survey. If the drain or sewer is within 1m of the piling, trial holes should be excavated to establish the exact position of the sewer. The location of any connections should also be established. Piling should not be carried out where the distance from the outside of the sewer to the outside of the pile is less than twice the diameter of the pile.

## Protection from settlement

**1.9** Where a drain or sewer runs under a building at least 100mm of granular or other suitable flexible filling should be provided round the pipe. On sites where excessive subsidence is possible additional flexible joints may be advisable or other solutions adopted such as suspended drainage. Where the crown of the pipe is within 300mm of the underside of the slab, special protection should be provided (see Approved Document H1, Section 2, paragraph 2.44).

**1.10** Where a drain or sewer running below a building is less than 2m deep, the foundation should be extended locally so that the drain or sewer passes through the wall (see paragraph 1.11).

**1.11** Where a drain or sewer runs through a wall or foundation suitable measures should be taken to prevent damage or misalignment. For further guidance see Approved Document H1 paragraph 2.24.

**1.12** Where the drain or sewer is more than 2m deep to invert and passes beneath the foundations, the foundations should be designed as a lintel spanning over the line of the drain or sewer. The span of the lintel should extend at least 1.5m either side of the pipe and should be designed so that no load is transmitted onto the drain or sewer.

**1.13** A drain trench should not be excavated lower than the foundations of any building nearby. For further guidance see Approved Document H1 paragraph 2.25.

# The Requirement

This Approved Document, which took effect on 1 April 2002, deals with the following Requirement which is contained in the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<p><b>Separate systems of drainage</b></p> <p><b>H5.</b> Any system for discharging water to a sewer which is provided pursuant to paragraph H3 shall be separate from that provided for the conveyance of foul water from the building.</p>	<p>Requirement H5 applies only to a system provided in connection with the erection or extension of a building where it is reasonably practicable for the system to discharge directly or indirectly to a sewer for the separate conveyance of surface water which is:</p> <p>(a) shown on a map of sewers; or</p> <p>(b) under construction either by the sewerage undertaker or by some other person (where the sewer is the subject of an agreement to make a declaration of vesting pursuant to Section 104 of the Water Industry Act 1991 (b)).</p>

(b) Section 104 was amended by Section 96 of the Schedule 9 to the Water Act 2003, and is prospectively amended by Section 42 of the Flood and Water Management Act 2010 (c. 29).

## Guidance

### Performance

In the Secretary of State's view the requirements of H5 will be met if separate systems of drains and sewers are provided for foul water and rainwater where:

- a. the rainwater is not contaminated; and
- b. the drainage is to be connected either directly or indirectly to the public sewer system and either:
  - i. the public sewer system in the area comprises separate systems for foul water and surface water; or
  - ii. a system of sewers which provides for the separate conveyance of surface water is under construction either by the sewerage undertaker or by some other person (where the sewer is the subject of an agreement to make a declaration of vesting pursuant to Section 104 of the Water Industry Act 1991).

### Introduction to provisions

**0.1** These provisions are to help minimise the volume of rainwater entering the public foul sewer system as this can overload the capacity of the sewer and cause flooding.

#### Provision where separate sewer systems are provided

**1.1** Where the buildings are to be drained to the public sewer system, and the sewerage undertaker has provided a separate system of sewers, separate drainage systems will be necessary in order to comply with the requirements of Section 106 (Right to communicate with public sewers) of the Water Industry Act 1991 (see appendix H1-C paragraph C.7).

### **Provision where separate sewer systems are proposed**

**1.2** Separate foul and rainwater drainage systems should also be provided where there is a combined sewer system at present but a system of sewers which provides for the separate conveyance of surface water is under construction either by the sewerage undertaker or by some other person (where the sewer is the subject of an agreement to make declaration of vesting pursuant to Section 104 of the Water Industry Act 1991).

**1.3** These separate drainage systems will both initially connect to the existing combined sewer system. However, when the separate sewer systems are completed, the drainage will be reconnected to the new sewers, minimising the disruption to the occupiers.

### **Contaminated runoff**

**1.4** Approved Document H3 paragraph 3.21 deals with drainage from areas where materials are stored which could contaminate runoff. This could cause pollution if discharged to a surface water sewer. Where such flows are to be discharged into the foul sewer system, the consent of the sewerage undertaker should first be obtained in accordance with Section 106 (Right to communicate with public sewers) of the Water Industry Act 1991 (see appendix H1-C paragraph C.7). The sewerage undertaker should also be consulted where such flows are to be discharged into a foul drain which, though it would initially connect to a combined sewer, is intended would eventually be reconnected to a proposed foul sewer.

# The Requirement

This Approved Document, which took effect on 1 April 2002, deals with the following Requirement which is contained in the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>Solid waste storage</b> <b>H6.</b> (1) Adequate provision shall be made for storage of solid waste. (2) Adequate means of access shall be provided: (a) for people in the building to the place of storage; and (b) from the place of storage to a collection point (where one has been specified by the waste collection authority under Section 46 (household waste) or Section 47 (commercial waste) of the Environmental Protection Act 1990 <b>(a)</b> or to a street (where no collection point has been specified).	
<b>(a)</b> 1990 c. 43; section 46 was amended by Section 19 of the London Local Authorities Act 2007 (2007 c. ii) and Section 47 was amended by Section 21 of that Act. Section 46 was also amended by Section 76 and Schedule 5 to the Climate Change Act 2008 (c. 28).	

## Guidance

### Performance

In the Secretary of State's view the requirements of H6 will be met if the solid waste storage is:

- a. designed and sited so as not to be prejudicial to health or local amenity;
- b. of sufficient area having regard to the requirements of the waste collection authority for the number and size of receptacles under Sections 46 and 47 of the Environmental Protection Act 1990;
- c. sited so as to be accessible for use by people in the building and of ready access for removal to the collection point specified by the waste collection authority under Sections 46 and 47 of the Environmental Protection Act 1990.

### Introduction to provisions

**0.1** The efficacy of a refuse storage system is dependent on its capacity and the ease of removal in relation to the collection service provided by the waste collection authority.

**0.2** The waste collection authority has powers under Section 46 (Receptacles for household waste) and Section 47 (Receptacles for commercial or industrial waste) to specify the type and number of receptacles to be used and the location where the waste should be placed for collection. **Consultation should take place with the waste collection authority to determine their requirements.**

**0.3** H6 applies to the erection or extension of a building and to all material changes of use described in Regulation 5.

## Domestic developments

### Capacity

**1.1** For domestic developments space should be provided for storage of containers for separated waste (i.e. waste which can be recycled is stored separately from waste which cannot) with a combined capacity of 0.25m<sup>3</sup> per dwelling or such other capacity as may be agreed with the waste collection authority. Where collections are less frequent than once per week, this allowance should be increased accordingly.

**1.2 Low rise domestic developments –**

In low rise domestic developments (houses, bungalows and flats up to 4th floor) any dwelling should have, or have access to, a location where at least two movable individual or communal waste containers, meeting the requirements of the waste collection authority, can be stored.

**1.3** Where separate storage areas are provided for each dwelling, an area of 1.2m x 1.2m should be sufficient to provide for storage of waste containers and provide space for access.

**1.4** Where communal storage areas are provided space requirements should be determined in consultation with the waste collection authority.

**1.5 High rise domestic developments –** in multi-storey domestic developments dwellings up to the 4th floor may each have their own waste container or may share a waste container.

**1.6** Dwellings above the 4th storey may share a single waste container for non-recyclable waste fed by chute, with separate storage for any waste which can be recycled. Alternatively storage compounds or rooms should be provided. In such a case a satisfactory management arrangement for conveying refuse to the storage area should be assured.

**1.7** The use of 'Residents Only' recycling centres (areas where residents may bring their recyclable waste for storage in large containers, e.g. bottle banks) in large blocks has been found to be effective in some areas.

### Siting

**1.8** Storage areas for waste containers and chutes should be sited so that the distance householders are required to carry refuse does not usually exceed 30m (excluding any vertical distance). Containers should be within 25m of the waste collection point specified by the waste collection authority.

**1.9** The location for storage of waste containers should be sited so that, unless it is completely unavoidable, the containers can be taken to the collection point without being taken through a building, unless it is a porch or garage, or a car port or other open covered space (this provision applies only to new buildings except that extensions or conversions should not remove such a facility where one already exists).

**1.10** For waste containers up to 250 litres, steps should be avoided between the container store and collection point wherever possible and should not exceed 3 in number. Slopes should not exceed 1:12. Exceptionally this may be exceeded provided that the lengths are not excessive and it is not part of a series of slopes. (See also Approved Document K1 Section 2.) For storage areas where larger containers are to be used steps should be avoided. Where this is not otherwise possible, the storage area should be relocated.

**1.11** The collection point should be reasonably accessible to the size of waste collection vehicles typically used by the waste collection authority.

**1.12** External storage areas for waste containers should be away from windows and ventilators and preferably be in shade or under shelter. Storage areas should not interfere with pedestrian or vehicle access to buildings.

### Design

**1.13** Unsightly bins can damage the visual amenity of an area and contribute to increased levels of anti-social nuisance such as odour and litter, so bin storage should be planned carefully. Where the location for storage is in a publicly accessible area or in an open area around a building (e.g. in a front garden) an enclosure or shelter should be considered. Best practice guidance is given in NHBC Foundation report NF60.

**1.14** Where enclosures, compounds or storage rooms are provided they should allow room for filling and emptying and provide a clear space of 150mm between and around the containers. Enclosures, compounds or storage rooms for communal containers should be a minimum of 2m high. Enclosures for individual containers should be sufficiently high to allow the lid to be opened for filling. The enclosure should be permanently ventilated at the top and bottom and should have a paved impervious floor.

**1.15** Communal storage areas should have provision for washing down and draining the floor into a system suitable for receiving a polluted effluent. Gullies should incorporate a trap which maintains a seal even during prolonged periods of disuse.

**1.16** Any room for the open storage of waste should be secure to prevent access by vermin. Any compound for the storage of waste should be secure to prevent access by vermin unless the waste is to be stored in secure containers with close fitting lids.

**1.17** Where storage rooms are provided, separate rooms should be provided for the storage of waste which cannot be recycled, and waste which can be recycled.

**1.18 High-rise domestic developments** – where chutes are provided they should be at least 450mm diameter and should have a smooth non-absorbent surface and close fitting access doors at each storey which has a dwelling and be ventilated at the top and bottom.

## Non-domestic developments

**1.19** In other types of development, and particularly where special problems such as high density developments influence the provision of a system, it is essential that the waste collection authority is consulted for guidance on resolving the following points.

- a. The volume and nature of the waste and the storage capacity required, based on the frequency of collection and the size and type of waste container.
- b. Any requirements for segregation of waste which can be recycled.
- c. The method of waste storage, including any on-site treatment proposed, related to the intended layout and building density.
- d. The location of waste storage areas, waste treatment areas and waste collection points and the access to these locations for operatives and vehicles.
- e. Hygiene arrangements in the waste storage and waste treatment areas.
- f. Fire hazards and protection measures.

**1.20** Waste storage areas should have an impervious floor and should have provision for washing down and draining the floor into a system suitable for receiving a polluted effluent. Gullies should incorporate a trap which maintains a seal even during prolonged periods of disuse.

**1.21** Any room for the open storage of waste should be secure to prevent access by vermin. Any compound for the storage of waste should be secure to prevent access by vermin unless the waste is to be stored in secure containers with close fitting lids.

**1.22** Waste storage areas should be marked and signs should be provided.

### Alternative approach

**1.23** Recommendations and data on these items can be found in BS 5906:2005 *Code of practice for waste management in buildings*.

## Appendix H6-A: Relevant waste collection legislation

### Collection of household waste

**A.1** Under Section 45 (Collection of controlled waste) of the Environmental Protection Act 1990, local authorities have a general duty to collect household waste within their area without charge.

**A.2** Under Section 46 (Receptacles for household waste) of the Environmental Protection Act 1990, the local authority may require:

- a. waste of certain types to be stored separately so that it can be recycled;
- b. occupiers of dwellings to provide containers of a specified type for storage of waste;
- c. additional containers to be provided for separate storage of recyclable waste;
- d. locations where containers should be placed for emptying.

### Collection of commercial and industrial waste

**A.3** Under Section 45 (Collection of controlled waste) of the Environmental Protection Act 1990, local authorities may also have a duty to collect commercial waste within their area where requested and they may also collect industrial waste. A charge may be levied for such services.

**A.4** Under Section 47 (Receptacles for commercial or industrial waste) of the Environmental Protection Act 1990, the local authority may still require:

- a. waste of certain types to be stored separately so that it can be recycled;
- b. occupiers to provide containers of a specified type for storage of waste;
- c. additional containers to be provided for separate storage of recyclable waste;
- d. locations where containers should be placed for emptying.

### Access for removal of waste to be maintained

**A.5** Under Section 23 (Provision of facilities for refuse) subsection (3) of the Building Act 1984, it is unlawful to obstruct the access (such as those specified in Requirement H6 of the Building Regulations) provided for removal of waste without the consent of the local authority. In giving their consent, the local authority may specify conditions regarding the provision of an alternative means of access for removal of refuse.

# Standards referred to

## H1

### BS 65:1991

Specification for vitrified clay pipes, fittings and ducts, also flexible mechanical joints for use solely with surface water pipes and fittings. AMD 8622 1995.

### BS EN 274:1993

Sanitary tapware. Waste fittings for basins, bidets and baths. General technical specifications. (Withdrawn and superseded by BS EN 274-1:2002 Waste fittings for sanitary appliances. Requirements. AMD 14959 2004. BS EN 274-2:2002 Waste fitting for sanitary appliances. Test methods. AMD 14957 2004. BS EN 274-3:2002 Waste fittings for sanitary appliances. Quality control. AMD 14958 2004.)

### BS EN 295-1:1991

Vitrified clay pipes and fittings and pipe joints for drains and sewers. Test requirements. AMD 9290 1996, AMD 9429 1995, AMD 10621 1999.

### BS EN 295-2:1991

Vitrified clay pipes and fittings and pipe joints for drains and sewers. Quality control and sampling. AMD 10620 1999.

### BS EN 295-3:1991

Vitrified clay pipes and fittings and pipe joints for drains and sewers. Test methods. AMD 10357 1999.

### BS EN 295-6:1996

Vitrified clay pipes and fittings and pipe joints for drains and sewers. Requirements for vitrified clay manholes. AMD 15279 2004.

### BS 416-1:1990

Discharge and ventilating pipes and fittings, sand-cast or spun in cast iron. Specification for spigot and socket systems.

### BS 437:1978

Specification for cast iron spigot and socket drain pipes and fittings. AMD 5877 1988.

### BS EN 598:1995

Ductile iron pipes, fittings, accessories and their joints for sewerage applications. Requirements and test methods.

### BS EN 752-1:1996

Drain and sewer systems outside buildings. Generalities and definitions.

### BS EN 752-2:1997

Drain and sewer systems outside buildings. Performance requirements.

### BS EN 752-3:1997

Drain and sewer systems outside buildings. Planning. AMD 10984 2000, AMD 13038 2001.

### BS EN 752-4:1998

Drain and sewer systems outside buildings. Hydraulic design and environmental considerations. AMD 15442 2005.

### BS EN 752-5:1998

Drain and sewer systems outside buildings. Rehabilitation.

### BS EN 752-6:1998

Drain and sewer systems outside buildings. Pumping installations.

### BS EN 752-7:1998

Drain and sewer systems outside buildings. Maintenance and operations. AMD 10440 1999.

### BS EN 877:1999

Cast iron pipes and fittings, their joints and accessories for the evacuation of water from buildings. Requirements, test methods and quality assurance.

### BS 882:1992

Specification for aggregates from natural sources for concrete. AMD 13579 2002. (Withdrawn and superseded by BS EN 1260:2002 Aggregates for concrete. AMD 15333 2004.)

### BS EN 1057:1996

Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications.

### BS EN 1091:1997

Vacuum sewerage systems outside buildings.

### BS EN 1254-1:1998

Copper and copper alloys. Plumbing fittings. Fittings with ends for capillary soldering or capillary brazing to copper tubes. AMD 10099 1998.

### BS EN 1254-2:1998

Copper and copper alloys. Plumbing fittings. Fittings with compression ends for use with copper tubes.

### BS EN 1254-3:1998

Copper and copper alloys. Plumbing fittings. Fittings with compression ends for use with plastics pipes.

### BS EN 1254-4:1998

Copper and copper alloys. Plumbing fittings. Fittings combining other end connections with capillary or compression ends. AMD 10750 1999.

### BS EN 1254-5:1998

Copper and copper alloys. Plumbing fittings. Fittings with short ends for capillary brazing to copper tubes. AMD 10100 1998.

### BS EN 1295-1:1998

Structural design of buried pipelines under various conditions of loading. General requirements.

### BS EN 1329-1:2000

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Unplasticized polyvinyl chloride (PVC-U). Specifications for pipes, fittings and the system.

**BS EN 1401-1:1998**

Plastics piping systems for non-pressure underground drainage and sewerage. Unplasticized poly(vinylchloride) (PVC-U). Specifications for pipes, fittings and the system. AMD 13794 2002.

**BS EN 1451-1:2000**

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Polypropylene (PP). Specifications for pipes, fittings and the system. AMD 13819 2002.

**BS EN 1455-1:2000**

Plastics piping systems for soil and waste (low and high temperature) within the building structure. Acrylonitrile-butadienestyrene (ABS). Specifications for pipes, fittings and the system. AMD 13818 2002.

**BS EN 1519-1:2000**

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Polyethylene (PE). Specifications for pipes, fittings and the system. AMD 13817 2002.

**BS EN 1565-1:2000**

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Styrene copolymer blends (SAN + PVC). Specifications for pipes, fittings and the system. AMD 13816 2002.

**BS EN 1566-1:2000**

Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Chlorinated poly(vinyl chloride) (PVC-C). specification for pipes, fittings and the system. AMD 13815 2002.

**BS EN 1610:1998**

Construction and testing of drains and sewers.

**BS EN 1671:1997**

Pressure sewerage systems outside buildings.

**BS EN 1825-1:2004**

Installations for separation of grease. Principles of design, performance and testing, marking and quality control.

**BS EN 1825-2:2002**

Installations for separation of grease. Selection of nominal size, installation and maintenance.

**BS EN 1852-1:1998**

Plastics piping systems for non-pressure underground drainage and sewerage. Polypropylene (PP). Specifications for pipes, fittings and the system. AMD 14514 2003.

**BS 3868:1995**

Specification for prefabricated drainage stack units in galvanized steel.

**BS 3921:1985**

Specification for clay bricks.

(Current but partially superseded by BS EN 772-3:1998 Method of test for masonry units. Determination of net volume and percentage of voids of clay masonry units by hydrostatic weighing. BS EN 772-7:1998 Method of test for masonry units. Determination of water absorption of clay masonry damp proof course units by boiling in water.)

**BS 5255:1989**

Specification for thermo-plastics waste pipe and fittings.

(Current but partially superseded by BS EN 1329-1:2000 Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Unplasticized poly(vinyl chloride) (PVC-U). Specifications for pipes, fittings and the system. BS EN 1455-1:2000 Plastics piping systems for soil and waste (low and high temperature) within the building structure. Acrylonitrile-butadiene-styrene (ABS). Specifications for pipes, fittings and the system. AMD 13818 2002. BS EN 1519-1:2000 Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Polyethylene (PE). Specifications for pipes, fittings and the system. AMD 13817 2002. BS EN 1565-1:2000 Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Styrene copolymer blends (SAN + PVC). Specifications for pipes, fittings and the system. AMD 13816 2002. BS EN 1566-1:2000 Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Chlorinated poly(vinyl chloride) (PVC-C). Specification for pipes, fittings and the system. AMD 13815 2002.)

**BS 5911-2:1982**

Precast concrete pipes, fittings and ancillary products. Specification for inspection chambers. AMD 5146 1986, AMD 8077 1994, AMD 11030 2001. (Withdrawn and superseded by BS 5911-4:2002 Concrete pipes and ancillary concrete products. Specification for unreinforced and reinforced concrete inspection chambers. AMD 15038 2004. BS EN 1917:2002 Concrete manholes and inspection chambers, unreinforced, steel fibre and reinforced. AMD 15289 2004.)

**BS 5911-100:1988**

Precast concrete pipes, fittings and ancillary products. Specification for unreinforced and reinforced pipes and fittings with flexible joints. AMD 6269 1989, AMD 7588 1993. (Withdrawn and superseded by BS 5911-1:2002 Concrete pipes and ancillary concrete products. Specification for unreinforced and reinforced concrete pipes (including jacking pipes) and fittings with flexible joints. AMD 15040 2004. BS EN 1916:2002 Concrete pipes and fittings, unreinforced, steel fibre and reinforced. AMD 15288 2004.)

**BS 5911-120:1989**

Precast concrete pipes, fittings and ancillary products. Specification for reinforced jacking pipes with flexible joints. AMD 9020 1996. (Withdrawn and superseded by BS 5911-1:2002 Concrete pipes and ancillary concrete products. Specification for unreinforced and reinforced concrete pipes (including jacking pipes) and fittings with flexible joints. AMD 15040 2004. BS EN 1916:2002 Concrete pipes and fittings, unreinforced, steel fibre and reinforced. AMD 15288 2004.)

**BS 5911-200:1994**

Precast concrete pipes, fittings and ancillary products. Specification for unreinforced and reinforced manholes and soakaways of circular cross section. AMD 11031 2001, AMD 13205 2001. (Withdrawn and superseded by BS 5911-3:2002 Concrete pipes and ancillary concrete products. Specification for unreinforced and reinforced concrete manholes and soakaways. AMD 15039 2004. BS EN 1917:2002 Concrete manholes and inspection chambers, unreinforced, steel fibre and reinforced. AMD 15289 2004.)

**BS 6798:2000**

Specification for installation of gas-fired hot water boilers of rated input not exceeding 70kW. AMD 14908 2005.

**BS 7158:2001**

Plastics inspection chambers for drains and sewers. Specification. (Current but superseded by BS EN 13598-1:2003 Plastics piping systems for non-pressure underground drainage and sewerage. Unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE). Specifications for ancillary fittings including shallow inspection chambers.)

**BS 8000-13:1989**

Workmanship on building sites. Code of practice for above ground drainage and sanitary appliances.

**BS 8000-14:1989**

Workmanship on building sites. Code of practice for below ground drainage.

**BS 8110-1:1997**

Structural use of concrete. Code of practice for design and construction. AMD 9882 1998, AMD 13468 2002, AMD 16016 2005.

**BS EN 12050-1:2001**

Wastewater lifting plants for buildings and sites. Principles of construction and testing. Lifting plants for wastewater containing faecal matter.

**BS EN 12050-2:2001**

Wastewater lifting plants for buildings and sites. Principles of construction and testing. Lifting plants for faecal-free wastewater.

**BS EN 12050-3:2001**

Wastewater lifting plants for buildings and sites. Principles of construction and testing. Lifting plants for wastewater containing faecal matter for limited applications.

**BS EN 12056-1:2000**

Gravity drainage systems inside buildings. General and performance requirements.

**BS EN 12056-2:2000**

Gravity drainage systems inside buildings. Sanitary pipework, layout and calculation.

**BS EN 12056-3:2000**

Gravity drainage systems inside buildings. Roof drainage, layout and calculation.

**BS EN 12056-4:2000**

Gravity drainage systems inside buildings. Wastewater lifting plants. Layout and calculation.

**BS EN 12056-5:2000**

Gravity drainage systems inside buildings. Installation and testing, instructions for operation, maintenance and use.

**BS EN 12109:1999**

Vacuum drainage systems inside buildings.

**BS EN 12380:2002**

Air admittance valves for drainage systems. Requirements, test methods and valuation of conformity.

**BS EN 13564-1:2002**

Anti-flooding devices for buildings. Quality assurance.

**BS EN 13564-2:2002**

Anti-flooding devices for buildings. Test methods.

**BS EN 13564-3:2002**

Anti-flooding devices for buildings. Quality assurance.

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**BS 5328-1:1997**

Concrete. Guide to specifying concrete. AMD 10364 1999, AMD 13876, AMD 14163 2002. (Withdrawn and superseded by BS 8500-1:2002 Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier. AMD 14639 2003. BS 8500-2:2002 Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete. AMD 14640 2003. BS EN 206-1:2000 Concrete. Specification, performance, production and conformity. AMD 13189 2001, AMD 14857 2004, AMD 15359 2004, AMD 15406 2004.)

**BS 5328-2:1997**

Concrete. Methods for specifying concrete mixes. AMD 9691 1997, AMD 10365 1999, AMD 10612 1999, AMD 13877. (Withdrawn and superseded by BS 8500-1:2002 Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier. AMD 14639 2003. BS 8500-2:2002 Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete. AMD 14640 2003. BS EN 206-1:2000 Concrete. Specification, performance, production and conformity. AMD 13189 2001, AMD 14857 2004, AMD 15359 2004, AMD 15406 2004.)

**BS 5328-3:1990**

Concrete. Specification for the procedures to be used in producing and transporting concrete. AMD 6927 1991, AMD 7176 1992, AMD 9312, AMD 10366 1999, AMD 10708 1999, AMD 13878 2002. (Withdrawn and superseded by BS 8500-1:2002 Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier. AMD 14639 2003. BS 8500-2:2002 Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete. AMD 14640 2003. BS EN 206-1:2000 Concrete. Specification, performance, production and conformity. AMD 13189 2001, AMD 14857 2004, AMD 15359 2004, AMD 15406 2004.)

**BS 5328-4:1990**

Concrete. Specification for the procedures to be used in sampling, testing and assessing compliance of concrete. AMD 6928 1991, AMD 8760 1995, AMD 9313, AMD 10367 1999, AMD 10611 1999. (Withdrawn and superseded by BS 8500-1:2002 Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier. AMD 14639 2003. BS 8500-2:2002 Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete. AMD 14640 2003. BS EN 206-1:2000 Concrete. Specification, performance, production and conformity. AMD 13189 2001, AMD 14857 2004, AMD 15359 2004, AMD 15406 2004.)

**BS 6297:1983**

Code of practice for design and installation of small sewage treatment works and cesspools. AMD 1650 1990.

**BS 7781:1994**

Procedure for type testing of small biological domestic wastewater treatment plants.

**BS EN 12566-1:2000**

Small wastewater treatment plants less than 50 PE. Part Prefabricated septic tanks. AMD 14918 2004.

**H3****BS EN 752-1:1996**

Drain and sewer systems outside buildings. Generalities and definitions.

**BS EN 752-2:1997**

Drain and sewer systems outside buildings. Performance requirements.

**BS EN 752-3:1997**

Drain and sewer systems outside buildings. Planning. AMD 10984 2000, AMD 13038 2001.

**BS EN 752-4:1998**

Drain and sewer systems outside buildings. Hydraulic design and environmental considerations. AMD 15442 2005.

**BS EN 752-5:1998**

Drain and sewer systems outside buildings. Rehabilitation.

**BS EN 752-6:1998**

Drain and sewer systems outside buildings. Pumping installations.

**BS EN 752-7:1998**

Drain and sewer systems outside buildings. Maintenance and operations. AMD 10440 1999.

**BS EN 858:2001**

Separator systems for light liquids (e.g. oil and petrol). Principles of product design, performance and testing, making and quality control. AMD 15525 2005.

**BS EN 858-2:2003**

Separator systems for light liquids (e.g. oil and petrol). Selection of nominal size, installation, operation and maintenance.

**BS EN 1295-1:1998**

Structural design of buried pipelines under various conditions of loading. General requirements.

**BS EN 1610:1998**

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**BS EN 12056-1:2000**

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**BS EN 12056-2:2000**

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**BS EN 12056-4:2000**

Gravity drainage systems inside buildings. Wastewater lifting plants. Layout and calculation.

**BS EN 12056-5:2000**

Gravity drainage systems inside buildings. Installation and testing, instructions for operation, maintenance and use.

**H4**

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**H5**

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**H6****BS 5906:2005**

Code of practice for waste management in buildings.

# Other publications referred to

## H1

### Water Regulations Advisory Scheme (WRAS)

Information and Guidance Note 09-02-05  
*Marking and identification of pipe work for reclaimed and (grey water) systems*, 1999.

Information and Guidance Note 09-02-04  
*Reclaimed water systems. Information about installing, modifying or maintaining reclaimed water systems*, 1999.

WRAS documents available from WRAS, Fern Close, Pen-y-Fan Industrial Estate, Oakdale, Gwent, NP11 3EH, Tel 01495 248454, Fax 01495 249235, email [info@wras.co.uk](mailto:info@wras.co.uk). Available to download from [www.wras.co.uk/](http://www.wras.co.uk/)

### Water Research Council (WRc)

*Sewers for adoption. A design and construction guide for developers*, 5th edition, 2001. ISBN 1 89892 043 5

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### BRE

Good Building Guide GBG 42 Part 1 *Reed beds: application and specification*, 2000. ISBN 1 86081 436 0

Good Building Guide GBG 42 Part 1 *Reed beds: design, construction*, 2000. ISBN 1 86081 437 9

### Environment Agency

Pollution Prevention Guidelines PPG 4 *Disposal of sewage where no mains drainage is available*, 2001. Available to download from [www.netregs.gov.uk](http://www.netregs.gov.uk)

## H3

### BRE

Digest 365 *Soakaway design*, 1991 (minor revisions 2003). ISBN 1 86081 604 5

### CIRIA

Publication C522 *Sustainable urban drainage systems – design manual for England and Wales*, 2000. ISBN 0 86017 522 7

Report 156 *Infiltration drainage – Manual of good practice*, 1996. ISBN 0 86017 457 3

### Environment Agency

Pollution Prevention Guidelines PPG 3 *Use and design of oil separators in surface water drainage systems*, 2000. Available to download from [www.netregs.gov.uk](http://www.netregs.gov.uk)

### H R Wallingford

Report SR 463 *Performance of syphonic drainage systems for roof gutters*.

### Department for Communities and Local Government

Planning Policy Guidance 14, Development on unstable land – Annex 1: *Landslides and planning*, 1996. ISBN 0 11753 259 2. Available to download from [www.gov.uk](http://www.gov.uk)

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### NHBC Foundation

Report NF60 *Avoiding rubbish design. Providing for bin storage on new housing developments*, 2015. Available to download from [www.nhbcfoundation.org](http://www.nhbcfoundation.org)

The Building Regulations 2010

## **Combustion appliances and fuel storage systems**

**J**

### **APPROVED DOCUMENT**

<b>J1</b>	<b>Air supply</b>
<b>J2</b>	<b>Discharge of products of combustion</b>
<b>J3</b>	<b>Warning of release of carbon monoxide</b>
<b>J4</b>	<b>Protection of building</b>
<b>J5</b>	<b>Provision of information</b>
<b>J6</b>	<b>Protection of liquid fuel storage systems</b>
<b>J7</b>	<b>Protection against pollution</b>

**2010 edition**  
incorporating 2010 and  
2013 amendments

## **MAIN CHANGES IN THE 2010 EDITION**

### **Section 1**

New guidance has been included for access for visual inspection of concealed flues. This should ensure that flues can be properly inspected both when an appliance is first commissioned and subsequently serviced.

### **Section 2**

Guidance has been included in support of a new requirement J3 “Warning of release of carbon monoxide” on the provision of carbon monoxide alarms where solid fuel appliances are installed.

The provisions for flue outlet clearances relative to adjacent pitched roofs have been clarified in Diagram 17.

The guidance on the provision of hearths and wall clearances for solid fuel appliances have been made more flexible to take account of the availability of modern appliances.

### **Section 2, 3 & 4**

The guidance for permanent ventilation openings for open flued appliances in very airtight houses (those with a design air permeability less than or equal to 5.0 m<sup>3</sup>/(h.m<sup>2</sup>)) have been increased to counteract the decrease in adventitious ventilation relative to older houses. Appendix F gives advice on assessing the air permeability of older houses in relation to this guidance.

### **Section 4**

This section now explicitly includes liquid biofuel and blends on mineral oil and liquid biofuel within the scope of combustion installations designed to burn oil.

### **Section 5**

The guidance on identifying where secondary containment for oil tanks is necessary has been expanded to include locations in inner protection zone as shown on the Environment Agency’s groundwater sources map.

### **Appendix G**

This informative appendix provides and explanation of the European designation system for certain flue and chimney products.

## **MAIN CHANGES MADE BY THE FURTHER 2010 AMENDMENTS**

This 2010 edition incorporates changes to reflect the renumbering of regulations in the Building Regulations 2010 and Building (Approved inspectors etc) Regulations 2010. There have been no changes to the requirements in Part J of Schedule 1 to the Building Regulations, but please note the simpler definition of ‘room for residential purposes’.

## **MAIN CHANGES MADE BY THE 2013 AMENDMENTS**

These changes, which apply only to England\*, update the guidance on materials and workmanship.

\*This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No 2) Order 2009.

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# What is an Approved Document?

This document has been approved and issued by the Secretary of State to provide practical guidance on ways of complying with Requirements J1 to J7 and regulations 7 of the Building Regulations 2010 (SI 2010/2214) for England and Wales. The Building Regulations 2010 are referred to throughout the remainder of this Document as ‘the Building Regulations’. Where appropriate the Approved Document also gives guidance on relevant requirements in the Building (Approved Inspectors etc) Regulations 2010 (SI 2010/2215).

The intention of issuing Approved Documents is to provide guidance about compliance with specific aspects of building regulations in some of the more common building situations. They set out what, in ordinary circumstances, may be reasonable provision for compliance with the relevant requirement(s) of building regulations to which they refer.

If guidance in an Approved Document is followed there will be a presumption of compliance with the requirement(s) covered by the guidance. However, this presumption can be overturned, so simply following guidance does not guarantee compliance. For example, if one particular case is unusual in some way, then ‘normal’ guidance may not be applicable. It is also important to note that there may well be other ways of achieving compliance with the requirements. **There is therefore no obligation to adopt any particular solution contained in this Approved Document if you would prefer to meet the relevant requirement in some other way. However, persons intending to carry out building work should always check with their Building Control Body, either the local authority or an approved inspector, that their proposals comply with building regulations.**

The guidance contained in this Approved Document relates only to the particular requirements of building regulations that the document addresses (see ‘Requirements’ below). However, building work may be subject to more than one requirement of building regulations. In such cases the work will also have to comply with any other applicable requirements of building regulations.

This document is one of a series that has been approved and issued by the Secretary of State for the purpose of providing practical guidance with respect to the requirements of Schedule 1 and Regulation 7 of the Building Regulations 2010 (SI 2010/2215) for England and Wales.

At the back of this document is a list of all the documents that have been approved and issued by the Secretary of State for this purpose.

## How to use this Approved Document

In this document the following conventions have been adopted to assist understanding and interpretation:

- Text shown against a green background are extracts from the Building Regulations or Building (Approved Inspectors etc) Regulations, and set out the legal requirements that relate to compliance with the sanitation, hot water safety and water efficiency requirements of building regulations. It should be remembered however that, as noted above, building works must comply with all the other applicable provisions of building regulations.
- Key terms are defined in Section 0 and are printed in *italic text*.
- Details of technical publications referred to in the text of this Document will be given in footnotes and repeated as end notes. A reference to a publication is likely to be made for one of two main reasons. The publication may contain additional or more comprehensive technical detail, which it would be impractical to include in full in the Document but which is needed to fully explain ways of meeting the requirements; or it is a source of more general information. The reason for the reference will be indicated in each case. The reference will be to a specified edition of the document. The Approved Document may be amended from time to time to include new references or to refer to revised editions where this aids compliance.

## Where you can get further help

If you do not understand the technical guidance or other information set out in this Approved Document and the additional detailed technical references to which it directs you, there are a number of routes through which you can seek further assistance:

- The Communities and Local Government website: [www.communities.gov.uk](http://www.communities.gov.uk)
- The Planning Portal website: [www.planningportal.gov.uk](http://www.planningportal.gov.uk)
- If you are the person undertaking the building work you can seek assistance either from your local authority building control service or from your approved inspector (depending on which building control service you are using, or intend to use, to certify compliance of your work with the requirements of the Building Regulations).

- Persons registered with a competent person self-certification scheme may be able to get technical advice from their scheme operator.
- If your query is of a highly technical nature you may wish to seek the advice of a specialist, or industry technical body, for the relevant subject.

### **Responsibility for compliance**

It is important to remember that if you are the person (e.g. designer, builder, installer) carrying out building work to which any requirement of building regulations applies you have a responsibility to ensure that the work complies with any such requirement. The building owner may also have a responsibility for ensuring compliance with building regulation requirements and could be served with an enforcement notice in cases of non-compliance.

# The requirements

This Approved Document, which takes effect on 1 October 2010, deals with combustion appliances and fuel storage systems in the Building Regulations 2010 (as amended).

## Limitation on requirements

In accordance with regulation 8 of the Building Regulations, the requirements in Parts A to D, F to K and N and P (except for paragraphs G2, H2 and J6) of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings).

Paragraph G2 is excluded from regulation 8 as it deals with the conservation of water. Paragraphs H2 and J6 are excluded from regulation 8 because they deal directly with prevention of the contamination of water and of oil pollution. Parts E and M (which deal, respectively, with resistance to the passage of sound and access to and use of buildings) are excluded from regulation 8 because they address the welfare and convenience of building users. Part L is excluded from regulation 8 because it addresses the conservation of fuel and power. All these matters are amongst the purposes, other than health and safety that may be addressed by Building Regulations.

## Types of work covered by this Approved Document

### Building work

Building work, as defined in regulation 3 of the Building Regulations 2010, includes the erection and extension of a building, the provision or extension of a controlled service or fitting, and the material alteration of a building or a controlled service or fitting. In addition, Building Regulations may apply in cases where the purposes for which or the manner or circumstances in which a building or part of a building is used change in the way that constitutes a material change of use. Under regulation 4 of the Building Regulations 2010 (as amended), building work should be carried out in such a way that, on completion of work,

- i. the building complies with the applicable Parts of Schedule 1 to the Building Regulations,
- ii. in the case of an extension or material alteration of a building, or the provision, extension or material alteration of a controlled service or fitting, where it did not comply with any such requirement, it is no more unsatisfactory in relation to that requirement than before the work was carried out.

Work described in Part J concerns the provision or extension of controlled services or fittings. Work associated with installations covered in these sections may be subject to other relevant Parts of the Building Regulations.

### Material change of use

A material change of use occurs in specified circumstances in which a building or part of a building that was previously used for one purpose will be used in future for another. Where there is a material change of use the Building Regulations set requirements that must be met before the building can be used for its new purpose.

Regulation 5 of the Building Regulations specifies the following circumstances as material changes of use:

- a building is used as a dwelling where previously it was not.
- a building contains a flat where previously it did not.
- a building is used as an hotel or boarding house where previously it was not.
- a building is used as an institution where previously it was not.
- a building is used as a public building where previously it was not.
- a building no longer comes within the exemptions in Schedule 2 to the Building Regulations where previously it did.
- a building which contains at least one dwelling contains a greater or lesser number of dwellings than it did previously.
- a building contains a room for residential purposes where previously it did not.
- a building which contains at least one room for residential purposes contains a greater or lesser number of such rooms than it did previously.
- a building is used as a shop where previously it was not.

Parts J1 to J4 will apply to all the material changes of use mentioned above which means that whenever such changes occur the building must be brought up to the standards required by Parts J1 to J4.

### Historic buildings

Buildings included in the schedule of monuments maintained under section 1 of the Ancient Monuments and Archaeological Areas Act 1979 are exempt from compliance with the requirements of the Building Regulations.

There are other classes of buildings where special consideration may be needed in deciding what is adequate provision for compliance with Part J:

- a. listed buildings;
- b. buildings situated in designated conservation areas;
- c. buildings which are of architectural or historic interest and which are referred to as a material consideration in a local authority's development plan; and
- d. buildings of architectural and historical interest within national parks, areas of outstanding or natural beauty and world heritage sites.

It would not normally be considered appropriate to relax the requirements of Part J since they relate to health and safety. However, it may be necessary to seek alternative technical solutions to those set out in this approved document in order to achieve reasonable standards of safety without prejudicing the character of the host building or increasing the risk of long-term deterioration of the building's fabric or fittings.

In determining what is appropriate in the circumstances, the advice of the local authority's conservation officer should be sought. The views of the conservation officer are particularly important where building work requires planning permission and/or listed building consent.

## Notification of work

In almost all cases of new building work it will be necessary to notify a Building Control Body (BCB) in advance of any work starting. There are two exceptions to this: where work is carried out under a self-certification scheme listed in Schedule 3, and where work is listed in Schedule 4 to the Building Regulations as being not notifiable.

### Competent person self-certification schemes under Schedule 3

Under regulation 12(6) of the Building Regulations it is not necessary to notify a BCB in advance of work which is covered by this Approved Document if that work is of a type set out in column 1 of Schedule 3 to the Regulations and is carried out by a person registered with a relevant self-certification (competent persons) scheme as set out in column 2 of that Schedule. In order to join such a scheme a person must demonstrate competence to carry out the type of work the scheme covers, and also the ability to comply with all relevant requirements in the Building Regulations.

There are a number of schemes authorised for the installation of combustion appliances. Details of current schemes including those

relating to combustion appliances can be found from [www.communities.gov.uk/planningandbuildingregulations/competentpersonsschemes](http://www.communities.gov.uk/planningandbuildingregulations/competentpersonsschemes). Full details of the schemes can be found on the individual scheme websites.

Where work is carried out by a person registered with a competent person scheme, regulation 20 of the Building Regulations and regulation 20(1) of the Building (Approved Inspectors etc.) Regulations 2010 require that the occupier of the building be given, within 30 days of the completion of the work, a certificate confirming that the work complies with all applicable Building Regulation requirements. There is also a requirement that the BCB be given a notice that this has been done, or a copy of the certificate, again within 30 days of the completion of the work. These certificates and notices are usually made available through the scheme operator.

BCBs are authorised to accept these certificates as evidence of compliance with the requirements of the Building Regulations. However, local authority inspection and enforcement powers remain unaffected, although they are normally used only in response to a complaint that work does not comply.

### Work which is not notifiable under Schedule 4

Schedule 4 to the Building Regulations sets out types of work where there is no requirement to notify a BCB that work is to be carried out. These types of work are mainly of a minor nature where there is no significant risk to health, safety, water efficiency or energy efficiency. Health, safety, and energy efficiency requirements continue to apply to these types of work; only the need to notify a BCB has been removed.

Where only non-notifiable work as set out in Schedule 4 is carried out, there is no requirement for a certificate confirming that the work complies with Building Regulation requirements to be given to the occupier or the BCB.

In general, all work on a combustion appliance which is not a repair or maintenance will be notifiable work and Schedule 4 will not apply. However, it might be possible to add a control device to the appliance or to alter its electrical connection under the allowance in this schedule. Local authority building control departments can give advice in cases of doubt.

## Exemptions

Schedule 2 to the Building Regulations sets out a number of classes of buildings which are exempt from all Building Regulations requirements, including those in Part J.

Please note that the Gas Safety (Installation and Use) Regulations apply to buildings exempt under the Building Regulations.

## Materials and workmanship

Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations shall be carried out in accordance with regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in Approved Document 7.

Building Regulations are made for specific purposes, primarily the health and safety, welfare and convenience of people and for energy conservation. Standards and other technical specifications may provide relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance or matters which, although they relate to health and safety etc., are not covered by the Building Regulations.

When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

## Supplementary guidance

The Department of Communities and Local Government occasionally issues additional material to aid interpretation of the guidance in Approved Documents. This material may be conveyed in official letters to chief executives of local authorities and Approved Inspectors and/or posted on the websites accessed through: [www.communities.gov.uk/planningandbuilding/buildingregulations/](http://www.communities.gov.uk/planningandbuilding/buildingregulations/).

## Interaction with other legislation

### The Workplace (Health, Safety and Welfare) Regulations 1992

The Workplace (Health, Safety and Welfare) Regulations 1992 contain some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see: Workplace health, safety and welfare. Workplace (Health, Safety and Welfare) Regulations 1992. Approved Code of Practice L24. Published by HSE Books 1992 (ISBN 0 7176 0413 6).

The Workplace (Health, Safety and Welfare) Regulations 1992 apply to the common parts of flats and similar buildings if people such as cleaners and caretakers are employed to work in these common parts. Where the requirements of the Building Regulations that are covered by this Part do not apply to dwellings, the provisions may still be required in the situations described above in order to satisfy the Workplace Regulations.

### The Clean Air Act 1993

Under the Clean Air Act 1993 local authorities may declare the whole or part of the district of the authority to be a smoke control area. It is an offence to emit smoke from a chimney of a building, from a furnace or from any fixed boiler if located in a designated smoke control area unless an authorised fuel was used. It is also an offence to acquire an 'unauthorised fuel' for use within a smoke control area unless it is used in an 'exempt' appliance ('exempted' from the controls which generally apply in the smoke control area).

Authorised fuels are fuels which are authorised by Statutory Instruments (Regulations) made under the Clean Air Act 1993. These include inherently smokeless fuels such as gas, electricity and anthracite together with specified brands of manufactured solid smokeless fuels. These fuels have passed tests to confirm that they are capable of burning in an open fireplace without producing smoke.

Exempt appliances are appliances (ovens, wood burners, boilers and stoves) which have been exempted by Statutory Instruments (Orders) under the Clean Air Act 1993. These have passed tests to confirm that they are capable of burning an unauthorised or inherently smoky solid fuel without emitting smoke.

More information and details of authorised fuels and exempt appliances can be found on the internet at <http://smokecontrol.defra.gov.uk/>

### **Maintenance**

The guidance in this Approved Document provides a way of ensuring that combustion appliances can function safely. For combustion appliances to continue to work safely and effectively it is essential that they are adequately and regularly serviced and maintained.

# The Requirements J1/J2/J3/J4/J5/J6

This Approved Document, which takes effect on **1 October 2010**, deals with the following Requirements which are contained in the Building Regulations 2010 (as amended by SI 2001/2214).

<i>Requirement</i>	<i>Limits on application</i>
<b>Part J Combustion Appliances and Fuel Storage Systems</b>	
<b>Air supply</b>	
<b>J1.</b> Combustion appliances shall be so installed that there is an adequate supply of air to them for combustion, to prevent overheating and for the efficient working of any flue.	Requirements J1 and J2 apply only to fixed combustion appliances (including incinerators).
<b>Discharge of products of combustion</b>	
<b>J2.</b> Combustion appliances shall have adequate provision for the discharge of products of combustion to the outside air.	
<b>Warning of release of carbon monoxide</b>	
<b>J3.</b> Where a fixed combustion appliance is provided, appropriate provision shall be made to detect and give warning of the release of carbon monoxide.	Requirement J3 applies only to fixed combustion appliances located in dwellings.
<b>Protection of building</b>	
<b>J4.</b> Combustion appliances and fluepipes shall be so installed, and fireplaces and chimneys shall be so constructed and installed, as to reduce to a reasonable level the risk of people suffering burns or the building catching fire in consequence of their use.	
<b>Provision of information</b>	
<b>J5.</b> Where a hearth, fireplace, flue or chimney is provided or extended, a durable notice containing information on the performance capabilities of the hearth, fireplace, flue or chimney shall be affixed in a suitable place in the building for the purpose of enabling combustion appliances to be safely installed.	
<b>Protection of liquid fuel storage systems</b>	
<b>J6.</b> Liquid fuel storage systems and the pipes connecting them to combustion appliances shall be so constructed and separated from buildings and the boundary of the premises as to reduce to a reasonable level the risk of the fuel igniting in the event of fire in adjacent buildings or premises.	Requirement J6 applies only to: <ul style="list-style-type: none"> <li>(a) fixed oil storage tanks with capacities greater than 90 litres and connecting pipes; and</li> <li>(b) fixed liquefied petroleum gas storage installations with capacities greater than 150 litres and connecting pipes, which are located outside the building and which serve fixed combustion appliances (including incinerators) in the building.</li> </ul>
<b>Protection against pollution</b>	
<b>J7.</b> Oil storage tanks and the pipes connecting them to combustion appliances shall: <ul style="list-style-type: none"> <li>(a) be so constructed and protected as to reduce to a reasonable level the risk of the oil escaping and causing pollution; and</li> <li>(b) have affixed in a prominent position a durable notice containing information on how to respond to an oil escape so as to reduce to a reasonable level the risk of pollution.</li> </ul>	Requirement J7 applies only to fixed oil storage tanks with capacities of 3500 litres or less, and connecting pipes, which: <ul style="list-style-type: none"> <li>(a) are located outside the building; and</li> <li>(b) serve fixed combustion appliances (including incinerators) in a building used wholly or mainly as a private dwelling, but does not apply to buried systems.</li> </ul>

Particular reference should be made to:

**Approved Document B** for guidance on compartmentation of buildings for fire safety purposes and for appropriate degrees of fire resistance for compartment boundaries.

**Approved Document F** for guidance on ventilation for health, and provision of extract ventilation using open flued combustion appliances.

# Section 0: General guidance

## Introduction to the provisions

**0.1** This Approved Document gives guidance on how to satisfy the requirements of Part J. Although Part J applies to the accommodation of any combustion installation and liquid fuel storage system within the Limits on Application, the guidance in this Approved Document has been prepared mainly with domestic installations in mind, such as those comprising space and water heating systems and cookers and their flues, and their attendant oil and liquefied petroleum gas (LPG) fuel storage systems. Part J does not include specific provisions relating to the storage of solid fuel (including solid biofuel) but the relevant guidance in Approved Document B should be followed.

**0.2** The guidance applies to combustion installations having power ratings and fuel storage capacities up to the limits shown in a) to c) below. Guidance which applies generally is given in this section and Section 1. More specific guidance is then given in:

- Section 2 for solid fuel installations of up to 45kW *rated output*;
- Section 3 for gas installations of up to 70kW net (77.7kW gross) *rated input*;
- Section 4 for oil installations of up to 45kW *rated heat output*.

Section 5 gives guidance on requirement J5 for heating oil storage installations with capacities up to 3500 litres and LPG storage installations with capacities up to 1.1 tonne, although there is no size limit on the application of requirement J5. Section 5 also gives guidance on requirement J6, which is limited to installations where the *capacity* of the oil storage tank is 3500 litres or less, serving buildings used wholly or mainly as private dwellings.

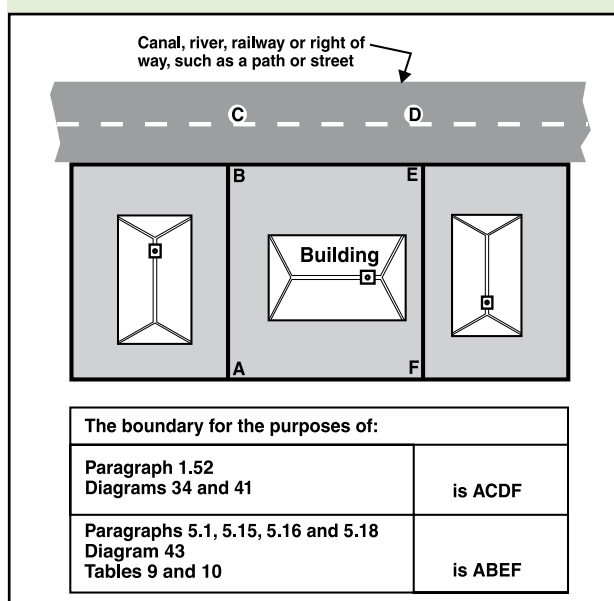
**0.3** For installations subject to the requirements of part J but outside the scope of this Approved Document, such as incinerators or installations with higher ratings than those mentioned above, specialist guidance may be necessary. However, some larger installations may be shown to comply by adopting the relevant recommendations to be found in the *CIBSE Guide B* and practice standards produced by BSI and IGEM.

## Explanation of terms used

**0.4** The following definitions have been adopted solely for the purposes of providing clarity in this Approved Document.

1. An **appliance compartment** is an enclosure specifically constructed or adapted to accommodate one or more combustion appliances.
2. A **balanced compartment** is a method of installing an open-flued appliance into a compartment which is sealed from the remainder of the building and whose ventilation is so arranged in conjunction with the appliance flue as to achieve a balanced flue effect.
3. A **balanced flue** appliance is a type of room-sealed appliance which draws its combustion air from a point outside the building adjacent to the point at which the combustion products are discharged, the inlet and outlet being so disposed that wind effects are substantially balanced. Balanced flues may run vertically, but in the most common configuration they discharge horizontally through the external wall against which the appliance is situated.
4. The **boundary** is the boundary of the land or buildings belonging to and under the control of the building owner. Depending upon the paragraphs of this Approved Document to which it applies, it may be drawn only around the perimeter of the land in question or extended to the centreline of adjacent routes or waterways as shown in Diagram 1.

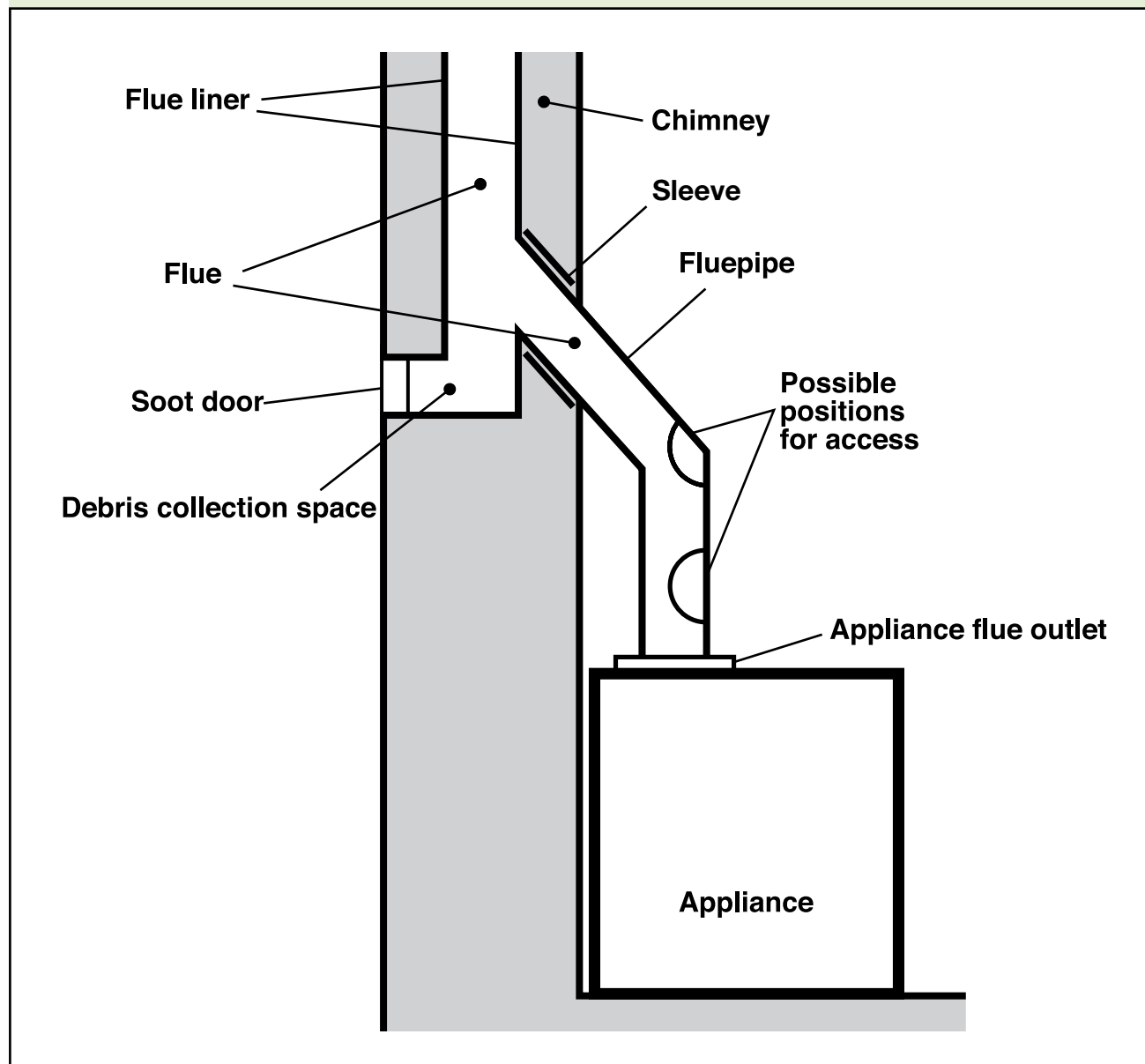
Diagram 1 **Boundaries in this Approved Document**



5. A **Building Control Body** is a body that carries out checks for compliance with the Building Regulations on plans of building work and on the building work itself. The Building Control Body may be either the local authority or an Approved Inspector. For further details, see the manual to the Building Regulations.
6. The **capacity** of an oil tank is its nominal capacity as stated by the manufacturer. It is usually 95 per cent of the volume of liquid required to fill it to the brim.

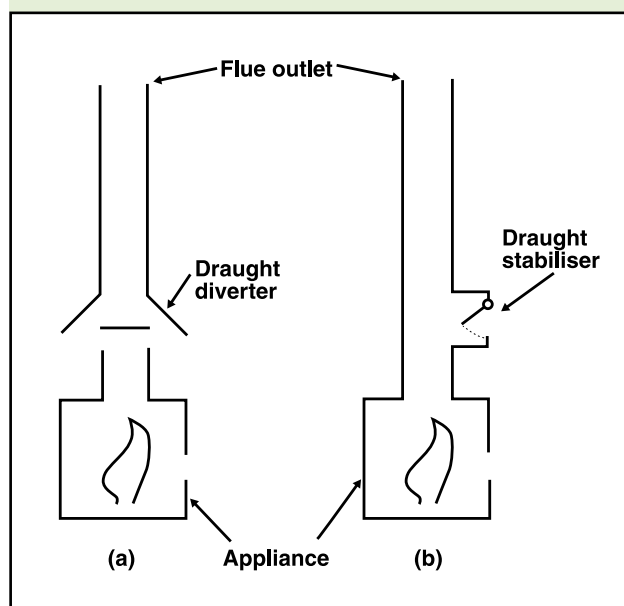
7. A **chimney** is a structure consisting of a wall or walls enclosing one or more flues (see Diagram 2). In the gas industry, the chimney for a gas appliance is commonly called the flue.
8. A **combustion appliance** (or **appliance**) is an apparatus where fuel is burned to generate heat for space heating, water heating, cooking or other similar purpose. The appliance does not include systems to deliver fuel to it or for the distribution of heat. Typical combustion appliances are boilers, warm air heaters, water heaters, fires, stoves and cookers.
9. The **designation** system in BS EN 1443:2003 expresses the performance characteristics of a chimney or its components, as assessed in accordance with an appropriate European product standard, by means of a code such as EN 1234 – T400 N1 D1 Gxx. Further information is given in Appendix G.

Diagram 2 Chimneys and flues



10. A **draught break** is an opening formed by a factory-made component into any part of the flue serving an open-flued appliance. Such openings may be provided to allow dilution air to be drawn into a flue or to lessen the effects of down-draught on combustion in the appliance.
11. A **draught diverter** is a form of draught break intended to prevent conditions in the main length of flue from interfering with the combustion performance of an open-flued appliance (see Diagram 3(a)). It allows the appliance to operate without interference from down-draughts that may occur in adverse wind conditions and excessive draught.

**Diagram 3 Draught diverter and draught stabiliser**



12. A **draught stabiliser** is a factory-made counter-balanced flap device admitting air to the flue, from the same space as the combustion air, to prevent excessive variations in the draught (see Diagram 3(b)). It is usual for these to be in the fluepipe or chimney, but they may be located on the appliance.
13. **Equivalent area** is defined in BS EN 13141-1:2004 as the area of a sharp-edged circular orifice which would pass the same air flow rate at the same applied pressure difference as the product or device being tested. The equivalent area of a simple ventilator will be less than the geometrical free area and for complex products may be significantly less.
14. **Factory-made metal chimneys** (also known as system chimneys) are prefabricated chimneys that are commonly manufactured as sets of components for assembly on site (although they can be supplied as one unit), having the performance appropriate for the

intended appliance. They are available in various materials and types ranging from single-walled metal chimneys suitable for some gas appliances to twin-walled chimneys with insulation sandwiched between an inner liner and an outer metal wall which are designed for oil or solid fuel use.

15. In a **fanned draught** installation, the proper discharge of the flue gases depends upon the operation of a fan, which may be separately installed in the flue or may be an integral part of the combustion appliance. Fans in combustion appliances either may extract flue gases from the combustion chamber or may cause the flue gases to be displaced from the combustion chamber if the fan is supplying it with air for combustion. Appliances with fans providing the combustion air (including most oil-fired and many gas-fired boilers) are also commonly referred to as forced draught appliances (see Diagram 4). Flues in fanned draught installations run horizontally or vertically and can be at higher or lower pressures than their surroundings, dependent upon the location of the fan.
16. A **fire compartment** is a building or part of a building comprising one or more rooms, spaces or storeys constructed to prevent the spread of fire to or from another part of the same building or an adjoining building. (A roof-space above the top storey of a fire compartment is included in that fire compartment.) A **separated part** of a building is a form of compartmentation in which part of a building is separated from another part of the same building by a compartment wall. Such walls run the full height of the part and are in one vertical plane. Further information on this is given in Approved Document B Vol 2 (see Section 8 Compartmentation and Appendix C Methods of Measurement).
17. A **fireplace recess** is a structural opening (sometimes called a builder's opening) formed in a wall or in a chimney breast, from which a chimney leads and which has a hearth at its base. Simple structural openings (Diagram 5(a)) are suitable for closed appliances such as stoves, cookers or boilers, but gathers (Diagram 5(b)) are necessary for accommodating open fires. Fireplace recesses are often lined with firebacks to accommodate inset open fires (Diagram 5(c)). Lining components and decorative treatments fitted around openings reduce the opening area. It is the finished fireplace opening area which determines the size of flue required for an open fire in such a recess.
18. The **fire resistance** of a component or construction is a measure of its ability to withstand the effects of fire in one or more ways for a stated period of time. Guidance on determination of performance in terms of fire resistance is given in Approved Document B (Fire Safety).

19. A **fire wall** is a means of shielding a fuel tank from the thermal radiation from a fire. For LPG tanks, it also ensures that gas accidentally leaking from the tank or fittings must travel by a longer path and therefore disperse safely, before reaching a hazard such as an opening in a building, a boundary or other potential ignition source.
20. A **flue** is a passage that conveys the products of combustion from an appliance to the outside air (see Diagram 2).
21. **Flueblock chimney** systems consist of a set of factory-made components, made from precast concrete, clay or other masonry units, that are designed for assembly on site to provide a complete chimney having the performance appropriate for the intended appliance. There are two types of common systems, one being solely for use with gas-burning appliances and the other, often called chimney block systems, being primarily designed for solid fuel-burning appliances.

Diagram 4 **Types of installation**

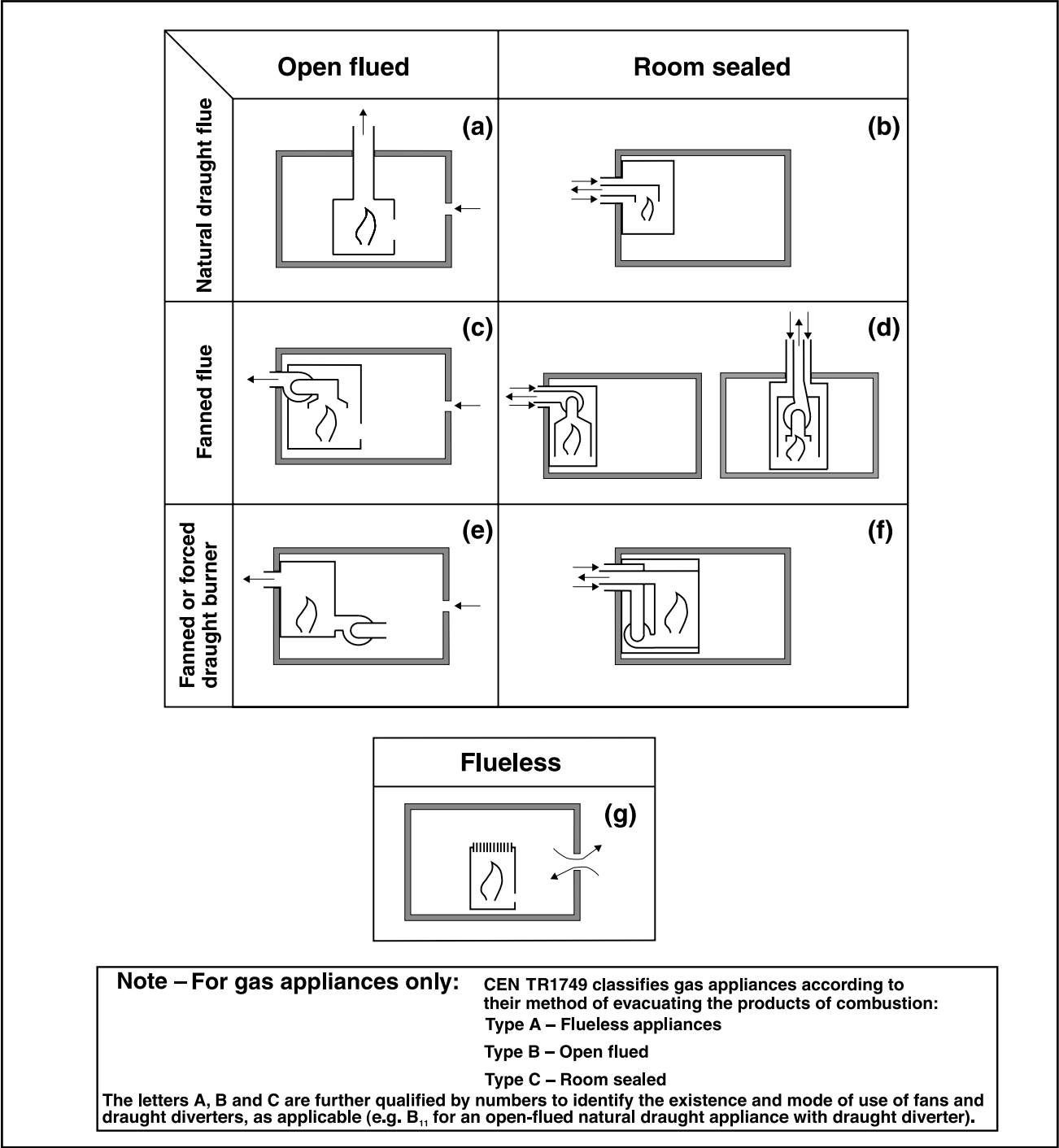
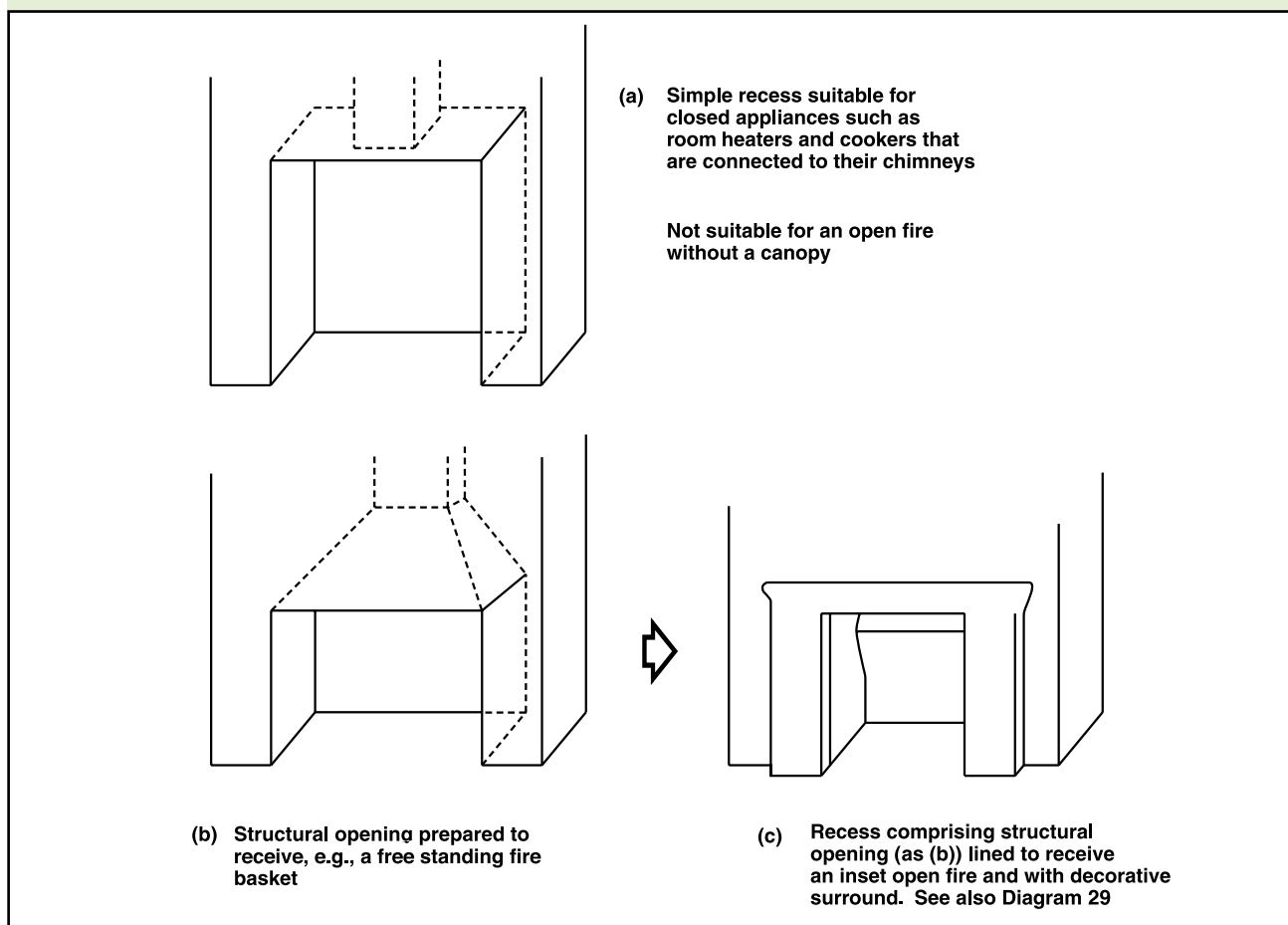
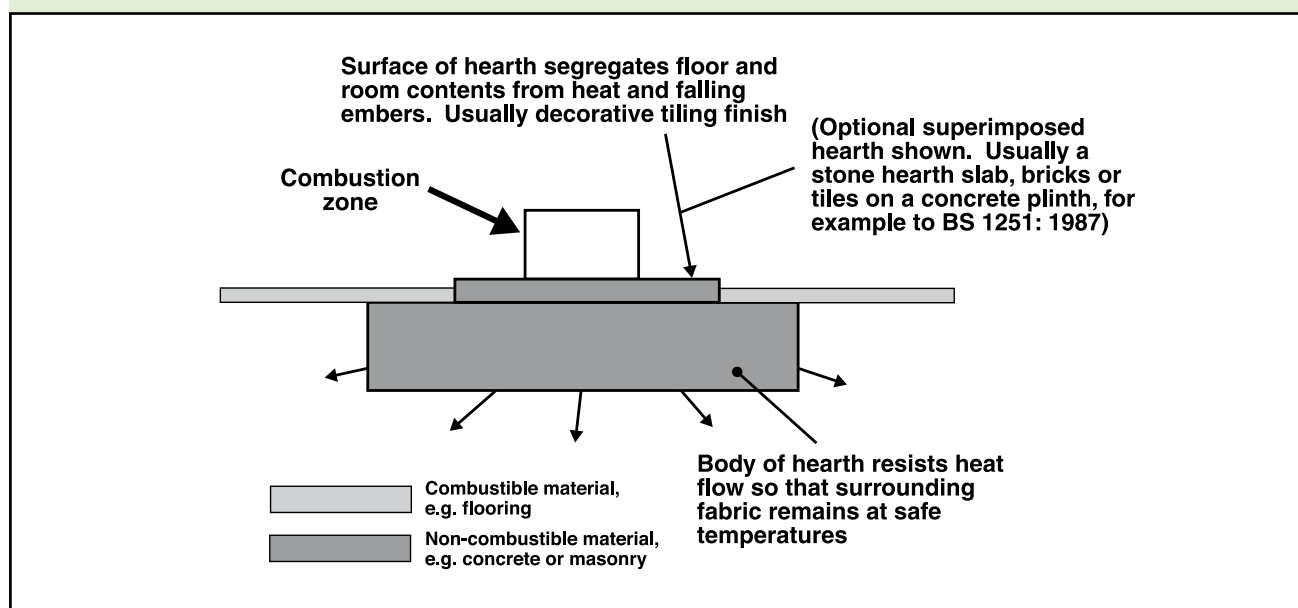


Diagram 5 **Fireplace recesses**



22. A **flue box** is a factory made unit, usually made of metal, which is similar to a prefabricated appliance chamber except that it is designed to accommodate a gas burning appliance in conjunction with a factory-made chimney.
23. A **flueless appliance** is one which is designed to be used without connection to a flue. Its products of combustion mix with the surrounding room air and are eventually transported to the outside as stale air leaves the room (see Diagram 4(g)).
24. A **flue liner** is the wall of the chimney that is in contact with the products of combustion (see Diagram 2), such as a concrete flue liner, the inner liner of a factory-made chimney system or a flexible liner fitted into an existing chimney.
25. A **flue outlet** is the point at which the products of combustion are discharged from the flue to the outside atmosphere, such as the top of a chimney pot or flue terminal.
26. A **fluepipe** is a pipe, either single walled (bare or insulated) or double walled, which connects a combustion appliance to a flue in a chimney. For clarity, when used in this way, it may be called a connecting fluepipe. (Fluepipe is also used to describe the tubular components from which some factory made chimneys for gas and oil appliances are made or from which plastic flue systems are made).
27. A **hearth** is a base intended to safely isolate a combustion appliance from people, combustible parts of the building fabric and soft furnishings. The exposed surface of the hearth provides a region around the appliance which can be kept clear of anything at risk of fire. The body of the hearth may be thin insulating board, a substantial thickness of material such as concrete or some intermediate provision dependent upon the weight and downward heat emission characteristics of the appliance(s) upon it (see Diagram 6).
28. The **heat input rate** is the maximum rate of energy flow into an appliance. It is calculated as the rate of fuel flow to the appliance multiplied by either the fuel's gross or net calorific value.  
**Note:** Traditionally, the UK has used Gross values, most European standards use Net values. Thus for gas appliances it is now the norm to express this rating as a net value (kW (net)).
29. **Installation instructions** are those instructions produced by manufacturers to enable installers to correctly install and test appliances and flues and to commission them into service.
30. In a **natural draught** flue, the combustion products flow into the flue as a result of the draught produced due to the difference between the temperature of the gases within

Diagram 6 The functions of hearths



the flue and the temperature of the ambient air. Taller flues produce a greater draught at their base. Except for those balanced flue appliances which are designed to discharge directly through the wall adjacent to the appliance, a satisfactory natural draught requires an essentially vertical run of flue (see Diagram 4 (a) and (b)).

31. **Non-combustible material.** This is the highest level of reaction to fire performance. Non-combustible materials include:

- any material which when tested to BS 476-11:1982 (2007) does not flame nor cause any rise in temperature on either the centre (specimen) or furnace thermocouples; and
- products classified as non-combustible in tests following the procedures in BS 476-4:1970 (2007);
- any material classified as class A1 in accordance with BS EN 13501-1:2002 Fire classification of construction products and building elements. Classification using data from reaction to fire tests.

Typical examples of such materials to be found in buildings include totally inorganic materials such as concrete, fired clay, ceramics, metals, plaster and masonry containing not more than 1 per cent by weight or volume of organic material. (Use in buildings of combustible metals such as magnesium-aluminium alloys should be assessed in each individual case.)

More detailed information is given in Approved Document B (Fire Safety).

32. A **Notified Body**, for the purposes of the Gas Appliances (Safety) Regulations (1995), means:

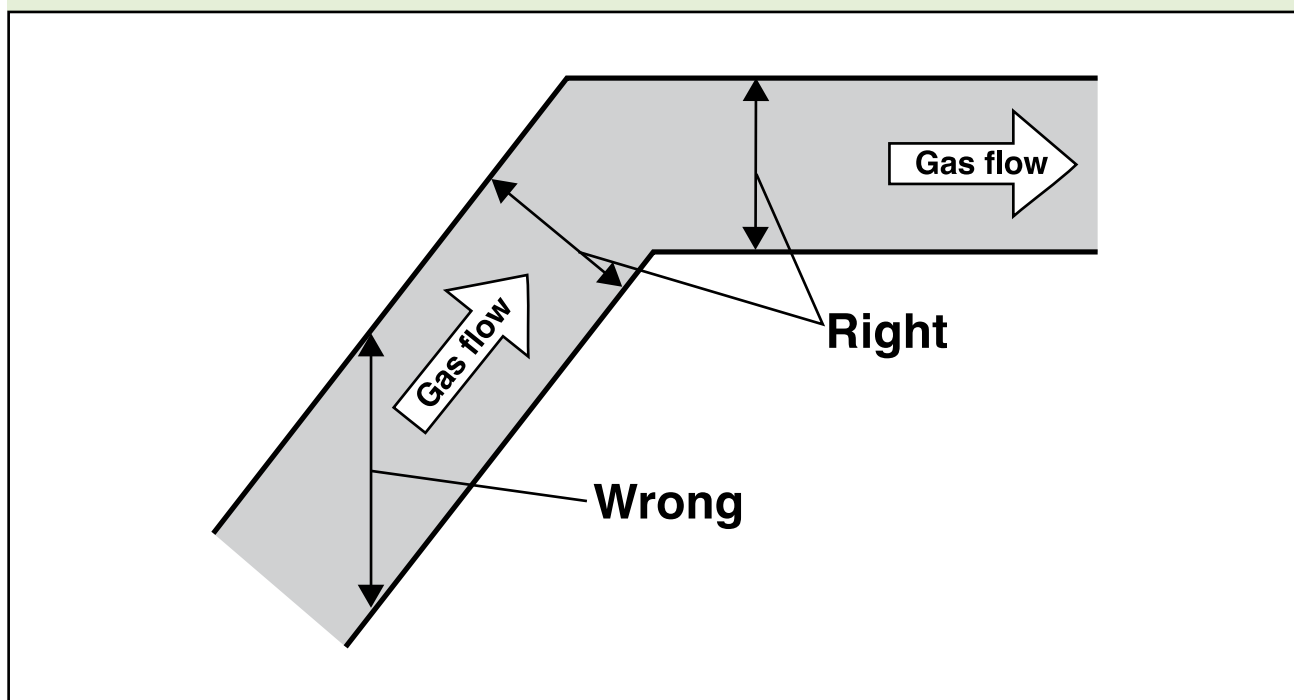
- a body which is approved by the Secretary of State for Trade and Industry as being competent to carry out the required Attestation procedures for gas appliances and whose name and identification number has been notified by him/her to the Commission of the European Community and to other member States in accordance with the Gas Appliances (Safety) Regulations (1995);
  - a body which has been similarly approved for the purposes of the Gas Appliances Directive by another member State and whose name and identification number has been notified to the Commission and to other member States pursuant to the Gas Appliances Directive.
33. An **open-flued appliance** is one which draws its combustion air from the room or space within which it is installed and which requires a flue to discharge its products of combustion to the outside air (see Diagram 4 (a), (c) and (e)).
34. A **prefabricated appliance chamber** is a set of factory-made precast concrete components designed to provide a fireplace recess to accommodate an appliance such as a stove, and incorporates a gather when used with an open fire. The chamber is normally positioned against a wall and may be designed to support a chimney. The chamber and chimney are often enclosed to create a false chimney breast (see also 'flue box').
35. The **rated heat input** (sometimes shortened to rated input) for a gas appliance is the maximum heat input rate at which it can be operated, as declared on the appliance data plate. (See also heat input rate.)
36. The **rated heat output** for an oil appliance is the maximum declared energy output rate (kW) as declared on the appliance data plate.

37. The **rated heat output** for a solid fuel appliance is the manufacturer's declared nominal energy output rate (kW) for the appliance. This may be different for different fuels.
38. A **room-sealed appliance** means an appliance whose combustion system is sealed from the room in which the appliance is located and which obtains air for combustion from a ventilated uninhabited space within the building or directly from the open air outside the building and which vents the products of combustion directly to open air outside the building (see Diagram 4 (b), (d) and (f)).
39. **Solid biofuel** means, for the purpose of this Approved Document, a solid fuel derived from plants and trees. It can include logs, wood chips, wood pellets and other processed plant material.
40. A **throat** is a contracted part of the flue between a fireplace recess and its chimney (see Diagram 22). Throats are usually formed from prefabricated components as shown in Diagram 29.

## Measuring the size of flues and ducts

**0.5** The size a *flue* or duct (area, diameter etc) should be measured at right angles to the direction in which gases flow. Where offset components are used, they should not reduce the *flue* area to less than the minimum required for the *combustion appliance* (see Diagram 7).

Diagram 7 **Measurement of flues and ducts**



# Section 1: Provisions which apply generally to combustion installations

## Performance

**1.1** In the Secretary of State's view requirements J1 to J5 will be met if the building provisions for the safe accommodation of *combustion appliances*:

- a. enable the admission of sufficient air for:
  - i. the proper combustion of fuel and the operation of *flues*; and
  - ii. the cooling of appliances where necessary;
- b. enable normal operation of appliances without the products of combustion becoming a hazard to health.
- c. incorporate an appropriate means of warning of a release of Carbon Monoxide for fixed appliances that burn solid fuels;
- d. enable normal operation of appliances without their causing danger through damage by heat or fire to the fabric of the building;
- e. have been inspected and tested to establish suitability for the purpose intended;
- f. have been labelled to indicate performance capabilities.

**Note:** Whilst, for the purposes of requirement J2A, it is considered appropriate to require carbon monoxide alarms only with solid fuel appliances, such alarms can still reduce the risk of poisoning from other types of appliance.

## Air supply for combustion appliances

**1.2** *Combustion appliances* require ventilation to supply them with air for combustion. Ventilation is also required to ensure the proper operation of *flues* or, in the case of *flueless appliances*, to ensure that the products of combustion are safely dispersed to the outside air. Installation of *room-sealed appliances* or those with a directly connected ducted external air supply will minimise ventilation energy losses from the room and the risk of cold draughts. In some cases, *combustion appliances* may also require air for cooling control systems and/or to ensure that casings remain safe to touch (see Diagram 8). General guidance on where it may be necessary to install air vents for these purposes is given below.

**1.3** Air vent sizes, which are dependent upon the type of fuel burned, are given in Sections 2, 3 and 4 and are for one *combustion appliance* only. The air supply provisions will usually need to be increased where a room contains more than one appliance (such as a kitchen containing an open-flued boiler and an open-flued cooker).

## Permanently open ventilation of rooms

**1.4** A room containing an *open-flued appliance* may need permanently open air vents. An open-flued appliance must receive a certain amount of air from outside ('combustion air' in Diagram 8) dependent upon its type and rating. Infiltration through the building fabric may be sufficient but for certain appliance ratings and forms of construction, permanent openings are necessary (see Diagram 8).

## Permanent ventilation of appliance compartments

**1.5** *Appliance compartments* that enclose open-flued *combustion appliances* should be provided with vents large enough to admit all of the air required by the appliance for combustion and proper flue operation, whether the compartment draws its air from a room or directly from outside (see Diagram 8 (b) and (c)).

**1.6** Where appliances require cooling air, *appliance compartments* should be large enough to enable air to circulate and high- and low-level vents should be provided (see Diagram 8 (d), (e), (f) and (g)).

**1.7** Where appliances are to be installed within *balanced compartments* (see paragraph 0.4(2)), special provisions will be necessary and the appliance and ventilation system manufacturer's instructions should be followed.

## Ventilation of other rooms or spaces

**1.8** If an appliance is *room-sealed* but takes its combustion air from another space in the building (such as the roof void) or if a *flue* has a permanent opening to another space in the building (such as where it feeds a secondary *flue* in the roof void), that space should have ventilation openings directly to outside. Where the roof-space is to be used as a source of air for a combustion installation serving a dwelling, the dwelling roof ventilation provisions suggested in Approved Document C would normally be satisfactory.

**1.9** Where flued appliances are supplied with combustion air through air vents which open into adjoining rooms or spaces, the adjoining rooms or spaces should have air vent openings of at least the same size direct to the outside. Air vents for *flueless appliances*, however, should open directly to the outside air.

**Diagram 8 General air supply to a combustion appliance**  
(for sizes see Sections 2, 3 and 4)

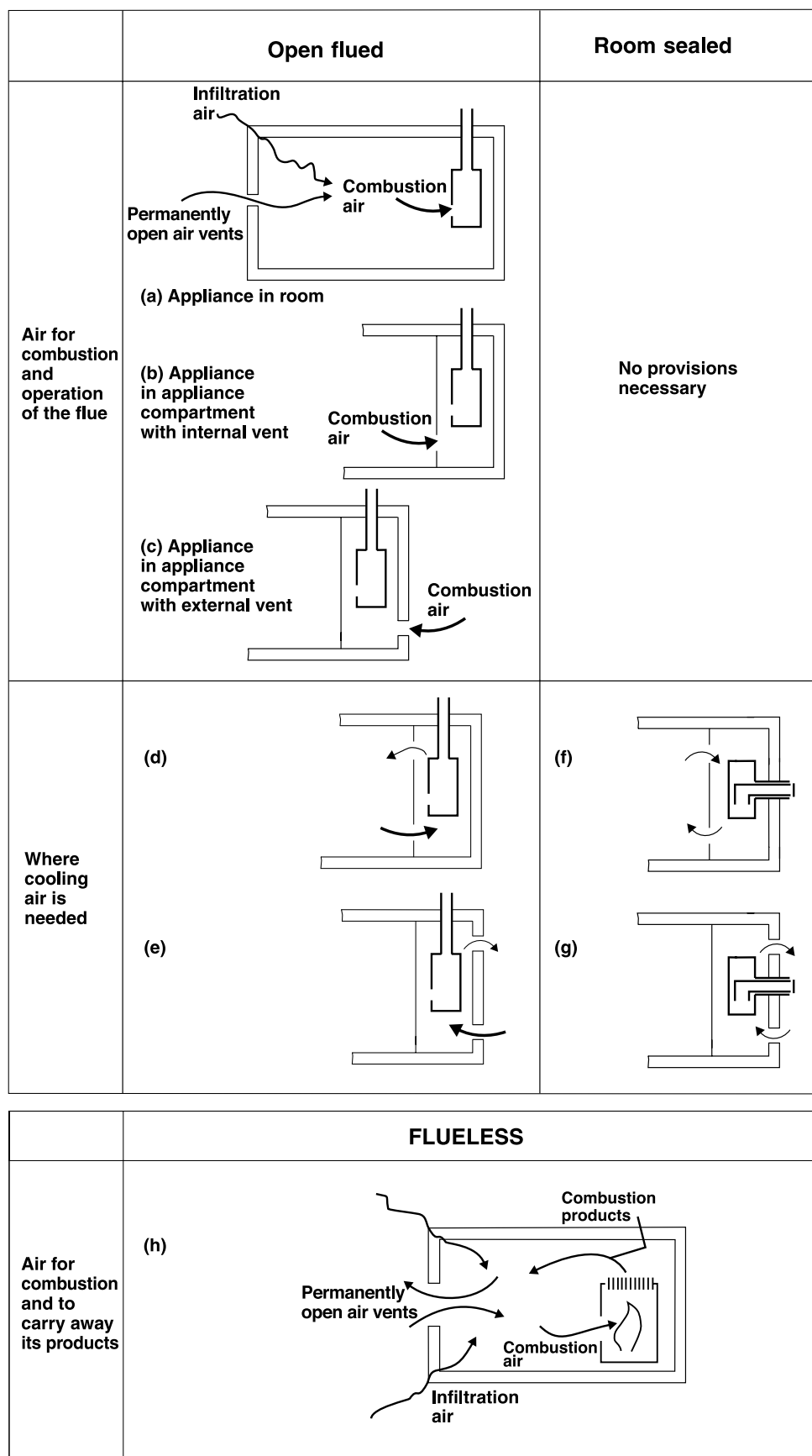
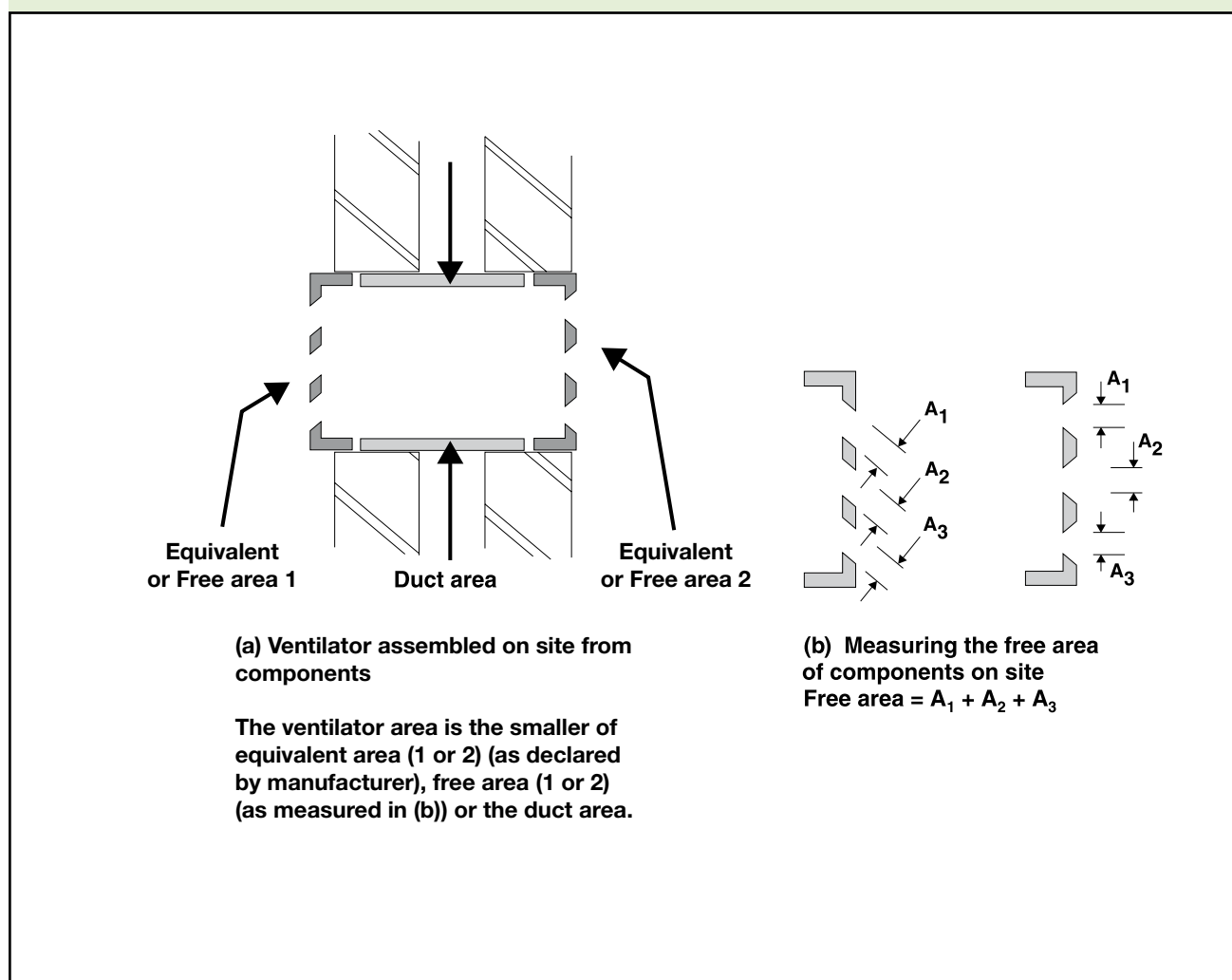


Diagram 9 Ventilator free areas



## Permanently open air vents

**1.10** Permanently open air vents should be non-adjustable, sized to admit sufficient air for the purpose intended and positioned where they are unlikely to become blocked. Ventilators should be installed so that building occupants are not provoked into sealing them against draughts or noise. Ventilation openings should not be made in *fire-resisting* walls other than external walls (although they should not penetrate those parts of external walls shielding LPG tanks). Air vents should not be located within a *fireplace recess* except on the basis of specialist advice.

**1.11** A way of meeting the requirement would be to size permanently open air vents so that their *equivalent area* is sufficient for the appliance(s) to be installed (taking account where necessary of obstructions such as grilles and anti-vermin mesh), and to site them:

- outside *fireplace recesses* and beyond the *hearths* of open fires so that dust or ash will not be disturbed by draughts; and
- in a location unlikely to cause discomfort from cold draughts.

**1.12** Where ventilation is to be provided via a single proprietary assembly, for example when it is proposed to use a proprietary ventilator with integral grilles to bridge a cavity wall, the *equivalent area* of the ventilator should be taken as that declared by the manufacturer having been measured by the method in BS EN 13141-1:2004.

**1.13** Where two or more components are to be used to provide a non-proprietary assembly, the assembly should be kept as simple and smooth as possible. The assembly should be taken to have an *equivalent area* equal to that of the component with the smallest *equivalent area* in the assembly.

**1.14** The *equivalent area* stated in the ventilator manufacturer's literature or marked on the air vent should be used whenever it is available, as this can differ considerably from the free area measured at one end of the air vent. When this is not available the *equivalent area* of a simple ventilator with no internal baffles can be taken as the total unobstructed cross-sectional area, measured in the plane where this area is at a minimum and at right angles to the direction of air flow. For an airbrick, grille or louver with apertures no smaller than 5mm, it will be the aggregate free area of the individual apertures as shown Diagram 9.

**1.15** Grilles or meshes protecting air vents from the entry of animals or birds should have aperture dimensions no smaller than 5mm.

**1.16** Discomfort from cold draughts can be avoided by supplying air directly to appliances, locating vents close to appliances (for example by using floor vents), by drawing air from intermediate spaces such as hallways or by ensuring good mixing of incoming cold air by placing external air vents close to ceilings (see Diagrams 10 and 11). In noisy areas it may be necessary to install noise-attenuated ventilators to limit the entry of noise into the building. Transfer or connecting ventilation should be at low level to reduce the transfer of smoke in the event of a fire and otherwise meet the guidance given in Approved Document B.

**1.17** Buildings may have air-tight membranes in their floors to isolate them from the ground below. Ventilation ducts or vents installed to supply air to *combustion appliances* should not penetrate these membranes in a way that will render them ineffective. Such membranes (including radon-proof membranes) are described in BRE Report BR 414 (2001) and BRE Report BR 211 (2007), which give guidance when service penetrations are necessary.

## Provisions complying with both Part F and Part J

**1.18** Rooms or spaces intended to contain open-flued *combustion appliances* may need permanent ventilation to comply with Part J and adjustable ventilation to comply with Part F. Permanently open air vents for *combustion appliances* can be accepted in place of some or all of the adjustable background ventilation for health, dependent upon opening area and location. However adjustable vents installed to meet the requirements of Part F cannot be used as substitutes for the ventilation openings needed to comply with Part J unless they are fixed permanently open.

**1.19** Rooms or spaces intended to contain *flueless appliances* may need: permanent ventilation and purge ventilation (such as openable windows) to comply with Part J; and adjustable ventilation and rapid ventilation to comply with Part F. Permanent ventilation provisions to comply with Part J may be acceptable in place of adjustable ventilation provisions for Part F subject to the limitations described in Paragraph 1.18. Openable elements installed for the rapid ventilation of rooms and other provisions made for the rapid ventilation of kitchens, in order to comply with Part F, may be acceptable in place of openable elements for the rapid ventilation of rooms or spaces containing *flueless appliances*.

Diagram 10 Location of permanent air vent openings, some examples

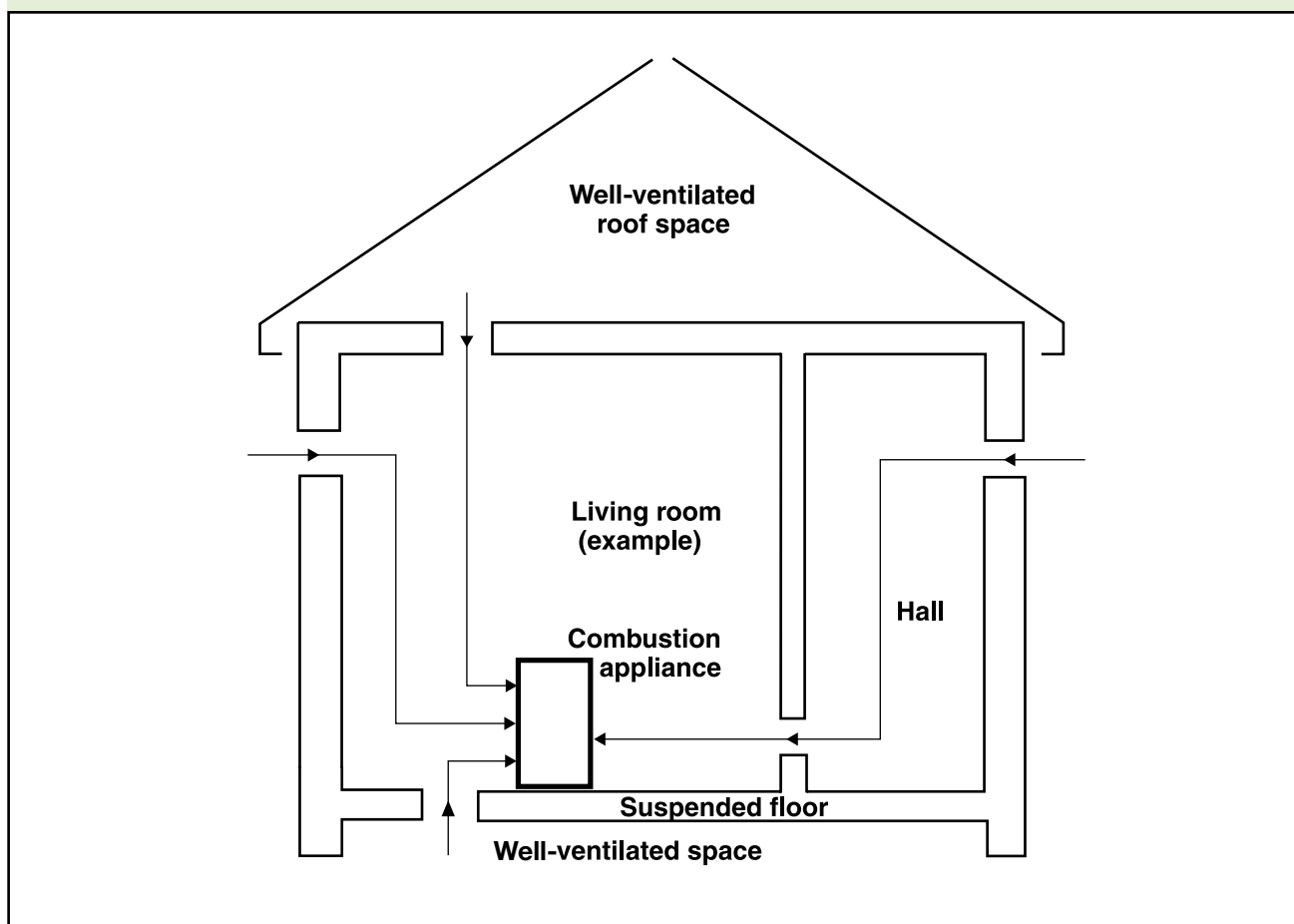
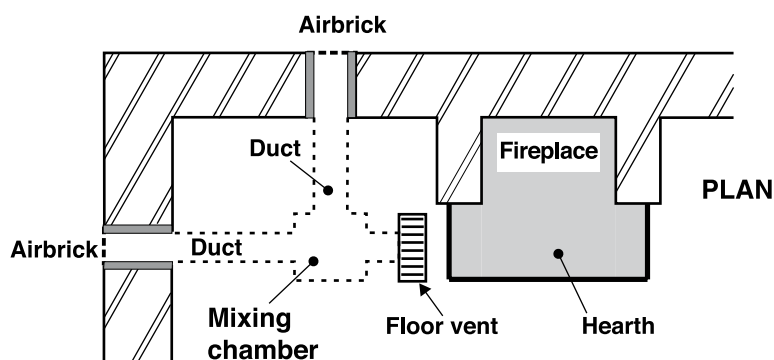


Diagram 11 Provision of permanent air vent openings in a solid floor



Airbrick, duct and grille should have an equivalent free area of at least that recommended in Section 2, 3 or 4 as relevant

## Interaction of mechanical extract ventilation and open-flued combustion appliances

**1.20** Extract fans lower the pressure in a building, which can cause the spillage of combustion products from *open-flued appliances*. This can occur even if the appliance and the fan are in different rooms. Ceiling fans produce air currents and hence local depressurisation, which can also cause the spillage of flue gases from *open-flued appliances* or from solid fuel open fires. In buildings where it is intended to install open-flued combustion appliances and extract fans, the combustion appliances should be able to operate safely whether or not the fans are running. A way of showing compliance in these circumstances would be to follow the installation guidance below, and to show by tests that combustion appliances operate safely whether or not fans are running.

- For gas appliances: where a kitchen contains an open-flued appliance, the extract rate of the kitchen extract fan should not exceed 20 litres/second (72m<sup>3</sup>/hour).
- For oil appliances: where a room contains an open-flued appliance the extract rate should be limited to 40 litres/second for an appliance with a pressure jet burner and 20 litres/second for an appliance with a vaporising burner.
- For solid fuel appliances: avoid installing extract ventilation in the same room. An open-flued appliance in a kitchen may satisfy the requirements of Part F through passive stack ventilation. Refer to Approved Document F. If mechanical extraction is unavoidable then seek specialist advice to ensure safe operation of the appliance.

- For commercial and industrial installations, specialist advice may be necessary regarding the possible need for the interlocking of gas heaters and any mechanical ventilation systems.
- When fans are used to extract radon from below a building follow the guidance in BRE Good Building Guide GBG 25.

**1.21** A suitable test would be to check for spillage when appliances are subjected to the greatest possible depressurisation. A prerequisite for this condition is that all external doors, windows and other adjustable ventilators to outside are closed. The depressurisation at the appliance will depend on the particular combination of fans in operation (fans in the room containing the appliance and fans elsewhere in the building) and the pattern of open internal doors, hatches etc. which is established at the time of the test (when fans should be on their maximum useable setting), and the specific combination causing the greatest depressurisation at the appliance depends upon the circumstances in each case. Several tests (which should include a test with the door leading into the room of installation closed and all fans in that room switched on) may therefore be necessary to demonstrate the safe operation of the appliance with reasonable certainty. The effect of ceiling fans should be checked during the tests.

**1.22** The presence of some fans may be obvious, such as those on view in kitchens, but others may be less obvious: fans installed in domestic appliances such as tumble dryers and fans fitted to other open-flued combustion appliances can also contribute to depressurisation. In addition, fans may also be provided to draw radon gas from the ground below a building (see Paragraph 1.17).

**1.23** The appliance manufacturer's *installation instructions* may describe a suitable spillage test for gas appliances but the procedure in BS 5440-1:2008 can be used. For oil-fired appliances the effects of fans can be checked and, where spillage or flue draught interference is identified, it may be necessary to add additional ventilation to the room or space. A flue draught interference test for oil-fired appliances is described in OFTEC Technical Books 2, 4 and 5.

## Provision of flues

**1.24** Appliances other than *flueless appliances* should incorporate or be connected to suitable *flues* which discharge to the outside air.

**1.25** This Approved Document provides guidance on how to meet the requirements in terms of constructing a *flue* or *chimney*, where each *flue* serves one appliance only. *Flues* designed to serve more than one appliance can meet the requirements by following the guidance in BS 5410-1:1997 for oil- and BS 5440-1:2008 for gas-fired systems. However, each solid fuel appliance should have its own *flue*.

## Condensates in flues

**1.26** *Chimneys* and *flues* should provide satisfactory control of water condensation. Ways of providing satisfactory control include:

- a. for *chimneys* that do not serve condensing appliances, by insulating *flues* so that *flue* gases do not condense in normal operation
- b. for *chimneys* that do serve condensing appliances:
  - i. by using lining components that are impervious to condensates and suitably resistant to corrosion (BS EN 1443:2003 'W' designation) and by making appropriate provisions for draining, avoiding ledges, crevices, etc
  - ii. making provisions for the disposal of condensate from condensing appliances.

## Construction of masonry chimneys

**1.27** New masonry *chimneys* should be constructed with *flue liners* and masonry suitable for the intended application. Ways of meeting the requirement would be to use bricks, medium-weight concrete blocks or stone (with wall thicknesses as given in Section 2, 3 or 4 according to the intended fuel) with suitable mortar joints for the masonry and suitably supported and caulked liners. Liners suitable for solid fuel appliances (and generally suitable for other fuels) could be:

- a. liners whose performance is at least equal to that corresponding to the designation T400 N2 D 3 G, as described in BS EN 1443:2003, such as:

- i. clay *flue liners* with rebates or sockets for jointing meeting the requirements for Class A1 N2 or Class A1 N1 as described in BS EN 1457:2009; or
- ii. concrete *flue liners* meeting the requirements for the classification Type A1, Type A2, Type B1 or Type B2 as described in BS EN 1857:2003; or
- iii. other products that meet the criteria in a).

**1.28** Liners should be installed in accordance with their manufacturer's instructions. Appropriate components should be selected to form the *flue* without cutting and to keep joints to a minimum. Bends and offsets should be formed only with matching factory-made components. Liners need to be placed with the sockets or rebate ends uppermost to contain moisture and other condensates in the *flue*. Joints should be sealed with fire cement, refractory mortar or installed in accordance with their manufacturer's instructions. Spaces between the lining and the surrounding masonry should not be filled with ordinary mortar. In the absence of liner manufacturer's instructions, the space could be filled with a weak insulating concrete such as mixtures of:

- a. one part ordinary Portland cement to 20 parts suitable lightweight expanded clay aggregate, minimally wetted; or
- b. one part ordinary Portland cement to 6 parts Vermiculite; or
- c. one part ordinary Portland cement to 10 parts Perlite.

## Construction of flueblock chimneys

**1.29** *Flueblock chimneys* should be constructed of factory-made components suitable for the intended application installed in accordance with the manufacturer's instructions. Ways of meeting the requirement for solid fuel appliances (and generally suitable for other fuels) include using:

- a. flueblocks whose performance is at least equal to that corresponding to the designation T400 N2 D 3 G, as described in BS EN 1443:2003, such as:
  - i. clay flueblocks at least meeting the requirements for Class FB1 N2 as described in BS EN 1806:2006
  - ii. other products that meet the criteria in a).
- b. blocks suitable for the purpose lined in accordance with Paragraph 1.27.

**1.30** Joints should be sealed in accordance with the flueblock manufacturer's instructions. Bends and offsets should be formed only with matching factory-made components.

## Material change of use

**1.31** Where a building is to be altered for different use (e.g. it is being converted into flats) the *fire resistance* of walls of existing masonry chimneys may need to be improved as shown in Diagram 12.

## Connecting fluepipes

**1.32** Satisfactory components for constructing connecting *fluepipes* include:

- a. cast iron *fluepipes* complying with BS 41:1973 (1998)
- b. metal flue pipes appropriately designated in accordance with BS EN1856-2:2004 to suit the appliance and types of fuels to be burnt – refer to detailed guidance in Sections 2, 3 and 4.
- c. vitreous enamelled steel pipe complying with BS 6999:1989 (1996)
- d. other *fluepipes* having the necessary performance *designation* for use with the intended appliance.

**1.33** *Fluepipes* with spigot and socket joints should be fitted with the socket facing upwards to contain moisture and other condensates in the *flue*. Joints should be made gas-tight. A

satisfactory way of achieving this would be to use proprietary jointing accessories or, where appropriate, by packing joints with non-combustible rope and fire cement.

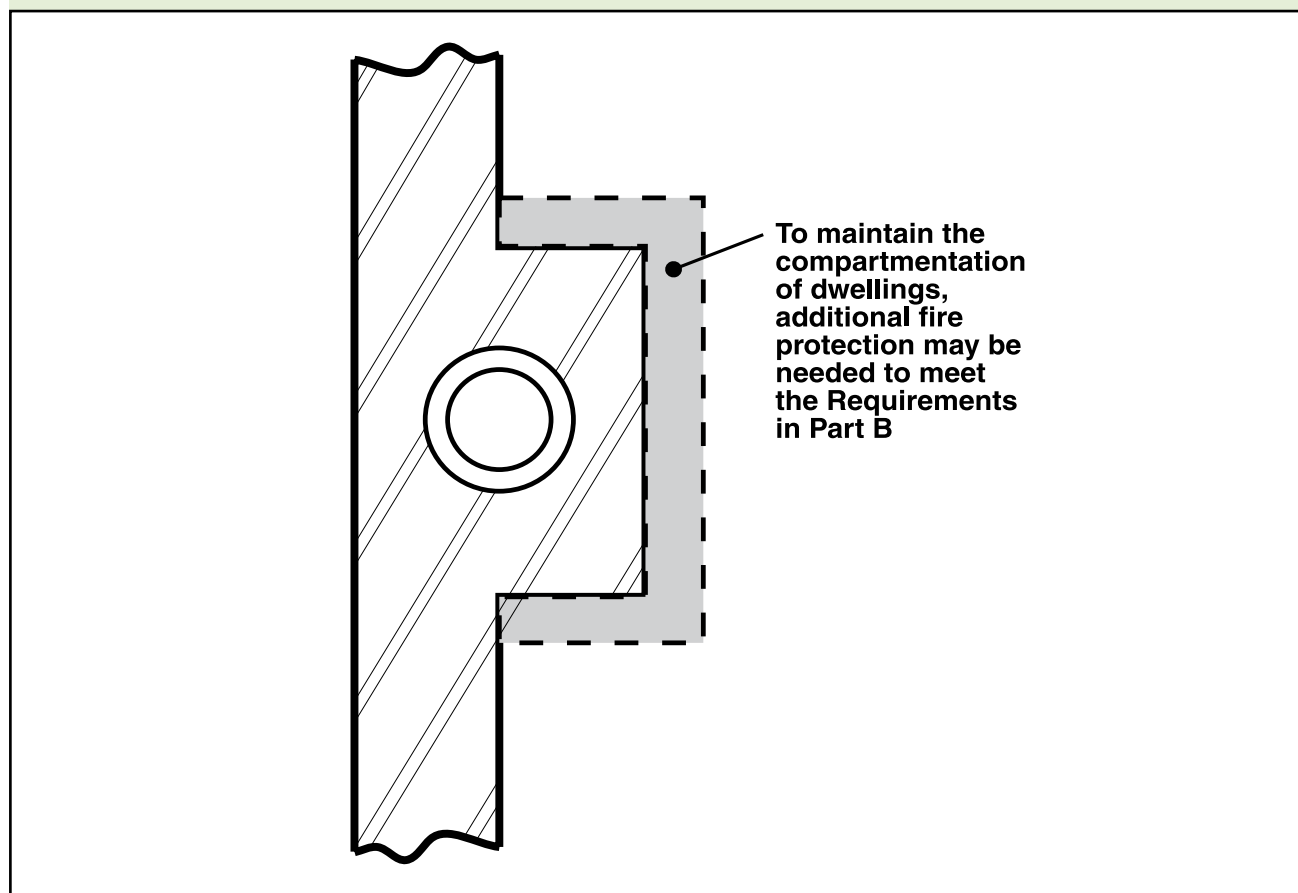
## Repair of flues

**1.34** It is important to the health and safety of building occupants that renovations, refurbishments or repairs to *flue liners* should result in *flues* that comply with the requirements of J2 to J5. The test procedures referred to in paragraph 1.55 and in Appendix E can be used to check this.

**1.35** *Flues* are controlled services as defined in Regulation 2 of the Building Regulations, that is to say they are services in relation to which Part J of Schedule 1 imposes requirements. If renovation, refurbishment or repair amounts to or involves the provision of a new or replacement *flue liner*, it is 'building work' within the meaning of Regulation 3 of the Building Regulations. 'Building work' and must not be undertaken without prior notification to the local authority. Examples of work that would need to be notified include:

- a. relining work comprising the creation of new flue walls by the insertion of new linings such as rigid or flexible prefabricated components

Diagram 12 **Material change of use: fire protection of chimneys passing through other dwellings**



- b. a cast in situ liner that significantly alters the *flue's* internal dimensions.

Anyone in doubt about whether or not any renovation, refurbishment or repair work involving a *flue* is notifiable 'building work', could consult the building control department of their local authority, or an approved inspector.

## Re-use of existing flues

**1.36** Where it is proposed to bring a *flue* in an existing *chimney* back into use or to re-use a *flue* with a different type or rating of appliance, the *flue* and the *chimney* should be checked and, if necessary, altered to ensure that they satisfy the requirements for the proposed use. A way of checking before and/or after remedial work would be to test the *flue* using the procedures in Appendix E.

**1.37** A way of refurbishing defective *flues* would be to line them using the materials and components described in Sections 2, 3, and 4 dependent upon the type of *combustion appliance* proposed. Before relining *flues*, they should be swept to remove deposits.

**1.38** A *flue* may also need to be lined to reduce the flue area to suit the intended appliance. Oversize *flues* can be unsafe.

**1.39** If a *chimney* has been relined in the past using a metal lining system and the appliance is being replaced, the metal liner should also be replaced unless the metal liner can be proven to be recently installed and can be seen to be in good condition.

## Use of flexible metal flue liners for the relining of chimneys

**1.40** A way of relining a *chimney* would be to use a flexible metal *flue liner*, appropriately designated in accordance with BS EN1856-2:2004 to suit the appliance, fuel and flue gas characteristics. Flexible *flue liners* should be used only to reline a *chimney* and should not be used as the primary liner of a new *chimney*. They can be used to connect gas back boilers to *chimneys* where the appliance is located in a *fireplace recess*.

## Use of plastic fluepipe systems

**1.41** A way of using plastic flue systems and liners would be to use a plastic *flue*, appropriately designated in accordance with BS EN 14471:2005 to suite the appliance, fuel and *flue* characteristics. Plastic fluepipe systems can be acceptable in some cases, for example with condensing boiler installations, where the *fluepipes* are supplied by or specified by the appliance manufacturer as being suitable for purpose.

## Factory-made metal chimneys

**1.42** Ways of meeting the requirements when proposing *factory-made metal chimneys* include:

- a. using component systems appropriately designated in accordance with BS EN1856-1:2003 to suit the appliance and types of fuels to be burnt and installing them in accordance with the relevant recommendations of BS EN 15287-1:2007;
- b. for gas and for oil appliances where flue temperatures will not normally exceed 250°C, using twin-walled component systems (and, for gas, single-walled component systems) appropriately designated in accordance with BS EN1856-1:2003 to suit the appliance and types of fuels to be burnt and installing gas appliances in accordance with BS 5440-1:2008;
- c. using any other *chimney* system that is suitable for the intended purpose and installed in accordance with the relevant recommendations in BS EN 15287-1:2007 or BS 5440-1:2008, as appropriate to the type of appliance being installed.

**1.43** Where a *factory-made metal chimney* passes through a wall, sleeves should be provided to prevent damage to the *flue* or building through thermal expansion. To facilitate the checking of gas-tightness, joints between *chimney* sections should not be concealed within ceiling joist spaces or within the thicknesses of walls without proper access being provided (see paragraph 1.47).

**1.44** When providing a *factory-made metal chimney*, provision should be made to withdraw the appliance without the need to dismantle the *chimney*.

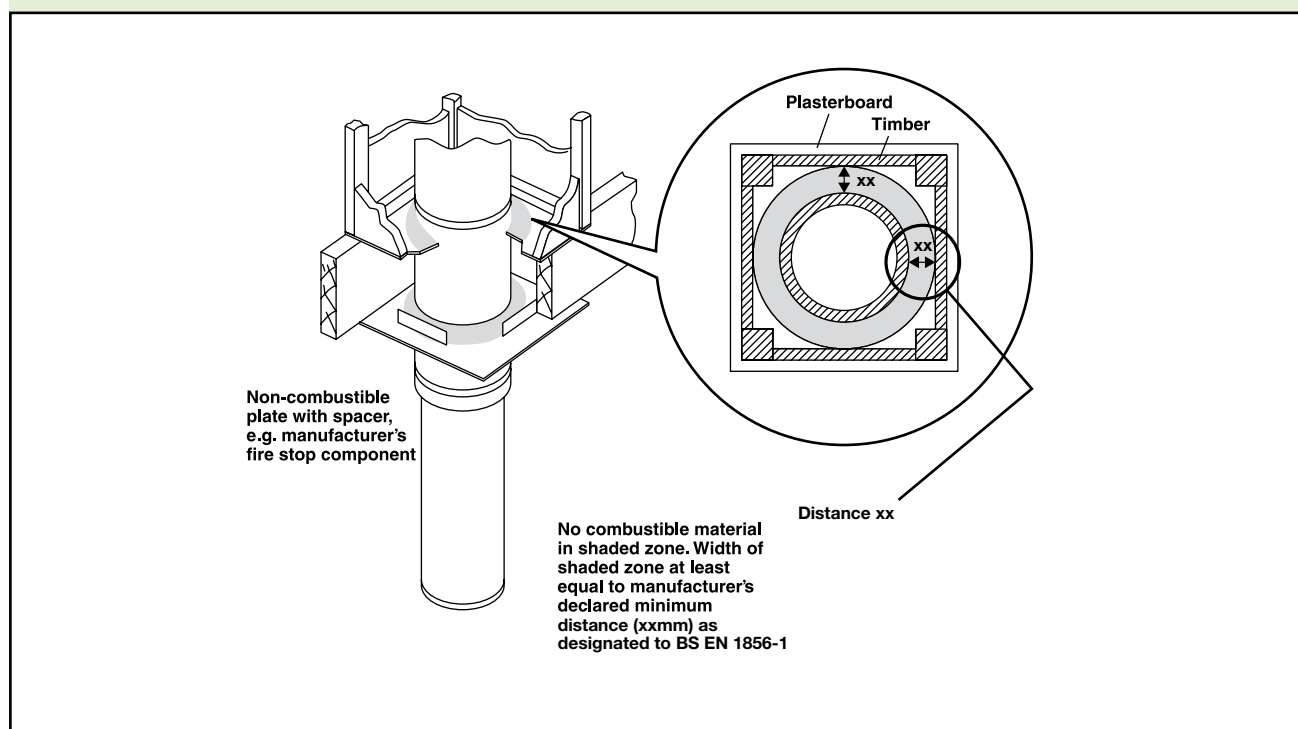
**1.45** *Factory-made metal chimneys* should be kept a suitable distance away from combustible materials. Ways of meeting the requirement for *chimneys* designated to BS EN 1856-1:2003 comprise:

- a. locating the *chimney* not less than distance 'xx' from combustible material, where 'xx' is defined in BS EN 1856-1:2003 as shown in Diagram 13;
- b. where a *chimney* passes through a cupboard, storage space or roof space, providing a guard placed no closer to the outer wall of the *chimney* than the distance in a) above.

**1.46** Where a *factory-made metal chimney* penetrates a *fire compartment* wall or floor, it must not breach the fire separation requirements of Part B. See Approved Document B for more guidance but the requirements may be met by:

- a. using a *factory-made metal chimney* of the appropriate level of *fire resistance* installed in accordance with BS EN 1856-1:2003 Annex NA; or
- b. casing the *chimney* in *non-combustible material* giving at least half the *fire resistance* recommended for the *fire compartment* wall or floor.

Diagram 13 **The separation of combustible material from a factory-made metal chimney designated to BS EN 1856-1:2003**



## Concealed flues

**1.47** Where a *flue* is routed within a void, appropriate means of access at strategic locations should be provided to allow the following aspects to be visually checked and confirmed. This is necessary both when an appliance is first installed and subsequently when the appliance is serviced:

- the *flue* is continuous throughout its length
- all joints appear correctly assembled and are appropriately sealed
- the *flue* is adequately supported throughout its length
- any required gradient of fall back to the boiler (required to recover the condensate produced as part of the combustion process) and any other required drain points have been provided.

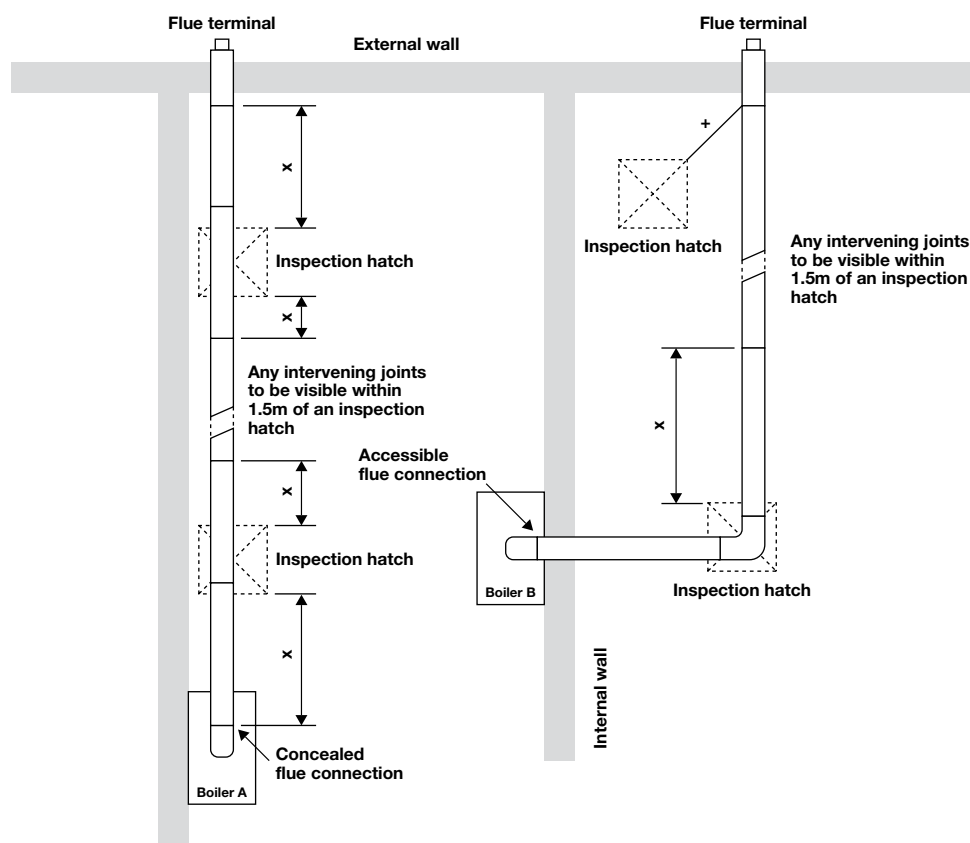
Means of access for *flues* needs to be sufficiently sized and positioned to allow a visual inspection to be undertaken of the *flue*, particularly at any joints in the *flue*. It is not intended that the means of access should be sized to allow full physical access to the flue system. Diagram 14 shows an acceptable approach for a *flue* in a ceiling void.

*Flues* should not pass through another dwelling since access for inspection may not always be available to that dwelling and *chimney* system running through it. *Flues* may pass through communal areas including purpose-designed ducts where inspection access is provided.

Any 'means of access' should not impair any fire, thermal or acoustic requirements of the Building Regulations. Refer to the relevant guidance in Approved Documents B, L and E. Where necessary, inspection panels or hatches should be fitted with resilient seals and provide the similar standards of fire, thermal and acoustic isolation to the surrounding structure.

Access hatches should be at least 300mm x 300mm or larger where necessary to allow sufficient access to the void to look along the length of the *flue*. Diagram 14 shows an acceptable approach to providing access to a horizontal *flue* located within a ceiling void.

Diagram 14 Example locations of access panels for concealed horizontal flues



All voids containing concealed flues should have at least one inspection hatch measuring at least 300mm square.

No flue joint within the void should be more than 1.5m distant from the edge of the nearest inspection hatch, i.e. dimension  $x$  in the diagram should be less than 1.5m.

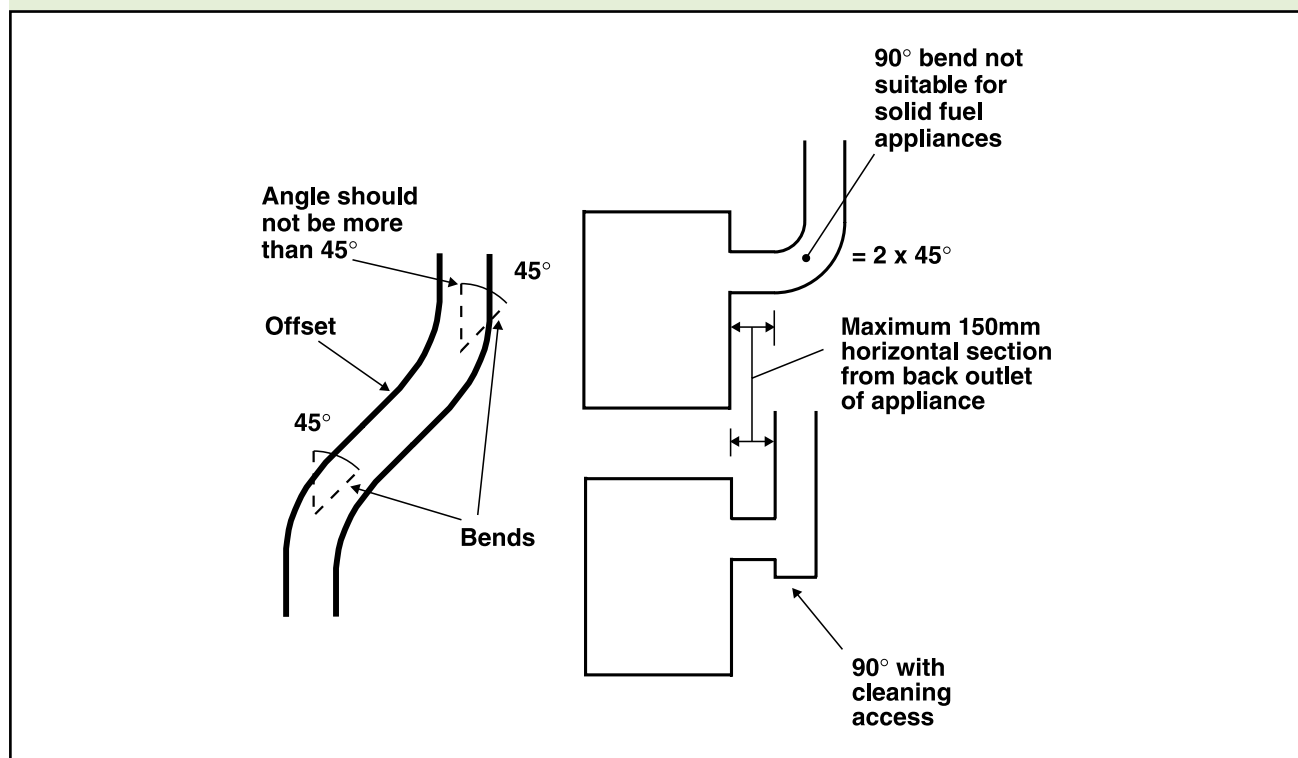
Where possible inspection hatches should be located at changes of direction. Where this is not possible then bends should be viewable from both directions.

## Configuration of natural draught flues serving open-flued appliances

**1.48** Flue systems should offer least resistance to the passage of flue gases by minimising changes in direction or horizontal length. A way of meeting the requirement would be to build flues so that they are straight and vertical except for the connections to *combustion appliances* with rear outlets where the horizontal section should not exceed 150mm. Where bends are essential, they should be angled at no more than 45° to the vertical.

**1.49** Provisions should be made to enable flues to be swept and inspected. A way of making reasonable provision would be to limit the number of changes of direction between the *combustion appliance* outlet and the *flue outlet* to not more than four (each up to 45°), with not more than two of these being between an intended point of access for sweeping and either another point of access for sweeping or the *flue outlet*. (90° factory-made bends, elbows or Tee pieces in fluepipes may be treated as being equal to two 45° bends (see Diagram 15)).

Diagram 15 **Bends in flues**



## Inspection and cleaning openings in flues

**1.50** A *flue* should not have openings into more than one room or space except for the purposes of:

- inspection or cleaning; or
- fitting an explosion door, *draught break*, *draught stabiliser* or *draught diverter*.

**1.51** Openings for inspection and cleaning should be formed using purpose factory-made components compatible with the flue system, having an access cover that has the same level of gas-tightness as the flue system and an equal level of thermal insulation. Openings for cleaning the *flue* should allow easy passage of the sweeping brush. Covers should also be non-combustible except where fitted to a combustible *fluepipe* (such as a plastic *fluepipe*). After the appliance has been installed, it should be possible to sweep the whole *flue*.

## Flues discharging at low level near boundaries

**1.52** *Flues* discharging at low level near boundaries should do so at positions where the building owner will always be able to ensure safe flue gas dispersal. A way of achieving this where owners of adjacent land could build up to the *boundary* would be to adopt the suggestions in Diagram 34 or 41, as relevant.

## Dry lining around fireplace openings

**1.53** Where a decorative treatment, such as a fireplace surround, masonry cladding or dry lining, is provided around a fireplace opening, any gaps that could allow flue gases to escape from the fireplace opening into the void behind the decorative treatment should be sealed to prevent such leakage. The sealing material should be capable of remaining in place despite any relative movement between the decorative treatment and the *fireplace recess*.

## Condition of combustion installations at completion

**1.54** Responsibility for achieving compliance with the requirements of Part J rests with the person carrying out the work. That 'person' may be, e.g., a specialist firm directly engaged by a private client or it may be a developer or main contractor who has carried out work subject to Part J or engaged a sub-contractor to carry it out. In order to document the steps taken to achieve compliance with the requirements, a report should be drawn up showing that materials and components appropriate to the intended application have been used and that *flues* have passed appropriate tests. A suggested checklist for such a report is given at Appendix A and guidance on testing is given at Appendix E. Other forms of report may be acceptable. Specialist firms should provide the report to the client, developer or main contractor, who may be asked for documentation by the *Building Control Body*.

**1.55** *Flues* should be checked at completion to show that they are free from obstructions, satisfactorily gas-tight and constructed with materials and components of sizes which suit the intended application. Where the building work includes the installation of a *combustion appliance*, tests should cover *fluepipes* and [the gas-tightness of] joints between *fluepipes* and *combustion appliance* outlets. A spillage test to check for compliance with J2 should be carried out with the appliance under fire, as part of the process of commissioning to check for compliance with Part L, and (in relevant cases) as required by the Gas Safety (Installation and Use) Regulations.

**1.56** *Hearths* should be constructed with materials and components of sizes to suit the intended application and should show the area where combustible materials should not intrude.

## Notice plates for hearths and flues (Requirement J5)

**1.57** Where a *hearth*, fireplace (including a *flue box*), *flue* or *chimney* is provided or extended (including cases where a *flue* is provided as part of the refurbishment work), information essential to the correct application and use of these facilities should be permanently posted in the building. A way of meeting this requirement would be to provide a notice plate as shown in Diagram 16 conveying the following information:

- the location of the *hearth*, fireplace (or *flue box*) or the location of the beginning of the *flue*;
- the category of the *flue* and generic types of appliances that can be safely accommodated;
- the type and size of the *flue* (or its liner if it has been relined) and the manufacturer's name;
- the installation date.

**1.58** Notice plates should be robust, indelibly marked and securely fixed in an unobtrusive but obvious position within the building such as:

- next to the electricity consumer unit; or
- next to the *chimney* or *hearth* described; or
- next to the water supply stop-cock.

**1.59** For *chimney* products whose performance characteristics have been assessed in accordance with a European Standard (EN) and which are supplied or marked with a *designation*, the installer may optionally include this *designation* on the label as shown in Diagram 16.

## Access to combustion appliances for maintenance

**1.60** There should be a permanent means of safe access to appliances for maintenance. Roof space installations of gas-fired appliances should comply with the requirements of BS 6798:2009.

Diagram 16 Example notice plate for hearths and flues

<b>Essential information</b>	<b>IMPORTANT SAFETY INFORMATION</b>	
	<b>This label must not be removed or covered</b>	
	Property address.....	20 Main Street New Town
	The hearth and chimney installed in the .....	lounge
	are suitable for .....	decorative fuel effect gas fire
	Chimney liner .....	double skin stainless steel flexible, 200mm diameter
	Suitable for condensing appliance.....	no
	Installed on .....	date
<b>Optional additional information</b>	Other information (optional) .....	
	Designation of stainless steel liner stated by manufacturer to be T450 N2 S D 3  e.g. installer's name, product trade names, installation and maintenance advice, European chimney product designations, warnings on performance limitations of imitation elements, e.g. false hearths.	

## Section 2: Additional provisions for appliances burning solid fuel (including solid biofuel) with a rated output up to 50kW

### Air supply to appliances

**2.1** A way of meeting the requirement would be to adopt the general guidance given in Section 1, beginning at Paragraph 1.2, in conjunction with the guidance below.

**2.2** Any room or space containing an appliance should have a permanent air vent opening of at least the size shown in Table 1. For appliances designed to burn a range of different solid fuels the air supply should be designed to accommodate burning the fuel that produces the highest heating output.

**2.3** Some manufacturers may specify even larger areas of permanently open air vents or omit to specify a *rated output* (for example in the case of a cooker). In these cases, manufacturers' *installation instructions* should be followed subject to any minimum ventilation provisions of this Approved Document.

### Size of flues

**2.4** *Fluepipes* should have the same diameter or equivalent cross-sectional area as that of the appliance *flue outlet* and should not be smaller than the size recommended by the appliance manufacturer.

**2.5** *Flues* should be at least the size shown in Table 2 relevant to the particular appliance, and not less than the size of the appliance *flue outlet* or that recommended by the appliance manufacturer.

**Table 1 Air supply to solid fuel appliances**

Type of appliance	Type and amount of ventilation (1)
Open appliance, such as an open fire with no throat, e.g. a fire under a canopy as in Diagram 23.	Permanently open air vent(s) with a total equivalent area of at least 50% of the cross sectional area of the flue.
Open appliance, such as an open fire with a throat as in Diagrams 22 and 29.	Permanently open air vent(s) with a total equivalent area of at least 50% of the throat opening area. (2)
Other appliance, such as a stove, cooker or boiler, with a flue draught stabiliser.	Permanently open vents as below: If design air permeability $>5.0\text{m}^3/(\text{h.m}^2)$ then 300mm <sup>2</sup> /kW for first 5kW of appliance rated output 850mm <sup>2</sup> /kW for balance of appliance rated output If design air permeability $\leq 5.0\text{m}^3/(\text{h.m}^2)$ then 850mm <sup>2</sup> /kW of appliance rated output (4)
Other appliance, such as a stove, cooker or boiler, with no flue draught stabiliser.	Permanently open vents as below: If design air permeability $>5.0\text{m}^3/(\text{h.m}^2)$ then 550mm <sup>2</sup> /kW of appliance rated output above 5kW If design air permeability $\leq 5.0\text{m}^3/(\text{h.m}^2)$ then 550mm <sup>2</sup> per kW of appliance rated output (4)

**Notes:**

- Equivalent area is as measured according to the method in BS EN 13141-1:2004 or estimated according to paragraph 1.14. Divide the area given in mm<sup>2</sup> by 100 to find the corresponding area in cm<sup>2</sup>
- For simple open fires as depicted in Diagram 29, the requirement can be met with room ventilation areas as follows:

Nominal fire size (fireplace opening size)	500mm	450mm	400mm	350mm
Total equivalent area of permanently open air vents	20,500mm <sup>2</sup>	18,500mm <sup>2</sup>	16,500mm <sup>2</sup>	14,500mm <sup>2</sup>

- Example: an appliance with a flue draught stabiliser and a rated output of 7kW would require an equivalent area of:  $[5 \times 300] + [2 \times 850] = 3200\text{mm}^2$
- It is unlikely that a dwelling constructed prior to 2008 will have an air permeability of less than  $5.0\text{m}^3/(\text{h.m}^2)$  at 50 Pa unless extensive measures have been taken to improve air-tightness. See Appendix F.

**2.6** For multi-fuel appliances, the *flue* should be sized to accommodate burning the fuel that requires the largest *flue*.

**Table 2 Size of flues in chimneys**

Installation (1)	Minimum flue size
Fireplace with an opening of up to 500mm x 550mm	200mm diameter or rectangular/square flues having the same cross-sectional area and a minimum dimension not less than 175mm
Fireplace with an opening in excess of 500mm x 550mm or a fireplace exposed on two or more sides	See paragraph 2.7. If rectangular/square flues are used the minimum dimension should be not less than 200mm
Closed appliance of up to 20kW rated output which: a) burns smokeless or low-volatiles fuel (2) or b) is an appliance which meets the requirements of the Clean Air Act when burning an appropriate bituminous coal (3) or c) is an appliance which meets the requirements of the Clean Air Act when burning wood (3)	125mm diameter or rectangular/square flues having the same cross-sectional area and a minimum dimension not less than 100mm for straight flues or 125mm for flues with bends or offsets
Pellet burner or pellet boiler which meets the requirements of the Clean Air Act (3)	125mm diameter  This may be reduced to no less than 100mm when permitted by the appliance manufacturer and supported by calculation according to BS EN 13384-1:2002. This calculation can be applied to an individual installation or manufacturers can provide precalculated designs.
Other closed appliance of up to 30kW rated output burning any fuel	150mm diameter or rectangular/square flues having the same cross-sectional area and a minimum dimension not less than 125mm
Closed appliance of above 30kW and up to 50kW rated output burning any fuel	175mm diameter or rectangular/square flues having the same cross-sectional area and a minimum dimension not less than 150mm
<b>Notes:</b>	
1. Closed appliances include cookers, stoves, room heaters and boilers.	
2. Fuels such as bituminous coal, untreated wood or compressed paper are not smokeless or low-volatiles fuels.	
3. These appliances are known as 'exempted fireplaces'.	

**2.7** For fireplaces with openings larger than 500mm x 550mm or fireplaces exposed on two or more sides (such as a fireplace under a canopy or open on both sides of a central *chimney* breast) a way of showing compliance would be to provide a *flue* with a cross-sectional area equal to 15 per cent of the total face area of the fireplace opening(s) (see Appendix B). However, specialist advice should be sought when proposing to construct *flues* having an area of:

- more than 15 per cent of the total face area of the fireplace openings; or
- more than 120,000mm<sup>2</sup> (0.12m<sup>2</sup>).

## Height of flues

**2.8** *Flues* should be high enough to ensure sufficient draught to clear the products of combustion. The height necessary for this will depend upon the type of the appliance, the height of the building, the type of *flue* and the number of bends in it, and an assessment of local wind patterns. However, a minimum *flue* height of 4.5m could be satisfactory if the guidance in Paragraphs 2.10 to 2.12 is adopted. As an alternative approach, the calculation procedure within BS EN 13384-1:2005 can be

used as the basis for deciding whether a *chimney* design will provide sufficient draught.

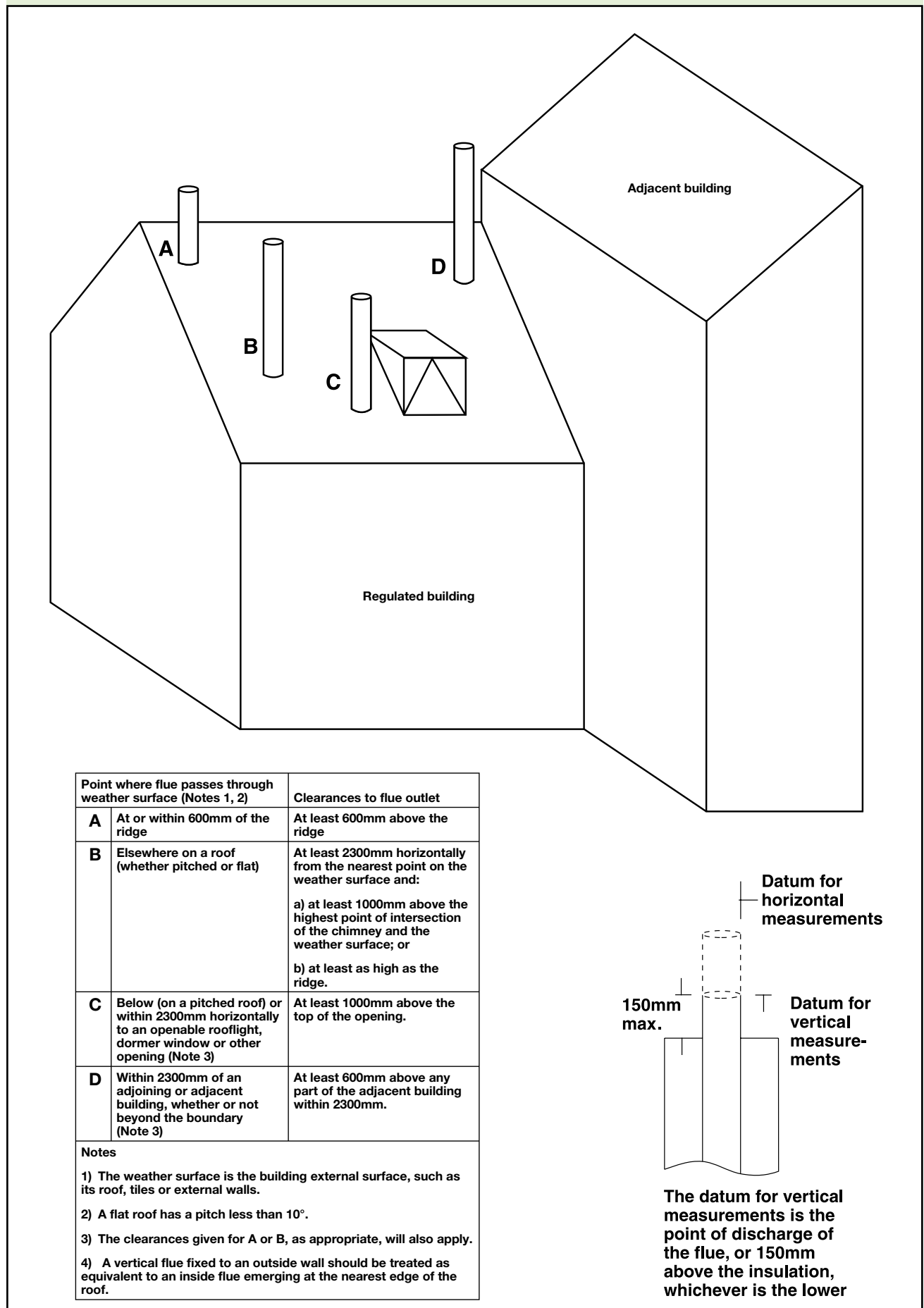
**2.9** The height of a *flue* serving an open fire is measured vertically from the highest point at which air can enter the fireplace to the level at which the *flue* discharges into the outside air. The highest point of air entry into the fireplace could be the top of the fireplace opening or, for a fire under a canopy, the bottom of the canopy. The height of a *flue* serving a closed appliance is measured vertically from the appliance outlet.

## Outlets from flues

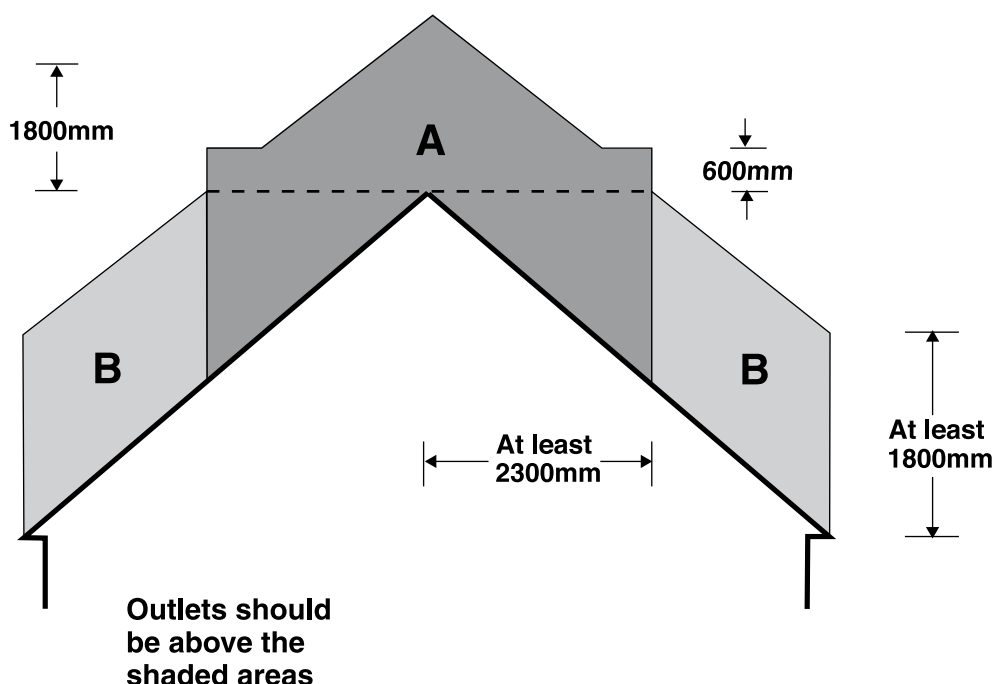
**2.10** The outlet from a *flue* should be above the roof of the building in a position where the products of combustion can discharge freely and will not present a fire hazard, whatever the wind conditions.

**2.11** *Flue outlet* positions which can meet the requirements in common circumstances are shown in Diagram 17. The *chimney* heights and/or separations shown may need to be increased in particular cases where wind exposure, surrounding tall buildings, high trees or high ground could have adverse effects on *flue* draught.

Diagram 17 **Flue outlet positions for solid fuel appliances**



**Diagram 18 Flue outlet positions for solid fuel appliances – clearances to easily ignited roof coverings**  
(Note: This diagram needs to be read in conjunction with Diagram 17)



Area	Location of flue outlet
<b>A</b>	At least 1800mm vertically above the weather surface and at least 600mm above the ridge.
<b>B</b>	At least 1800mm vertically above the weather surface and at least 2300mm horizontally from the weather surface.

**2.12** A way of meeting the requirements where *flues* discharge on or in close proximity to roofs with surfaces which are readily ignitable, such as where roofs are covered in thatch or shingles, would be to increase the clearances to *flue outlets* to those shown in Diagram 18.

**Note:** Thatched roofs can sometimes be vulnerable to spontaneous combustion caused by heat transferred from *flues* building up in thick layers of thatch in contact with the *chimney*. To reduce the risk it is recommended that rigid twin-walled insulated metal *flue liners* be used within a ventilated (top and bottom) masonry *chimney* void provided they are adequately supported and not in direct contact with the masonry. Non-metallic *chimneys* and cast in-situ *flue liners* can also be used provided the heat transfer to the thatch is assessed in relation to the depth of thatch and risk of spontaneous combustion.

Spark arrestors are not generally recommended as they can be difficult to maintain and may increase the risk of *flue* blockage and *flue* fires.

Further information and recommendations are contained in Hetas Information Paper 1/007 *Chimneys in Thatched Properties*.

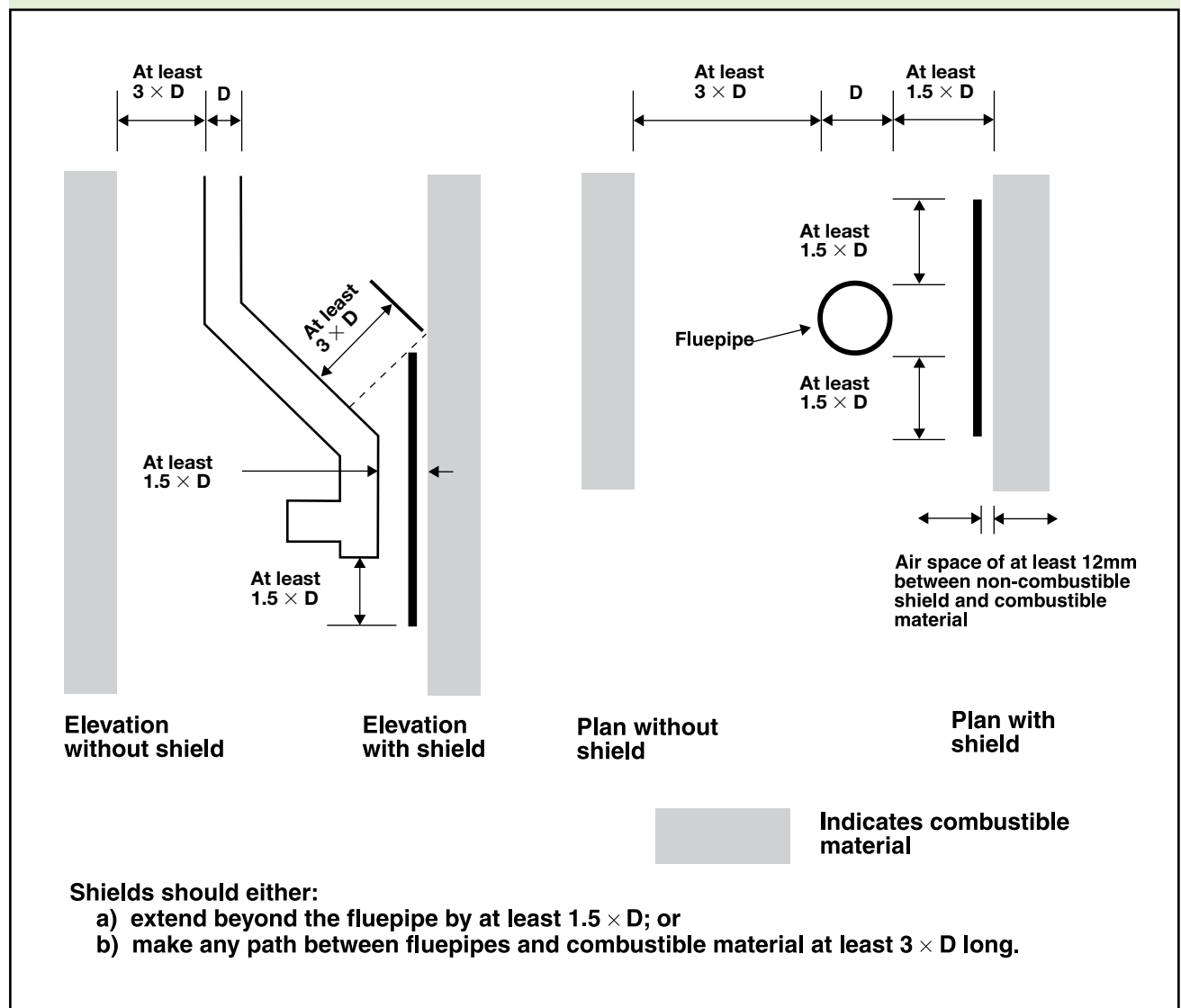
## Connecting fluepipes

**2.13** For connecting *fluepipes* a way of meeting the requirements would be to follow the general guidance in Paragraphs 1.32 and 1.33.

## Location and shielding of connecting fluepipes

**2.14** Connecting *fluepipes* should be used only to connect appliances to their *chimneys*. They should not pass through any roof space, partition, internal wall or floor, except to pass directly into

Diagram 19 **Protecting combustible material from uninsulated fluepipes for solid fuel appliances**



a chimney through either a wall of the chimney or a floor supporting the chimney. Connecting fluepipes should also be guarded if they could be at risk of damage or if the burn hazard they present to people is not immediately apparent.

**2.15** Connecting fluepipes should be located so as to avoid igniting combustible material. Ways of meeting the requirement include minimising horizontal and sloping runs and:

- following the guidance in Paragraph 1.45 where the connecting fluepipe is a factory-made metal chimney whose performance is at least equal to designation T400 N2 D3 G according to BS EN 1856-1:2003 or BS EN 1856-2:2004, and installed to BS EN 15827-1; or
- separation by shielding in accordance with Diagram 19.

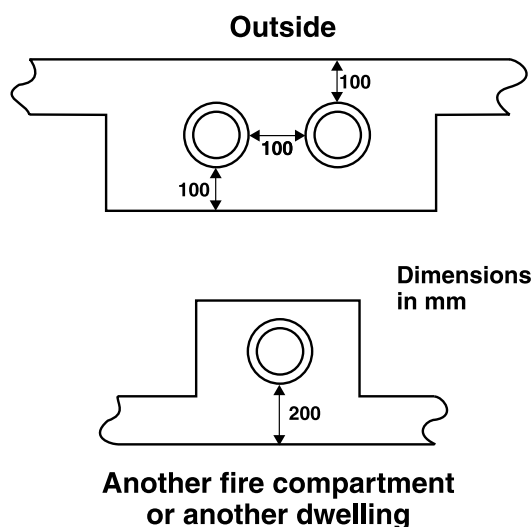
## Debris collection space

**2.16** Where a chimney cannot be cleaned through the appliance, a debris collecting space which is accessible for emptying and suitably sized opening(s) for cleaning should be provided at appropriate locations in the chimney.

## Masonry and flueblock chimneys

**2.17** Masonry chimneys should be built in accordance with Paragraphs 1.27 and 1.28. Flueblock chimneys should be built in accordance with Paragraphs 1.29 and 1.30. The minimum chimney thickness and distance to combustibles (xxmm) should be no less than the manufacturer's product declaration (Gxx) based on testing to BS EN 1858:2008 (concrete flue blocks) or BS EN 1806:2006 (clay/ceramic flueblocks). Other masonry chimney products should exceed the minimum thickness indicated in Diagram 20.

Diagram 20 **Wall thicknesses for masonry and flueblock chimneys**



## Separation of combustible material from fireplaces and masonry flues

**2.18** Combustible material should not be located where it could be ignited by the heat dissipating through the walls of fireplaces or masonry *flues*. A way of meeting the requirement would be to follow the guidance in Diagram 21 so that combustible material is at least:

- a. 200mm from the inside surface of a *flue* or *fireplace recess*; or
- b. at least xxmm from a flue product with designated separation distance (Gxx); or
- c. 40mm from the outer surface of a masonry *chimney* or *fireplace recess* unless it is a floorboard, skirting board, dado or picture rail, mantel-shelf or architrave. Metal fixings in contact with combustible materials should be at least 50mm from the inside surface of a *flue*.

## Factory-made metal chimneys

**2.19** A way of meeting the requirements would be to comply with Paragraphs 1.42 to 1.46 in Section 1 (but not Paragraph 1.42(b)). The appropriate *designation* is given in Table 3.

## Lining and relining of flues in chimneys

**2.20** Lining or relining *flues* may be building work and, in any case, such work should be carried out so that the objectives of J2 to J5 are met (see Paragraphs 1.34 and 1.35). Existing *flues* being re-used should be checked as described in Paragraph 1.36. Ways of meeting the requirements include the use of:

- a. liners whose performance is at least equal to that corresponding to the *designation* T400 N2 D3 G, as described in BS EN 1443:2003, such as:
  - i. factory-made flue lining systems manufactured to BS EN 1856-1:2003 or BS EN 1856-2:2004.
  - ii. a cast in-situ flue relining system where the material and installation procedures are suitable for use with solid fuel burning appliances and meeting the relevant requirements of BS EN 1857:2003 + A1:2008.
  - iii. other systems which are suitable for use with solid fuel-burning appliances and meeting the criteria in (a).
- b. liners as described in Paragraph 1.27.

Diagram 21 **Minimum separation distances from combustible material in or near a chimney**

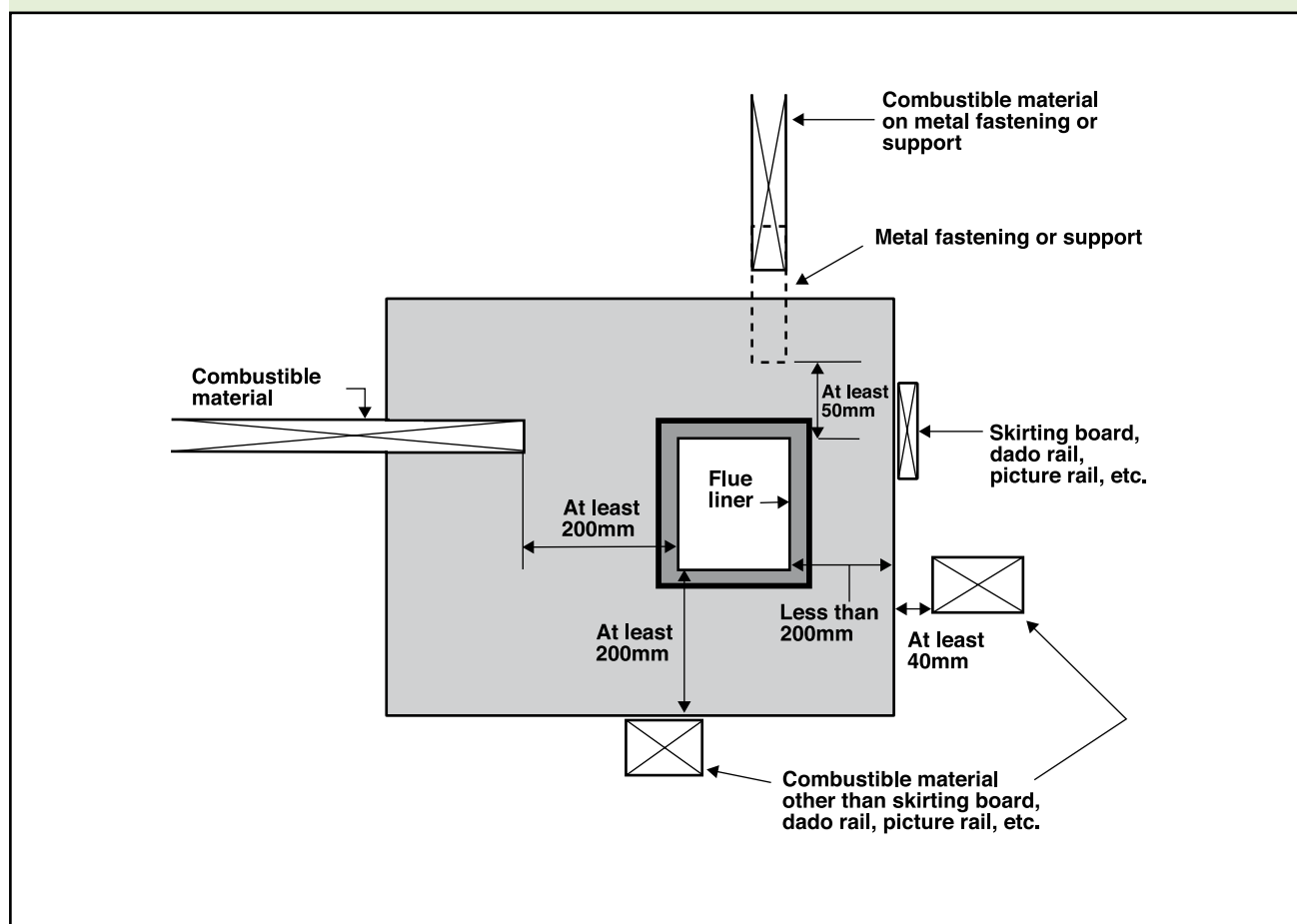


Table 3 **Minimum performance designations for chimney and fluepipe components for use with new solid fuel fired appliances**

Appliance type	Minimum designation	Fuel type
All solid fuel appliances	Masonry or flueblock flue with liner to T400 N2 D3 Gxx Clay flue blocks FB1N2 Clay/ceramic liners B1N2 Concrete liners B2 Factory made metal chimneys to T400 N2 D3 Gxx	Coal, Smokeless Fuel, Peat, wood and other biomass

See paragraph 1.27–1.29 and 1.42

## Formation of gathers

**2.21** To minimise resistance to the proper working of *flues*, tapered gathers should be provided in fireplaces for open fires. Ways of achieving these gathers include:

- using prefabricated gather components built into a *fireplace recess*, as shown in Diagram 22(a); or
- corbelling of masonry as shown in Diagram 22(b); or
- using a suitable canopy, as shown in Diagram 23; or
- using a *prefabricated appliance chamber* incorporating a gather.

Diagram 22 **Construction of fireplace gathers**

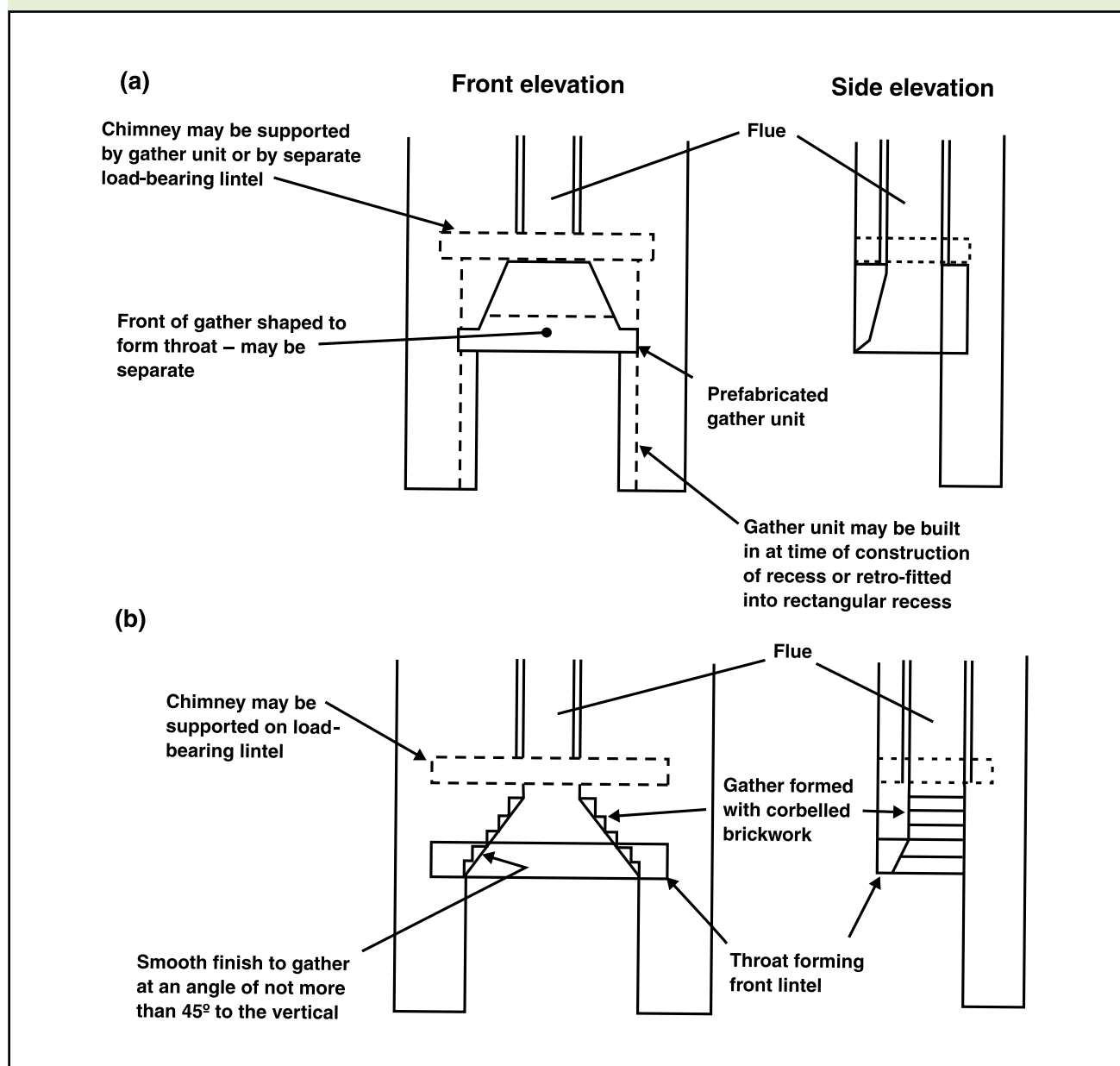
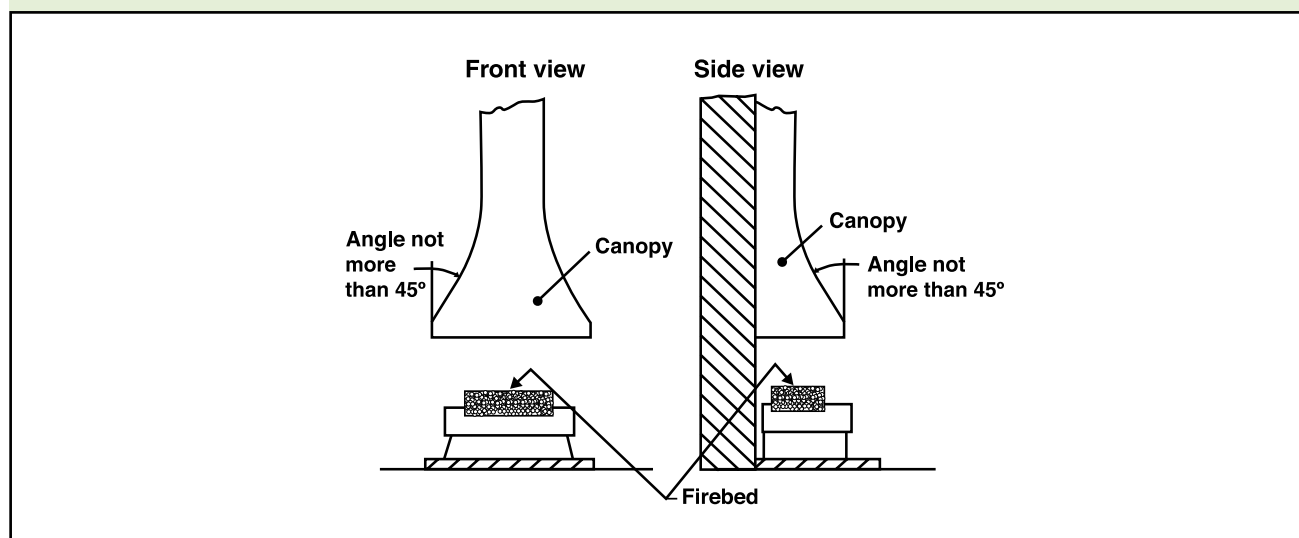


Diagram 23 **Canopy for an open solid fuel fire**



## Hearths

**2.22** *Hearths* should be constructed of suitably robust materials and to appropriate dimensions such that, in normal use, they prevent *combustion appliances* setting fire to the building fabric and furnishings, and they limit the risk of people being accidentally burnt. A way of making provision would be to adopt the guidance in Paragraphs 2.23 to 2.28 and to provide a *hearth* appropriate to the temperatures the appliance can create around it. The *hearth* should be able to accommodate the weight of the appliance and its *chimney* if the *chimney* is not independently supported.

**2.23** Appliances should stand wholly above:

- hearths* made of non-combustible board/sheet material or tiles at least 12mm thick, if the appliance is not to stand in an appliance recess and has been tested to an applicable appliance standard to verify that it cannot

cause the temperature of the upper surface of the *hearth* to exceed 100°C; or

- constructional *hearths* in accordance with the paragraphs below.

**2.24** Constructional *hearths* should:

- have plan dimensions as shown in Diagram 24; and
- be made of solid, *non-combustible material*, such as concrete or masonry, at least 125mm thick, including the thickness of any non-combustible floor and/or decorative surface.

**2.25** Combustible material should not be placed beneath constructional *hearths* unless there is an air-space of at least 50mm between the underside of the *hearth* and the combustible material, or the combustible material is at least 250mm below the top of the *hearth* (see Diagram 25).

Diagram 24 Constructional hearth suitable for a solid fuel appliance (including open fires)

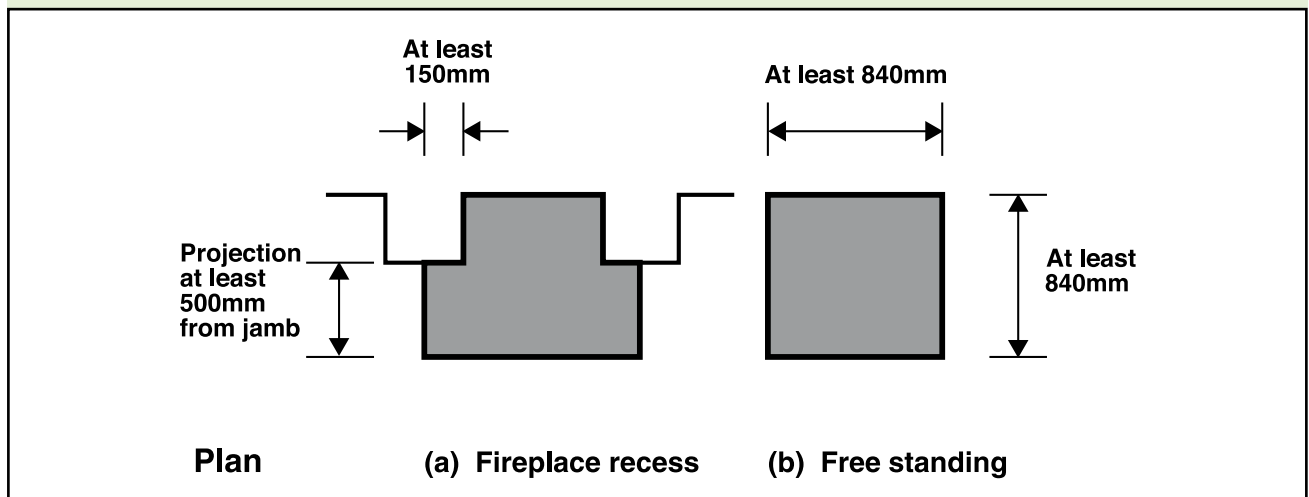


Diagram 25 Constructional hearth suitable for a solid fuel appliance (including open fires)

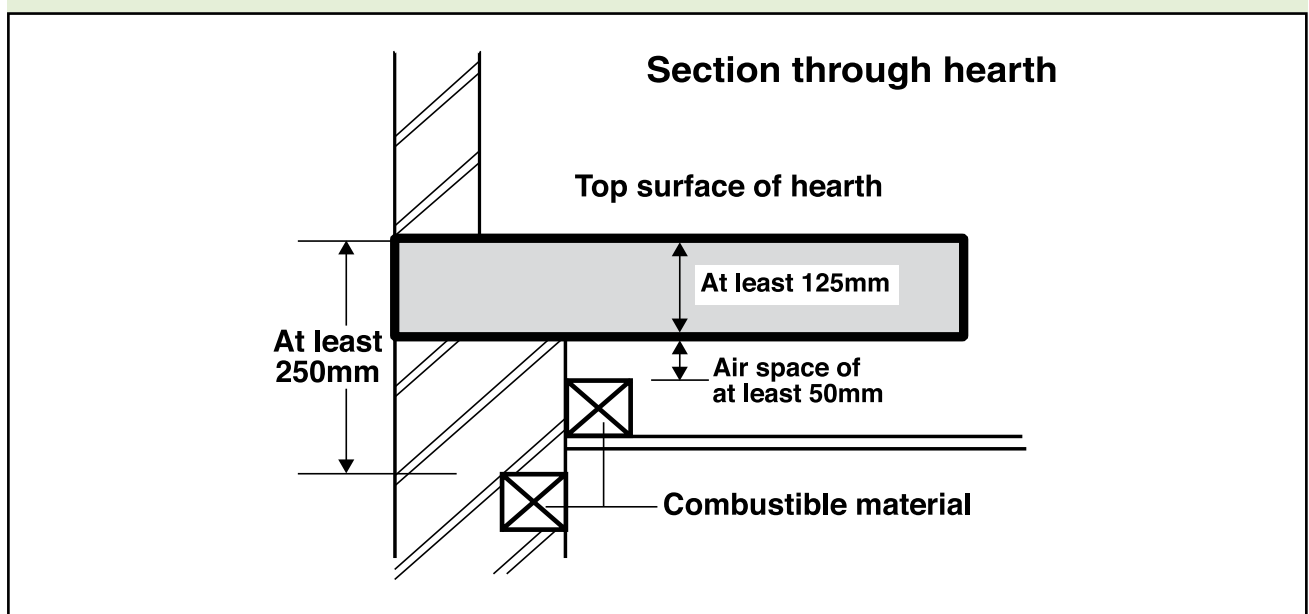
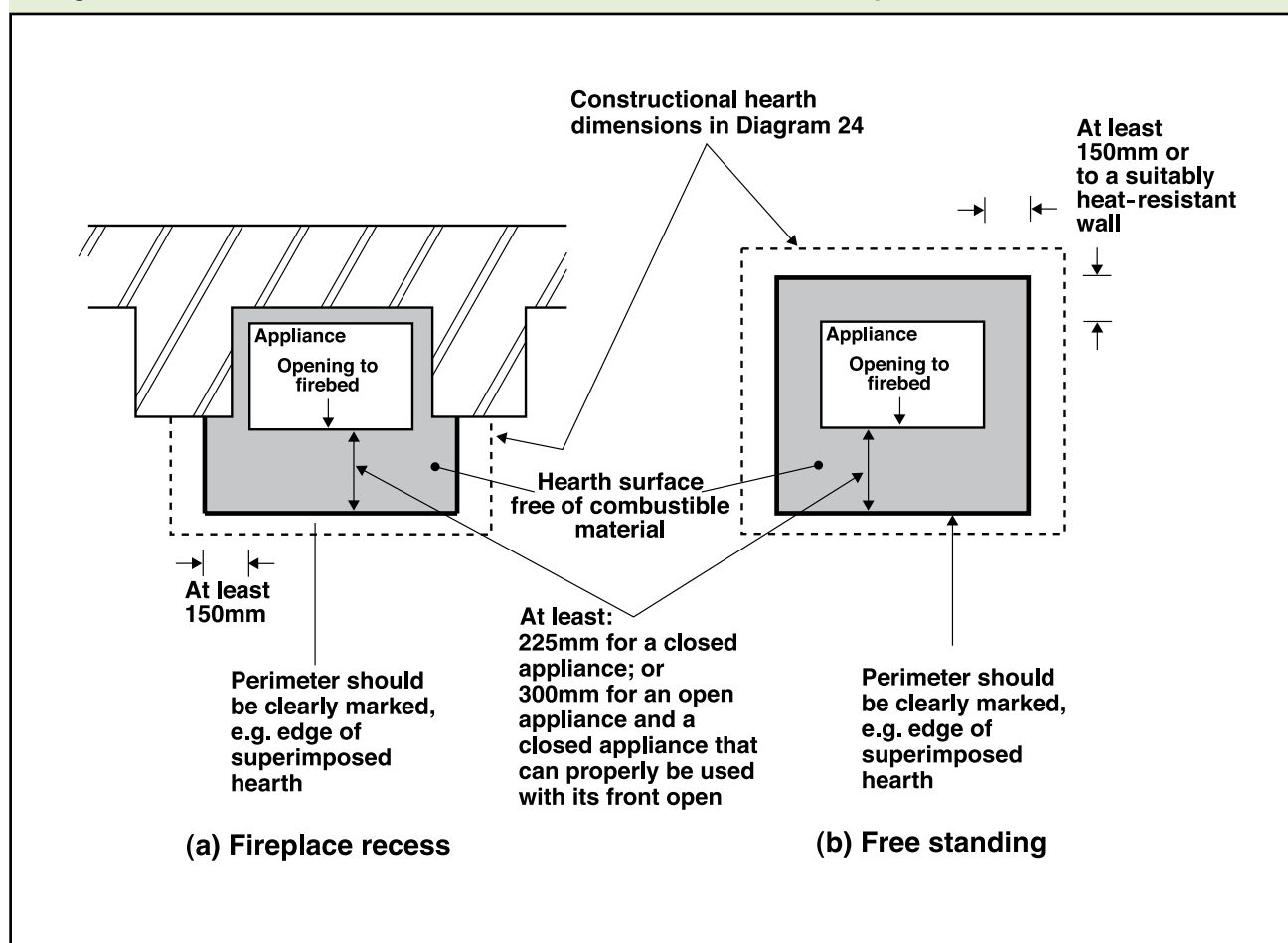


Diagram 26 **Non-combustible hearth surface surrounding a solid fuel appliance**



**2.26** An appliance should be located on a *hearth* so that it is surrounded by a surface free of combustible material as shown in Diagram 26. This surface may be part of the surface of the *hearth* provided in accordance with Paragraph 2.23, or it may be the surface of a superimposed *hearth* laid wholly or partly upon a constructional *hearth*. The boundary of this surface should be visually apparent to provide a warning to the building occupants and to discourage combustible floor finishes such as carpet from being laid too close to the appliance. A way of achieving this would be to provide a change in level.

**2.27** Dimensions shown in Diagram 26 may be reduced to manufacturer's recommendations for appliances with surface temperatures not exceeding 85°C when in normal operation and where there is no risk of spillage of fuel or ash.

**2.28** Combustible material placed on or beside a constructional *hearth* should not extend under a superimposed *hearth* by more than 25mm or to closer than 150mm measured horizontally to the appliance.

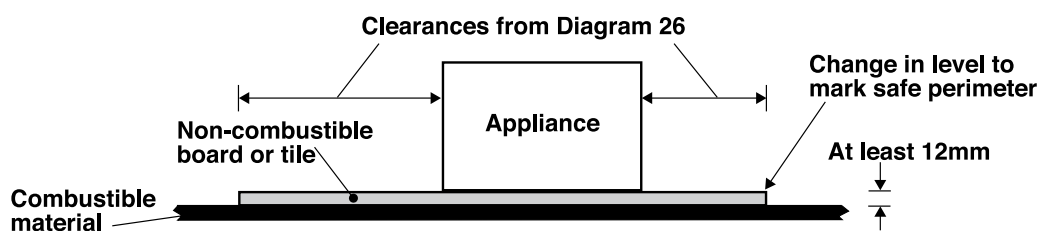
**2.29** Some ways of making these provisions are shown in Diagram 27.

## Fireplace recesses and prefabricated appliance chambers

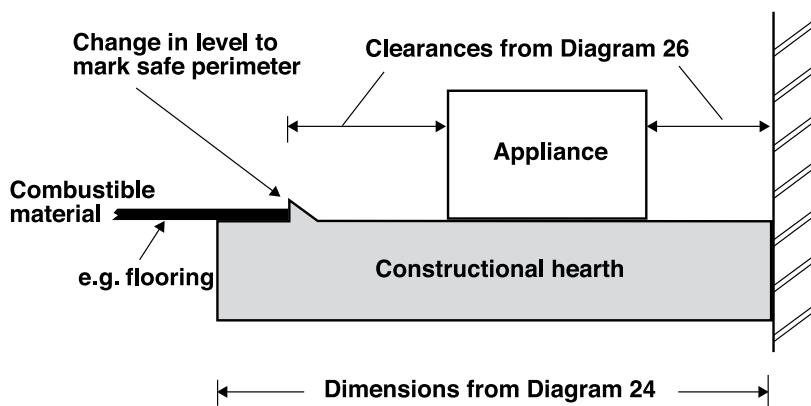
**2.30** Fireplaces for open fires need to be constructed such that they adequately protect the building fabric from catching fire. A way of achieving the requirements would be to build:

- fireplace recesses* from masonry or concrete as shown in Diagram 28; or
- prefabricated factory-made appliance chambers using components that are made of insulating concrete having a density of between 1200 and 1700 kg/m<sup>3</sup> and with the minimum thickness as shown in Table 4. Components should be supplied as sets for assembly and jointing in accordance with the manufacturer's instructions.

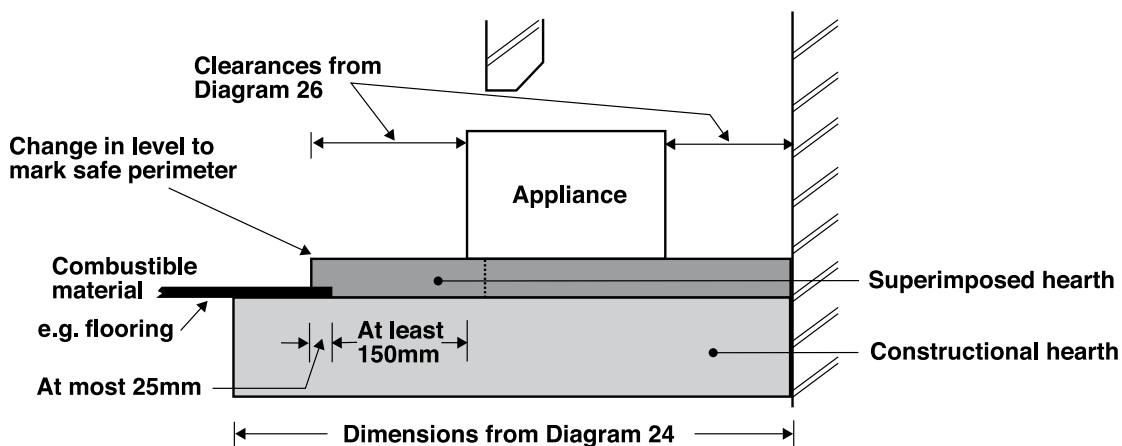
Diagram 27 **Ways of providing hearths**



(a) Appliance that cannot cause hearth temperature to exceed 100°C

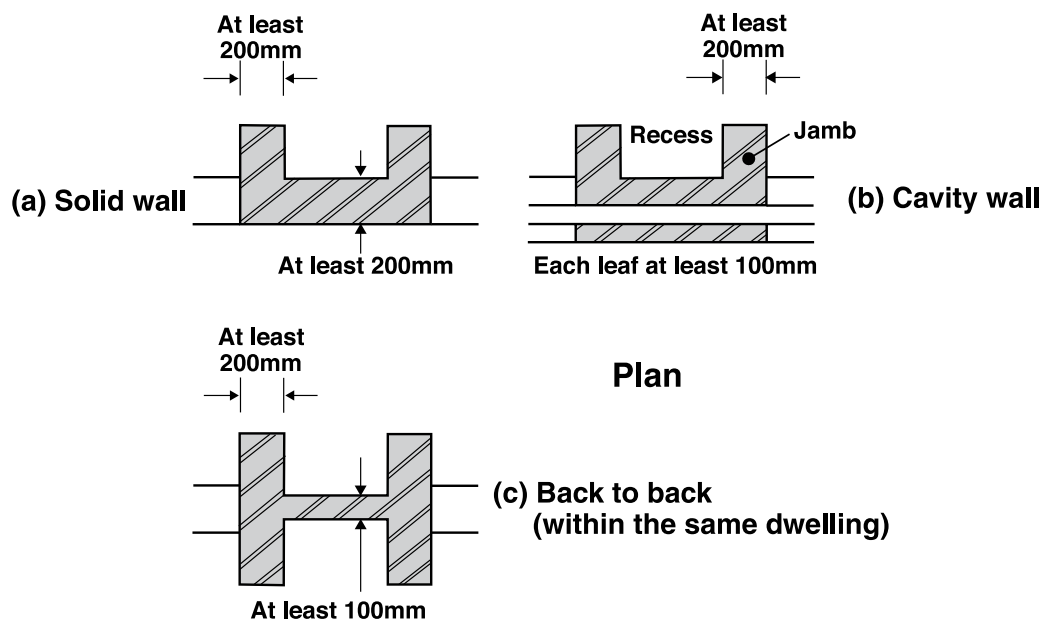


(b) Any appliance standing directly on a constructional hearth



(c) Any appliance in a fireplace recess with a superimposed hearth

**Diagram 28 Fireplace recesses**



**Table 4 Prefabricated appliance chambers: minimum thickness**

Component	Minimum thickness (mm)
Base	50
Side section, forming wall on either side of chamber	75
Back section, forming rear of chamber	100
Top slab, lintel or gather, forming top of chamber	100

## Fireplace lining components

**2.31** A *fireplace recess* may require protection from heat if it is to provide a durable setting for certain appliances such as inset open fires. Suitable protection would be fireplace lining components as shown in Diagram 29 or lining the recess with suitable firebricks.

## Walls adjacent to hearths

**2.32** Walls that are not part of a *fireplace recess* or a *prefabricated appliance chamber* but are adjacent to *hearths* or appliances also need to protect the building from catching fire. A way of achieving the requirement is shown in Diagram 30. Thinner material could be used provided it gives the same overall level of protection as the solid *non-combustible material*.

**2.33** Clearances shown in Diagram 30 may be reduced to manufacturer's recommendations for appliances with surface temperatures not exceeding 85°C when in normal operation.

## Alternative approach

The requirements may also be met by adopting the relevant recommendations in the publications listed below to achieve a level of performance equivalent to that obtained by following the guidance in this Approved Document:

- BS EN 15287-1:2007 Chimneys. Design, installation and commissioning of chimneys. Chimneys for non-room-sealed heating appliances; and
- BS 8303:1994 Installation of domestic heating and cooking appliances burning solid mineral fuels. Parts 1 to 3.

## Carbon monoxide alarms

**2.34** Where a new or replacement fixed solid fuel appliance is installed in a dwelling, a carbon monoxide alarm should be provided in the room where the appliance is located.

**2.35** Carbon monoxide alarms should comply with BS EN 50291:2001 and be powered by a battery designed to operate for the working life of the alarm. The alarm should incorporate a warning device to alert users when the working life of the alarm is due to pass. Mains-powered BS EN 50291 Type A carbon monoxide alarms with fixed wiring (not plug-in types) may be used as alternative applications provided they are fitted with a sensor failure warning device.

**2.36** The carbon monoxide alarm should be located in the same room as the appliance:

- on the ceiling at least 300mm from any wall or, if it is located on a wall, as high up as possible (above any doors and windows) but not within 150mm of the ceiling; and
- between 1m and 3m horizontally from the appliance.

**Note:** Further guidance on the installation of carbon monoxide alarms is available in BS EN 50292:2002 and from manufacturers' instructions. Provision of an alarm should not be regarded as a substitute for correct installation and regular servicing.

Diagram 29 Open fireplaces: throat and fireplace components

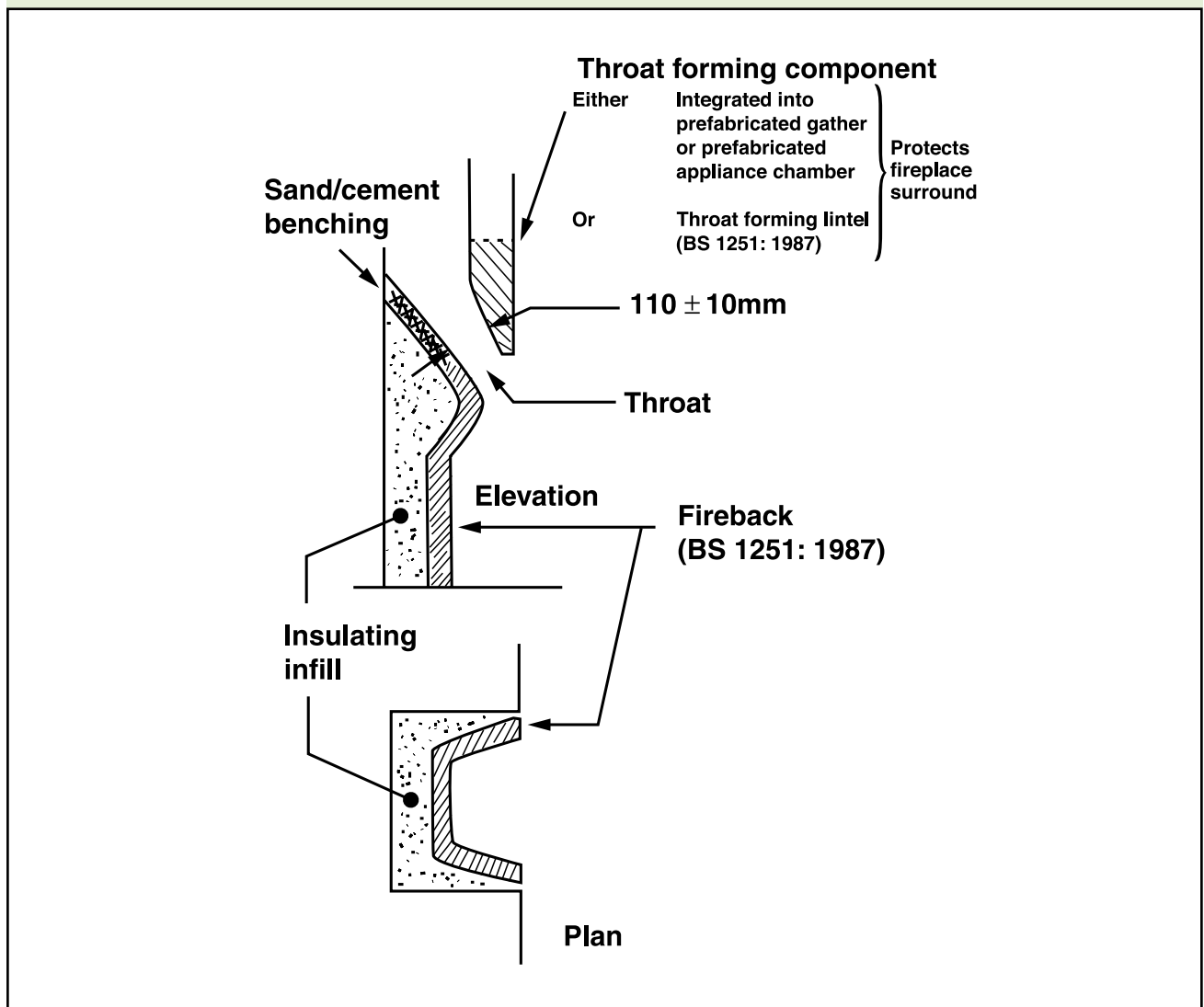
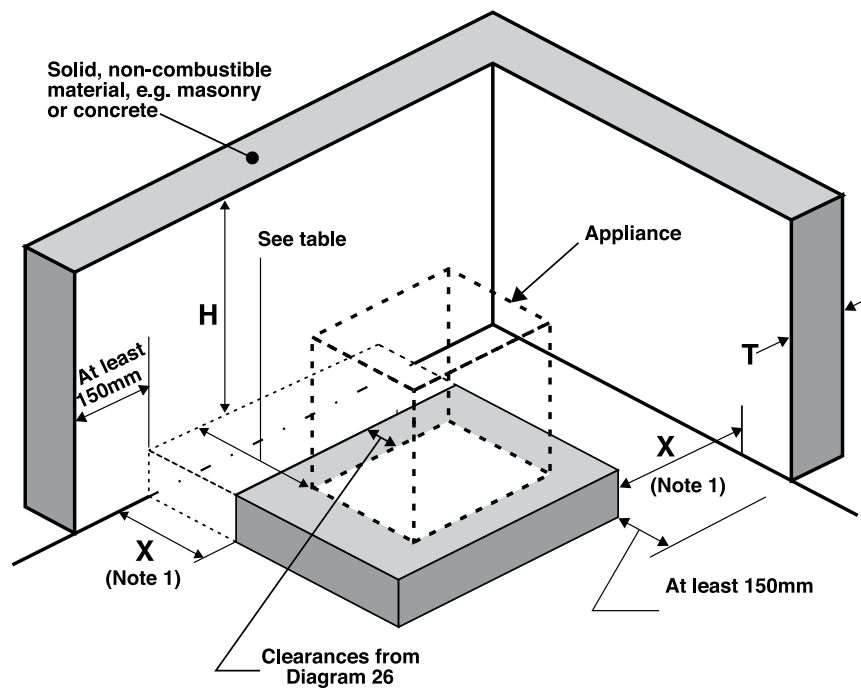


Diagram 30 **Wall adjacent to hearths**



Location of hearth or appliance	Solid, non-combustible material	
	Thickness (T)	Height (H)
Where the hearth abuts a wall and the appliance is not more than 50mm from the wall	200mm	At least 300mm above the appliance and 1.2m above the hearth
Where the hearth abuts a wall and the appliance is more than 50mm but not more than 300mm from the wall	75mm	At least 300mm above the appliance and 1.2m above the hearth
Where the hearth does not abut a wall and is no more than 150mm from the wall (see Note 1)	75mm	At least 1.2m above the hearth
Note: 1. There is no requirement for protection of the wall where X is more than 150mm.		

## Section 3: Additional provisions for gas burning appliances with a rated input up to 70kW (net)

### Gas Safety (Installation and Use) Regulations

**3.1** All combustion installations must be accommodated in ways that meet the requirements of the Building Regulations. However, gas installations also have to comply with the Gas Safety (Installation and Use) Regulations, which require anyone undertaking gas work to be competent. Any gas engineering business, whether an employer or self employed, must be a member of a class of persons approved by the Health and Safety Executive (HSE). Because of this, the Building Regulations allow that work need not be notified to *Building Control Bodies* if it solely comprises the installation of a gas appliance and it is to be undertaken by a member of such an approved class of persons. The Gas Safety (Installation and Use) Regulations cover the safe installation maintenance and use of gas fittings, appliances and *flues*. The following paragraphs give builders and lay readers an outline of some of the main requirements of the Gas Safety (Installation and Use) Regulations, but for further information reference should be made to the Health and Safety Commission's Approved Code of Practice (see below) or Building Control Bodies.

**3.2** The Gas Safety (Installation and Use) Regulations require that (a) gas fittings, appliances and gas storage vessels must be installed only by a person with the required competence and (b) any person having control to any extent of gas work must ensure that the person carrying out that work has the required competence and (c) any gas installation businesses, whether an employer or self-employed, must be a member of a class of persons approved by the HSE; for the time being this means they must be registered with Gas Safe Register.

**3.3** Guidance on the individual competency required for gas work is available from the Sector Skills Council Energy and Utility (EU) Skills [<http://www.euskills.co.uk/gas>]. Persons deemed competent to carry out gas work are those who hold a current certificate of competence in the type of activity to be conducted. Assessment of competence may be through the S/NVQ qualification under a nationally accredited certification scheme or under the Approved Code of Practice arrangements.

**3.4** The Gas Safety (Installation and Use) Regulations control all aspects of the ways combustion systems fired by gas (including natural gas and LPG) are installed, maintained and used, mainly in domestic and commercial premises, and the classes of persons who may

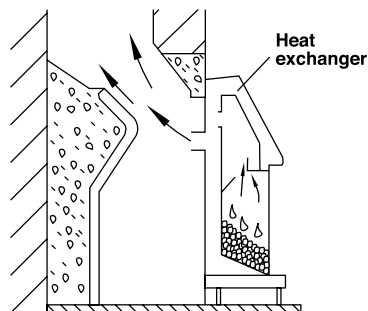
undertake gas work. The Regulations may be amended from time to time and whichever Regulations are currently in force at the time an installation is carried out must be complied with. The advice given below reflects the present state of the Gas Safety (Installation and Use) Regulations following the amendments that came into effect on 31 October 1998.

**3.5** The text of the Regulations and guidance on how to comply with them are contained in the Health and Safety Executive (HSE) Approved Code of Practice 'Safety in the installation and use of gas systems and appliances'. Important elements of the Regulations include that:

- a. any appliance installed in a room used or intended to be used as a bath or shower room must be of the *room-sealed* type;
- b. a gas fire, other gas space heater or gas water heater of more than 14kW (gross) *heat input* (12.7kW (net) heat input) must not be installed in a room used or intended to be used as sleeping accommodation unless the appliance is room sealed;
- c. a gas fire, other space heater or gas water heater of up to 14kW (gross) heat input (12.7kW (net) heat input) must not be installed in a room used or intended to be used as sleeping accommodation unless it is room sealed or equipped with a device designed to shut down the appliance before there is a build-up of a dangerous quantity of the products of combustion in the room concerned;
- d. the restrictions in (a)–(c) above also apply in respect of any cupboard or compartment within the rooms concerned, and to any cupboard, compartment or space adjacent to, and with an air vent into, such a room;
- e. instantaneous water heaters (installed in any room) must be room sealed or have fitted a safety device to shut down the appliance as in (c) above;
- f. precautions must be taken to ensure that all installation pipework, gas fittings, appliances and *flues* are installed safely. When any gas appliance is installed, checks are required for ensuring compliance with the Regulations, including the effectiveness of the *flue*, the supply of combustion air, the operating pressure or heat input (or where necessary both), and the operation of the appliance to ensure its safe functioning;
- g. any *flue* must be installed in a safe position and must be adequate, suitable and effective for use with the appliance which it serves;

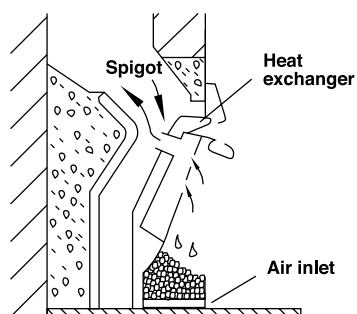
- h. no alteration is allowed to any premises in which a gas fitting or gas storage vessel is fitted which would adversely affect the safety of that fitting or vessel, causing it no longer to comply with the Regulations;
- i. LPG storage vessels and LPG-fired appliances fitted with automatic ignition devices or pilot lights must not be installed in cellars or basements.

**Diagram 31 Types of gas fire**



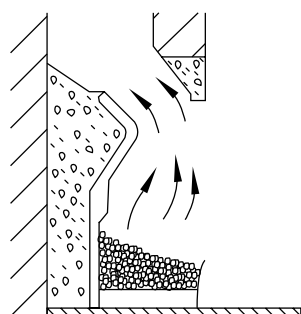
- (a) Radiant convector gas fires, convector heaters and fire / back boilers, as described in BS 5871: Part 1

These stand in front of a closure plate which is fitted to the fireplace opening of a fireplace recess or suitable fluebox. The appliance covers the full height of the fireplace opening so that air enters only through purpose-designed openings and the flue gases discharge only through the flue spigot.



- (b) Inset live fuel effect (ILFE) fires, as described in BS 5871: Part 2

These stand fully or partially within a fireplace recess or suitable fluebox and give the impression of an open fire. The appliance covers the full height of the fireplace opening so that air enters only through purpose-designed openings and the flue gases discharge only through the spigot.



- (c) Decorative fuel effect (DFE) fires, as described in BS 5871: Part 3

These are gas-fired imitations which can be substituted for the solid fuel appliances in open fires. Where suitable, they can also be used in flueboxes designed for gas appliances only.

Common designs include beds of artificial coals shaped to fit into a fireplace recess or baskets of artificial logs for use in larger fireplaces or under canopies.

**Note:** For illustration purposes, this diagram shows gas fires installed at or within a fireplace recess formed by fireplace components within a builder's opening. The actual setting for an appliance depends upon its type and manufacturer's installation instructions.

## Gas fires (other than flueless gas fires)

**3.6** These appliances fall into the main categories shown in Diagram 31 and the building provisions for accommodating them safely differ for each type.

**3.7** Provided it can be shown to be safe, gas fires may be installed in fireplaces which have *flues* designed to serve solid fuel appliances. Certain types of gas fire may also be installed in fireplaces which have *flues* designed specifically for gas appliances. The Gas Appliances (Safety) Regulations 1995 require that particular combinations of appliance, *flue box* (where required) and *flue* must be selected from those stated in the manufacturer's instructions as having been shown to be safe by a *Notified Body*.

## Flueless gas appliances

**3.8** *Flueless appliances* should meet the requirements, including requirement J2. A way of achieving this would be to follow the guidance on ventilation provisions for *flueless appliances* beginning at Paragraph 3.15.

**3.9** A flueless instantaneous water heater should not be installed in a room or space having a volume of less than 5 m<sup>3</sup>.

## Air supply to gas fires and other appliances

**3.10** A way of meeting the requirements would be to follow the general guidance given in Section 1, beginning at Paragraph 1.2, in conjunction with the guidance below.

## Flued Decorative Fuel Effect (DFE) fires

**3.11** Any room or space intended to contain a DFE fire should have permanently open air vents as described in (a) or (b) below, unless the installation is in accordance with Paragraph 3.12:

- a. for a DFE fire in a *fireplace recess* with a *throat*, the air vent *equivalent area* should be at least 10,000mm<sup>2</sup> (100cm<sup>2</sup>)
- b. for a DFE fire in a fireplace with no *throat*, such as a fire under a canopy, the air vent should be sized in accordance with Section 2 of this Approved Document, as if the room were intended to contain a solid fuel fire (see Table 1).

**3.12** In dwellings with an air permeability greater than 5.0 m<sup>3</sup>/hr/m<sup>2</sup> (see Appendix F), permanently open air vents may not be necessary for DFE fires with ratings not exceeding 7kW (net) that have a flue gas clearance rate (without spilling) not exceeding 70 m<sup>3</sup>/hour.

## Flued appliances other than decorative fuel effect fires

**3.13** These appliances include inset live fuel effect (ILFE) fires, radiant convector fires and boilers, in both room-sealed and open-flued variants.

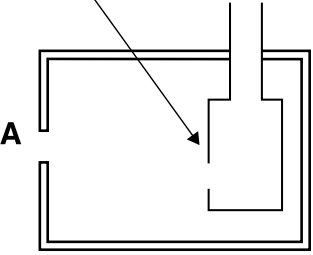
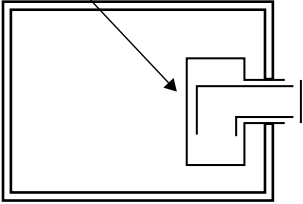
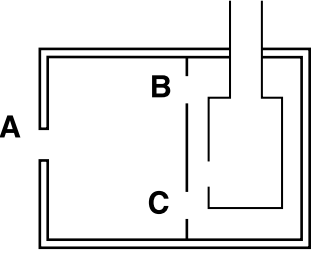
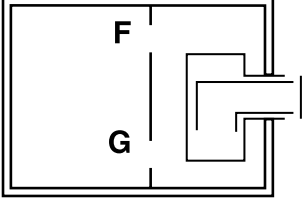
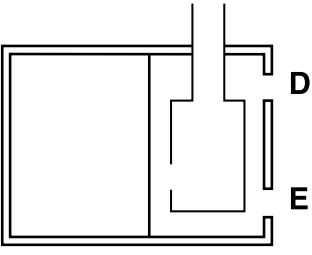
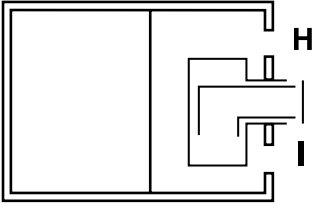
**3.14** A way of meeting the requirement would be to follow the guidance in Diagram 32. An example calculation illustrating the use of this guidance is given in Appendix C.

## Air supply to flueless appliances

**3.15** For some *flueless appliances*, it may be necessary to provide permanently open air vents and/or make provision for rapid ventilation as recommended in BS 5440-2:2009 or equivalent, to comply with Part F as well as Part J of the Building Regulations. Some ways of meeting the requirement when installing flueless cookers (including ovens, grills or hotplates), flueless water heaters and flueless space heaters are given in Diagram 33.

**3.16** A room containing a gas point intended for use with a *flueless appliance* (such as a gas point for a cooker or a gas point for a space or water heater, the gas point not being adjacent to a *flue*) should have the ventilation provision required for the installation of that appliance (calculated on the basis that an appliance with the largest rating consistent with the table to Diagram 33 could be installed there).

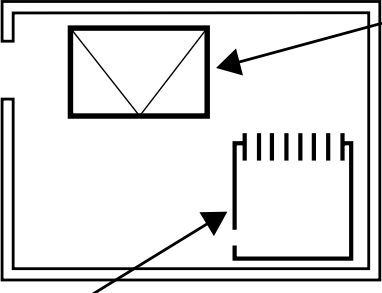
**Diagram 32 Free areas of permanently open air vents for gas appliance installations (other than decorative fuel effect fires or flueless appliances)**

	Open flued	Room sealed
<b>Appliance in a room or space</b>	<p>Open-flued appliance</p>  <p><math>A = 500\text{mm}^2</math> per kW input (net)</p>	<p>Room-sealed appliance</p>  <p>No vent needed</p>
<b>Appliance in an appliance compartment ventilated via an adjoining room or space</b>	 <p> <math>A = 500\text{mm}^2</math> per kW input (net)  <math>B = 1000\text{mm}^2</math> per kW input (net)  <math>C = 2000\text{mm}^2</math> per kW input         </p>	 <p> <math>F = 1000\text{mm}^2</math> per kW input (net)  <math>G = F</math> </p>
<b>Appliance in an appliance compartment ventilated direct to outside</b>	 <p> <math>D = 500\text{mm}^2</math> per kW input (net)  <math>E = 1000\text{mm}^2</math> per kW input (net)         </p>	 <p> <math>H = 500\text{mm}^2</math> per kW input (net)  <math>I = H</math> </p>

**Notes:**

1. A, D, E, H and I are permanently open vents on the outside. B, C, F and G are permanently open vents between an appliance compartment and a room or a space.
2. Calculations employ the appliance rated net heat input as described in paragraph 0.4.
3. The area given above is the free area of the vent(s) or the equivalent free area for ventilators of more complex design.
4. Divide the area given above in  $\text{mm}^2$  by 100 to find the corresponding area in  $\text{cm}^2$ .
5. In older dwellings with an air permeability which is more than  $5.0\text{m}^3/\text{h}/\text{m}^2$  the first  $7\text{kW}(\text{net})$  can be ignored.

Diagram 33 Ventilation for flueless gas appliances

<p>Permanently open vent opening directly to outside with free area not less than that given in Column 4 of the table below</p>  <p>In accordance with Approved Document F: a) openable window, door or similar form of controllable ventilation opening directly to outside; or b) for a kitchen, mechanical extract ventilation</p> <p>Flueless appliance with a rating not exceeding that given in Column 2 of the table below</p>			
Free areas of permanently open air vents			
Flueless appliance type	Maximum appliance rated heat input	Volume of room, space or internal space (m <sup>3</sup> )	Free area of permanently open air vent (mm <sup>2</sup> ) (3, 4)
Cooker, oven hotplate or grill or combination thereof	Not applicable	<5 5 to 10 >10	10,000 5,000 (8) No permanently open vent needed
Instantaneous water heater	11kW (net)	5 to 10 10 to 20 >20	10,000 5,000 No permanently open vent needed
Space heater not in an internal space (3, 4)	0.045kW (net) per m <sup>3</sup> volume of room (5)	all cases	10,000 PLUS 5,500 per kW input (net) in excess of 2.7kW (net)
Space heater in an internal space (3, 4)	0.090kW (net) per m <sup>3</sup> volume of internal space	all cases	10,000 PLUS 2,750 per kW input (net) in excess of 5.4kW (net) (7)
<p>Notes:</p> <ol style="list-style-type: none"> <li>The permanent ventilation provisions listed in this table are additional to the openable elements or (for kitchens only) extract ventilation in accordance with Approved Document F.</li> <li>Divide the area given above in mm<sup>2</sup> by 100 to find the corresponding area in cm<sup>2</sup>.</li> <li>An internal space here means one which communicates with several other rooms or spaces. An example would be a hallway or landing.</li> <li>For LPG fired space heaters conforming to BS EN 449:2002+A1:2007, follow the guidance in BS 5440-2:2009.</li> <li>No permanently open vent is needed if the room or space has a door direct to outside.</li> <li>Example: for a space heater in a lounge measuring 4m x 4m x 2.4m (= 38.4m<sup>3</sup>), the appliance rated input should not exceed 38.4 x 0.045 = 1.73kW (net).</li> <li>Example: a hallway containing a space heater with a rated input of 7kW (net) should have a permanently open vent with equivalent area of: 10,000 + 2750 x (7 - 5.4) = 14,400mm<sup>2</sup>.</li> <li>No permanent opening required if the room has a door that opens directly to outside.</li> </ol>			

## Size of natural draught flues for open-flued appliances

**3.17** Where builders wish to provide (or refurbish) *flues* for gas appliances but do not intend to supply the appliances, a way of showing compliance would be to size *flues* in accordance with Table 5.

**3.18** If an existing *flue* is to be used it should be checked in accordance with Paragraph 1.36.

**3.19** For appliances that are CE marked as compliant with the Gas Appliances (Safety) Regulations, *flues* should be sized in accordance with the manufacturer's *installation instructions*.

**3.20** Connecting *fluepipes* should be the same size in terms of diameter and/or equivalent cross-sectional area as the appliance *flue outlet*. The *chimney flue* should have at least the same cross-sectional area as that of the appliance *flue outlet*.

**Table 5 Size of flues for gas-fired appliances**

Intended installation	Minimum flue size	
Radiant / Convector gas fire	New flue:	
	Circular	125mm diameter
	Rectangular	16,500mm <sup>2</sup> cross-sectional area with a minimum dimension of 90mm
	Existing flue:	
	Circular	125mm diameter
	Rectangular	12,000mm <sup>2</sup> cross-sectional area with a minimum dimension of 63mm
ILFE fire or DFE fire within a fireplace opening up to 500mm x 550mm	Circular or rectangular	Minimum flue dimension of 175mm (1)
DFE fire installed in a fireplace with an opening in excess of 500mm x 550mm	Calculate in accordance with paragraph 2.7 in Section 2	
<b>Note:</b>		
1. Some ILFE and DFE appliances require a circular flue of at least 125mm diameter.		

## Height of natural draught flues for open-flued appliances

**3.21** Flues should be high enough to ensure sufficient draught to safely clear the products of combustion. The height necessary for this will depend upon the type of appliance, the building height, the type of flue and the number of bends in it, and a careful assessment of local wind patterns. For appliances that are CE marked as compliant with the Gas Appliances (Safety) Regulations, compliance with the manufacturer's *installation instructions* will meet the requirements.

**3.22** Where an older appliance that is not CE marked is to be installed, a way of showing compliance if it has manufacturer's *installation instructions* would be:

- for decorative fuel effect fires, to follow the guidance in BS 5871-3:2001 2005; or
- for appliances other than decorative fuel effect fires, to follow the calculation procedures in BS 5440-1:2008.

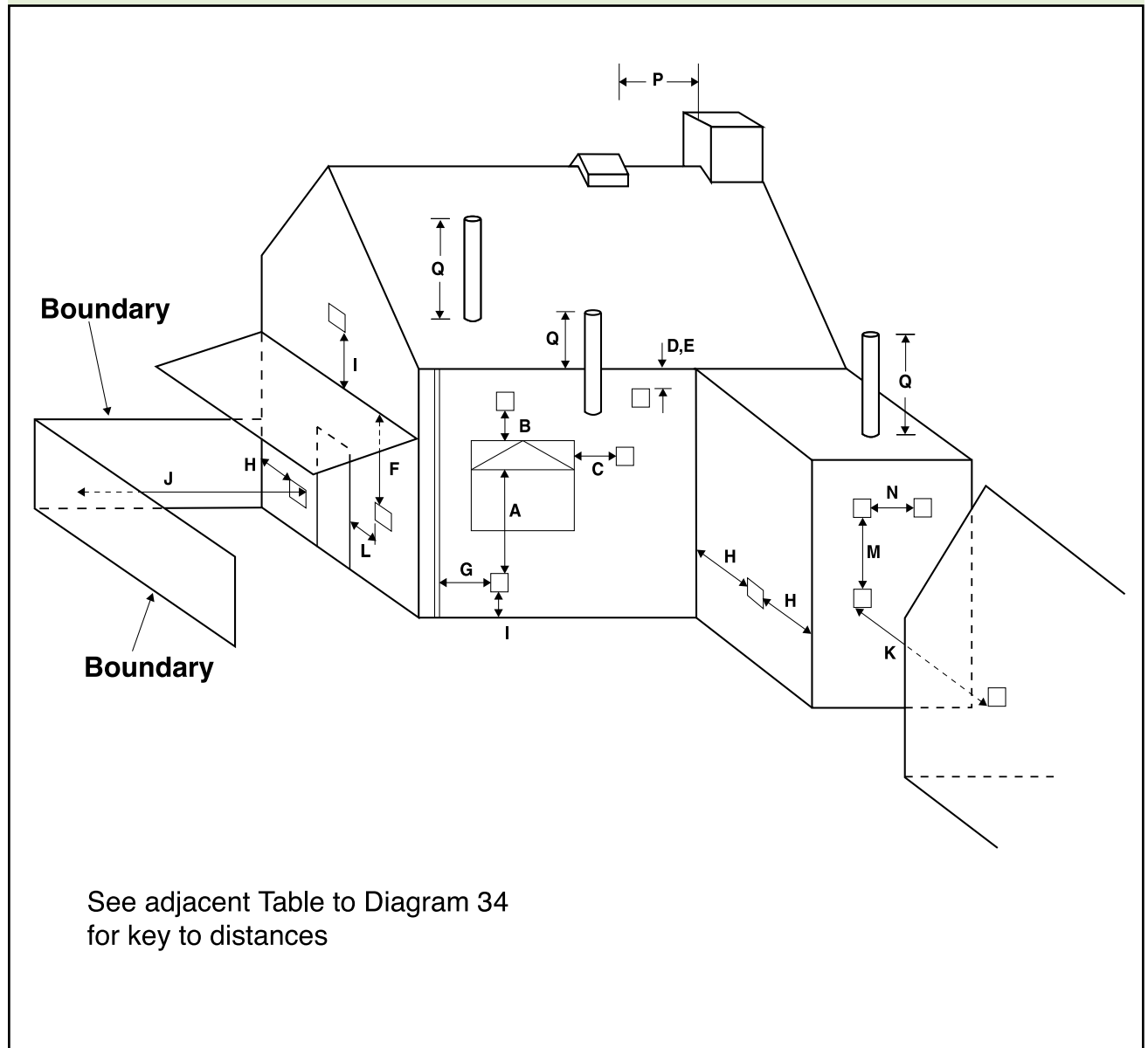
## Outlets from flues

**3.23** Outlets from flues should be so situated externally as to allow the dispersal of products of combustion and, if a *balanced flue*, the intake of air. A way of meeting this requirement would be to locate *flue outlets* as shown in Diagram 34 and Diagram 35.

**Note:** The plume of wet flue products from condensing boilers, positioned in accordance with the safety distances set out in Diagram 34, can sometimes be considered a nuisance for neighbouring properties. Whilst this nuisance is not considered to be within the scope of building regulations, such installations could be considered as a 'Statutory Nuisance' as set out in the Environmental Protection Act. As such installers may wish to adopt the guidance in Chapter 6 of the *Guide to Condensing Boiler Installation Assessment Procedure for Dwellings*

**Care may also need to be taken to locate flue outlets away from parts of the building that may be damaged by frequent wetting.**

Diagram 34 **Location of outlets from flues serving gas appliances**



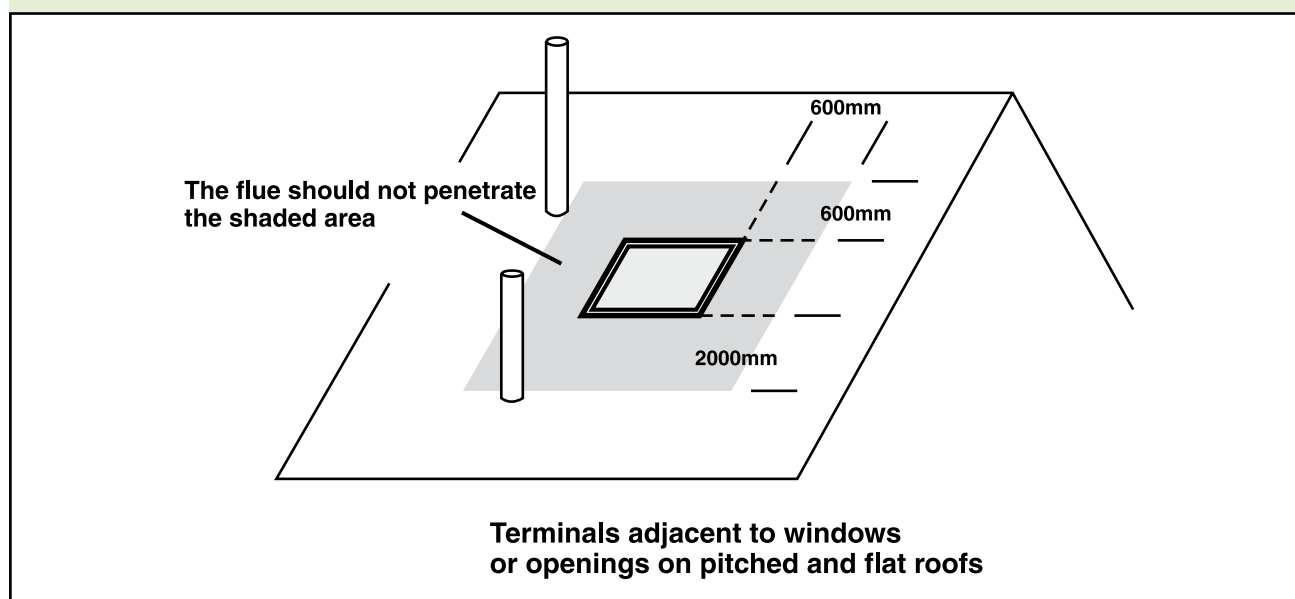
**Table to Diagram 34 Location of outlets from flues serving gas appliances**

Minimum separation distances for terminals in mm					
Location		Balanced flue		Open flue	
		Natural draught		Natural draught	Fanned draught
		Appliance rated heat input (net)			
A	Below an opening (1)	0–7kW >7–14kW >14–32kW >32kW	300 600 1500 2000	(3)	300
B	Above an opening (1)	0–32kW >32kW	300 600	(3)	300
C	Horizontally to an opening (1)	0–7kW >7–14kW >14kW	300 400 600	(3)	300
D	Below gutters, soil pipes or drainpipes	300	75	(3)	75
E	Below eaves	300	200	(3)	200
F	Below balcony or car port roof	600	200	(3)	200
G	From a vertical drainpipe or soil pipe	300	150 (4)	(3)	150
H	From an internal or external corner or to a boundary alongside the terminal (2)	600	300	(3)	200
I	Above ground, roof or balcony level	300	300	(3)	300
J	From a surface or a boundary facing the terminal (2)	600	600	(3)	600
K	From a terminal facing the terminal	600	1200	(3)	1200
L	From an opening in the car port into the building	1200	1200	(3)	1200
M	Vertically from a terminal on the same wall	1200	1500	(3)	1500
N	Horizontally from a terminal on the same wall	300	300	(3)	300
P	From a structure on the roof	N/A	N/A	1500mm if a ridge terminal. For any other terminal, as given in BS 5440-1:2008	N/A
Q	Above the highest point of intersection with the roof	N/A	Site in accordance with manufacturer's instructions	Site in accordance with BS 5440-1:2008	150

**Notes:**

1. An opening here means an openable element, such as an openable window, or a fixed opening such as an air vent. However, in addition, the outlet should not be nearer than 150mm (fanned draught) or 300mm (natural draught) to an opening into the building fabric formed for the purpose of accommodating a built-in element, such as a window frame.
  2. Boundary as defined in paragraph 0.4 (4). Smaller separations to the boundary may be acceptable for appliances that have been shown to operate safely with such separations from surfaces adjacent to or opposite the flue outlet.
  3. Should not be used.
  4. This dimension may be reduced to 75mm for appliances of up to 5kW input (net).
- N/A means not applicable.

Diagram 35 Location of outlets near roof windows from flues serving gas appliances



**3.24** Flue outlets should be protected where flues are at significant risk of blockage. Guidance on meeting this requirement is given below.

**3.25** Flues serving natural draught open-flued appliances should be fitted with outlet terminals if the flue diameter is no greater than 170mm. Suitable terminals include those appropriately designated in accordance with BS EN 1856-1:2003, and conforming to BS EN 13502:2002. The risk of blockage of flues of more than 170mm diameter should be assessed in the light of local conditions. In areas where nests of squirrels or jackdaws are likely, the fitting of a protective cage designed for solid fuel use and having a mesh size no larger than 25mm (but no smaller than 6mm) may be an acceptable provision if the total free area of its outlet openings is at least twice the cross-sectional area of the flue.

**3.26** A flue outlet should be protected with a guard if persons could come into contact with it or if it could be damaged. If a flue outlet is in a vulnerable position, such as where the flue discharges within reach from the ground, or a balcony, veranda or a window, it should be designed to prevent the entry of any matter that could obstruct the flow of flue gases.

## Provision of flues

**3.27** Satisfactory provision of chimneys and fluepipes for gas appliances may be achieved by:

- following the guidance on the selection of components and the manner of their installation as given in Paragraphs 3.28 to 3.35 and the references to Section 1; or (if the intended appliance is new and of known type)

or (if the intended appliance is new and of known type):

- using factory-made components that achieve a performance at least equal to that corresponding to the designation given in Table 6 for the intended appliance type when tested to an appropriate European chimney standard (BS EN); and
- installing these components in accordance with the guidance in Paragraphs 3.28 to 3.35 and Section 1, as relevant, and in accordance with the appliance manufacturer's and component manufacturer's installation instructions.

Table 6 Minimum performance designations for chimney and fluepipe components for use with new gas appliances

Appliance type		Minimum designation (see notes)
Boiler: open-flued	Natural draught	T250 N2 D 1 O
	Fanned draught	T250 P2 D 1 O
	Condensing	T140 P2 W 1 O
Boiler: room-sealed	Natural draught	T250 N2 D 1 O
	Fanned draught	T250 P2 D 1 O
	Condensing	T140 P2 W 1 O
Gas fire – radiant/convactor, ILFE or DFE		T250 N2 D 1 O
Air heater	Natural draught	T250 N2 D 1 O
	Fanned draught	T250 P2 D 1 O
	SE – duct	T250 N2 D 1 O

### Notes:

- The designation of chimney products is described in Appendix G. The BS EN for the product will specify its full designation and marking requirements.
- These are default designations. Where the appliance manufacturer's installation instructions specify a higher designation, this should be complied with.

## Connecting fluepipe components

**3.28** Satisfactory components for connecting *fluepipes* include:

- any of the options in Paragraph 1.32; or
- sheet metal *fluepipes* as described in BS EN 1856-2:2004; or
- fibre cement pipes as described in BS EN 1857:2003+A1:2008; or
- any other material or component that has been certified as suitable for this purpose.

## Masonry chimneys

**3.29** Masonry *chimneys* should be built in accordance with Paragraphs 1.27 and 1.28 in Section 1.

## Flueblock chimneys

**3.30** *Chimneys* can be constructed from factory-made flueblock systems primarily designed for solid fuel, as described in Paragraphs 1.29 and 1.30 in Section 1. They can also be constructed from factory-made flueblock systems comprising straight blocks, recess units, lintel blocks, offset blocks, transfer blocks and jointing materials complying with:

- BS EN 1858-1:2003 for concrete flueblocks of at least class D2; or
- BS EN 1806:2006 for clay/ceramic flueblocks with a performance class of at least FB4 N2.

**3.31** *Flueblock chimneys* should be installed with sealed joints in accordance with the flueblock manufacturer's *installation instructions*. Where bends or offsets are required, these should be formed using matching factory-made components. Flueblocks which are not intended to be bonded into surrounding masonry should be supported and restrained in accordance with the manufacturer's *installation instructions*.

## Factory-made metal chimneys

**3.32** *Chimneys* for gas appliances may be constructed using systems described in Paragraphs 1.42 to 1.46 in Section 1. *Factory-made metal chimneys* should be guarded if they could be at risk of damage or the burn hazard they present to people is not immediately apparent.

## Location and shielding of flues

**3.33** Combustible materials in the building fabric should be protected from the heat dissipation from *flues* so that they are not at risk of catching fire. A way of meeting the requirement would be to follow the guidance in Table 6.

**3.34** Where a *fluepipe* or *chimney* penetrates a *fire compartment* wall or floor, it must not breach the fire separation requirements of Part B. See Approved Document B for more guidance.

**Table 7 Protecting buildings from hot flues**

Flue within	Protection measures
Connecting fluepipe	Flues should be at least 25mm from any combustible material (measured from the outer surface of the flue wall, or the outer surface of the inner wall in the case of multi-walled products). Where passing through a combustible wall, floor or roof (other than a compartment wall, floor or roof) this separation can be achieved by a non-combustible sleeve enclosing the fluepipe or chimney with a 25mm air-space to the relevant flue wall. (The air-space could be wholly or partially filled with non-combustible insulating material).
Factory-made chimney appropriately designated to BS EN 1856-1:2003	
Factory-made chimney appropriately designated to BS EN 1856-1:2003 and BS EN 1856-2:2004	Install in accordance with Paragraph 1.45 of this Approved Document with minimum separation distances according to flue designation.
Masonry chimney	Provide at least 25mm of masonry between flues and any combustible material.
Flueblock chimney	Provide flueblock walls at least 25mm thick.

**3.35** Connecting *fluepipes* and factory-made *chimneys* should also be guarded if they could be at risk of damage or if they present a burn hazard to people that is not immediately apparent

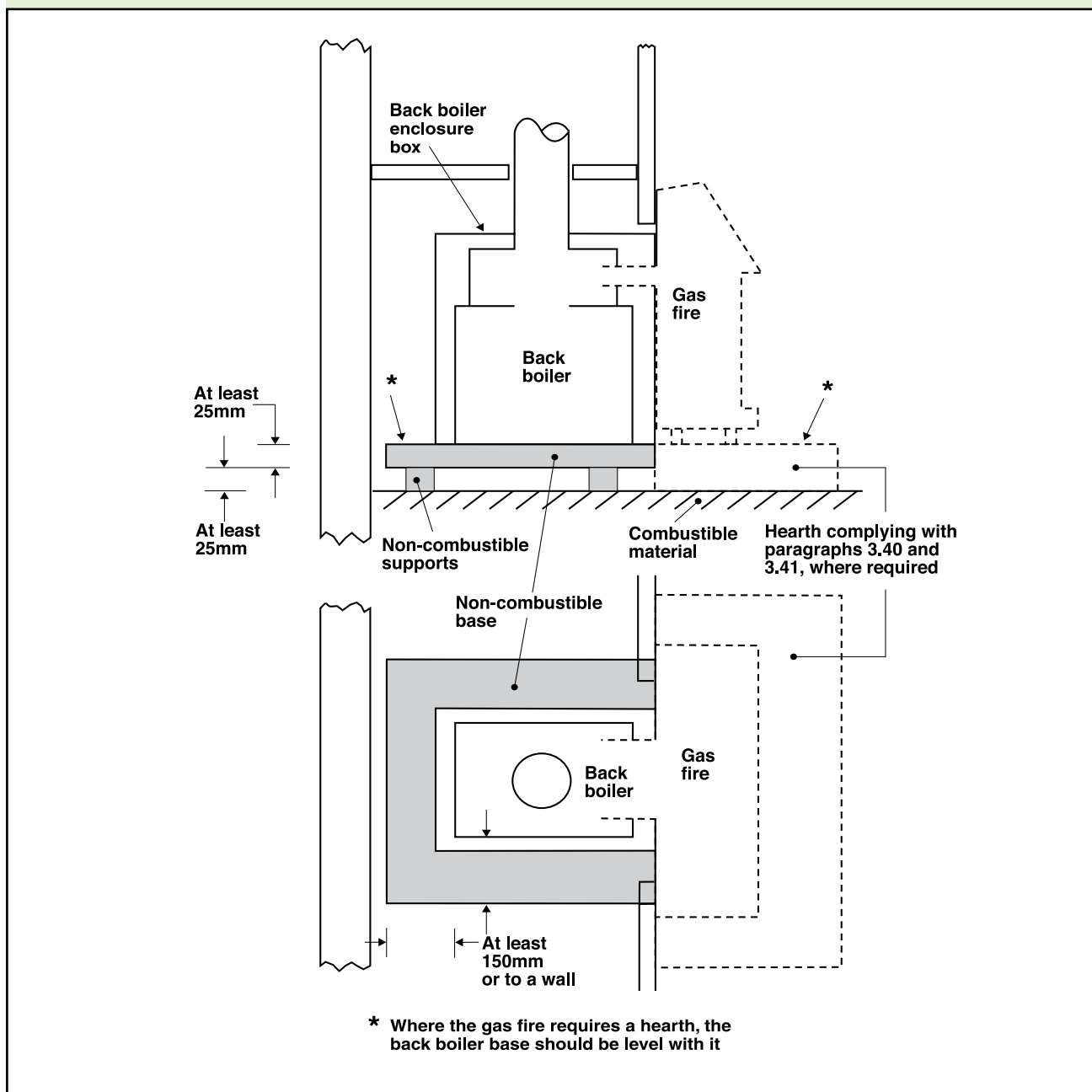
## Relining of flues in chimneys

**3.36** Lining or relining *flues* may be building work and, in any case, such work should be carried out so that the objectives of requirements J2 to J5 are met (see Paragraphs 1.34 and 1.35). Existing *flues* being re-used should be checked as described in Paragraph 1.36. For *flue liners* serving gas appliances, ways of meeting the requirements include the use of:

- liners as described in Paragraph 1.27;
- liners as described in Paragraph 2.20;
- flexible stainless steel liners appropriately designated to BS EN 1856-1:2003 (refer to Table 6);
- other systems suitable for the purpose.

**3.37** Flexible metal *flue liners* should be installed in one complete length without joints within the *chimney*. Other than for sealing at the top and the bottom, the space between the *chimney* and the liner should be left empty unless this is contrary to the manufacturer's instructions. Double-skin flexible *flue liners* should be *installed* in accordance with the manufacturer's *installation instructions*. BS 715 liners should be installed in accordance with BS 5440-1:2008.

Diagram 36 **Bases for back boilers (installation using a proprietary back boiler enclosure shown)**



## Debris collection space for chimneys

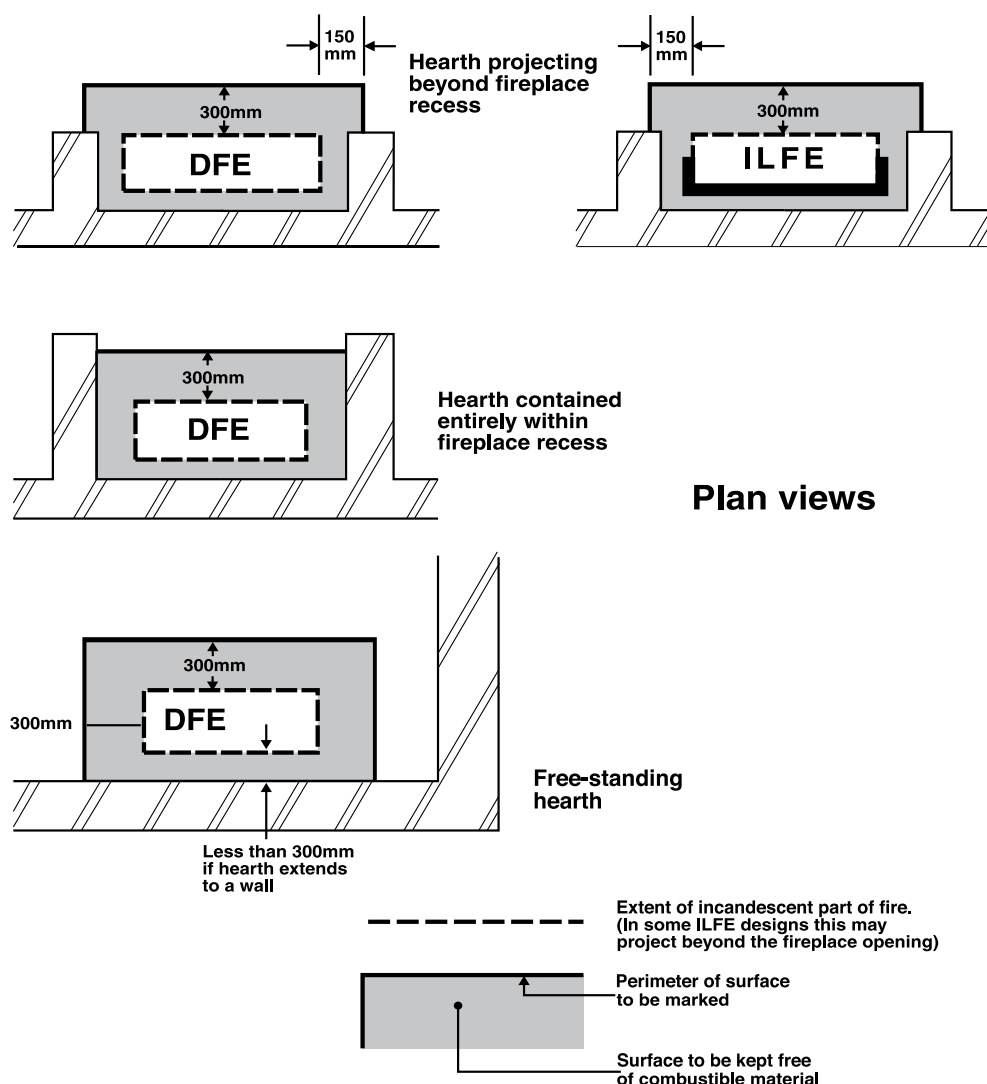
**3.38** A debris collection space should be provided at the base of a *flue* unless it is lined, or constructed of flue blocks, or is a *factory-made metal chimney* with a *flue box*. This can be achieved by providing a space having a volume of not less than 12 litres and a depth of at least 250mm below the point where flue gases discharge into the *chimney*. The space should be readily accessible for clearance of debris, for example by removal of the appliance. For gas fires of the type illustrated in Diagram 31 (a) and

(b), there should be at least 50mm clearance between the end of the appliance *flue outlet* and any surface.

## Bases for back boilers

**3.39** Provisions for back boilers should adequately protect the fabric of the building from heat. A way of meeting the requirement would be to stand back boilers on *hearths* intended for solid fuel appliances. Alternatively, unless otherwise stated in the appliance manufacturer's instructions, a way of meeting the requirements would be to stand back boilers on bases complying with Diagram 36.

**Diagram 37 Hearths for decorative fuel effect (DFE) and inset live fuel effect (ILFE) fires: minimum plan dimensions of non-combustible surfaces**



## Hearths

**3.40** Appliances should be placed on *hearths* unless:

- they are to be installed so that every part of any flame or incandescent material will be at least 225mm above the floor; or
- the manufacturer's instructions state that a *hearth* is not required.

**3.41** Where *hearths* are required, guidance on their minimum plan dimensions is given in Diagrams 37 and 38. *Hearths* should comprise at least a (top) layer of non-combustible, non-friable material not less than 12mm thick. The edges of *hearths* should be marked to provide a warning to the building occupants and to discourage combustible floor finishes such as carpet from being laid too close to the appliance. A way of achieving this would be to provide a change in level.

## Shielding of appliances

**3.42** Gas-fired appliances should be located where accidental contact is unlikely and surrounded by a non-combustible surface which provides adequate separation from combustible materials. For appliances that are CE marked as compliant with the Gas Appliances (Safety) Regulations, a way of meeting the requirement would be to adopt the manufacturer's instructions. An alternative approach would be to protect combustible fabric with:

- a shield of *non-combustible material*, such as insulating board, with a *fire-resistant* surface; or
- an air space of at least 75mm (see Diagram 39).

Diagram 38 **Hearths for other appliances: plan dimension of non-combustible surfaces**

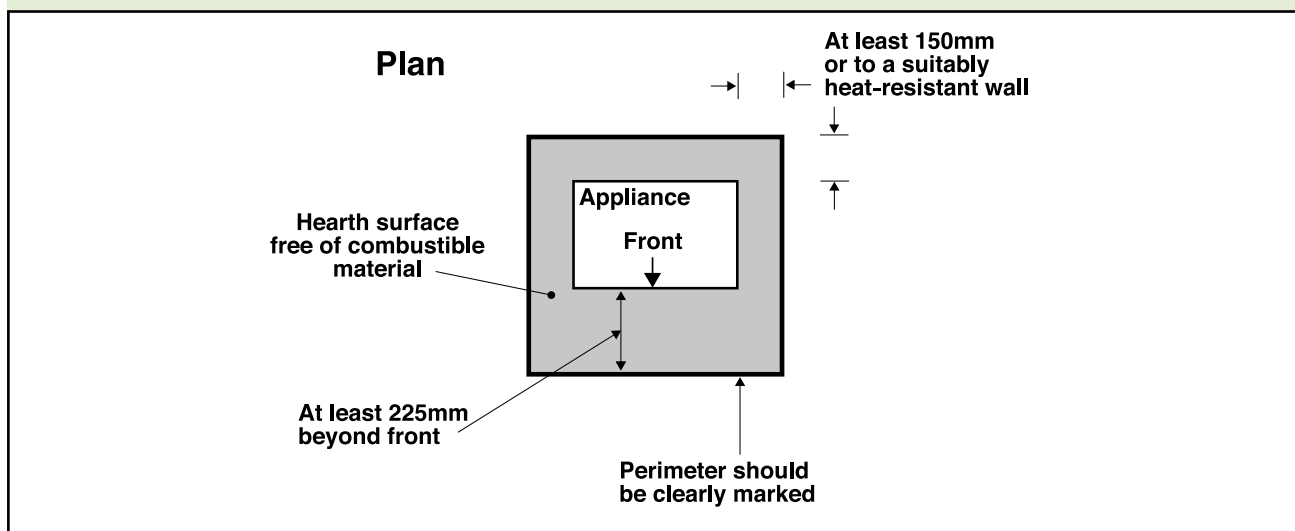
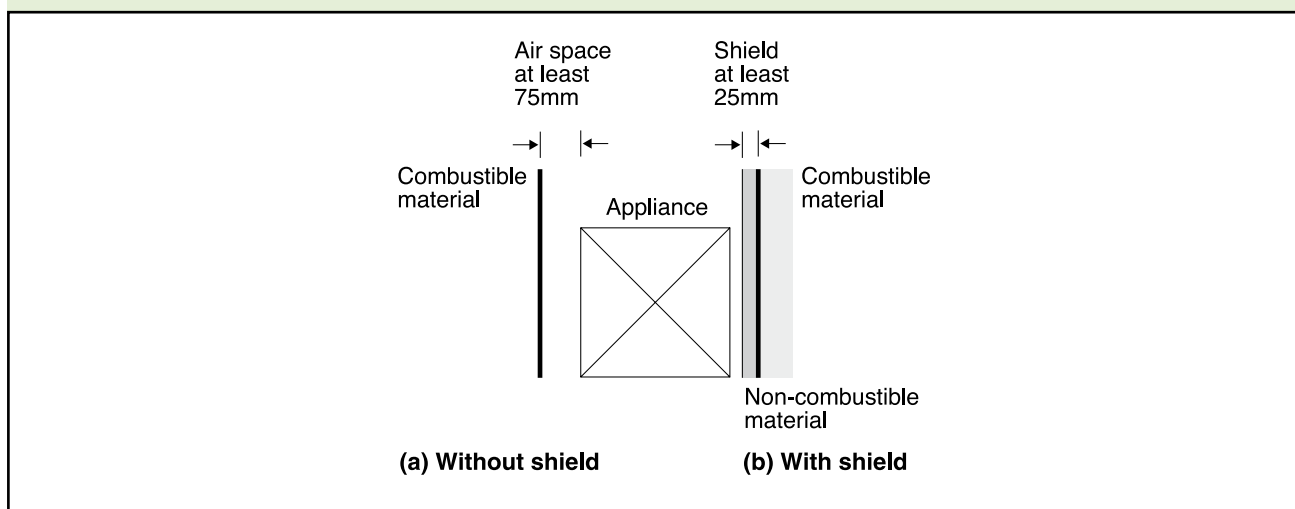


Diagram 39 **Shielding of appliances**



## Alternative approach

The requirements may also be met by adopting the relevant recommendations in the publications listed below to achieve an equivalent level of performance to that obtained by following the guidance in this Approved Document:

BS 5440 Installation and maintenance of *flues* and ventilation for gas appliances of rated input not exceeding 70kW net (1st, 2nd and 3rd family gases), Part 1:2008 Specification for installation and maintenance of *flues*; Part 2:2009 Specification for installation and maintenance of ventilation for gas appliances.

BS 5546:2000 Specification for installation of hot water supplies for domestic purposes, using gas-fired appliances of rated input not exceeding 70kW.

BS 5864:2004 Specification for installation in domestic premises of gas-fired ducted-air heaters of rated input not exceeding 60kW.

BS 5871 Specification for installation of gas fires, convector heaters, fire/back boilers and decorative fuel effect gas appliances, Part 1:2005 Gas fires, convector heaters and fire/back boilers and heating stoves (1st, 2nd and 3rd family gases); Part 2:2005 Inset live fuel effect gas fires of heat input not exceeding 15kW and fire/back boilers (2nd and 3rd family gases); Part 3:2005 Decorative fuel effect gas appliances of heat input not exceeding 20kW (2nd and 3rd family gases).

BS 6172:2004 Specification for installation of domestic gas cooking appliances (1st, 2nd and 3rd family gases).

BS 6173:2001 Specification for installation of gas-fired catering appliances for use in all types of catering establishments (2nd and 3rd family gases).

BS 6798:2009 Specification for installation of gas-fired boilers of rated input not exceeding 70kW net.

## Section 4: Additional provisions for oil burning appliances with a rated output up to 45kW

### Scope

**4.1** This guidance is relevant to combustion installations designed to burn oils meeting the specifications for Class C2 (Kerosene) and Class D (Gas oil) given in BS 2869:2006 or equivalent, liquid biofuel conforming to EN 14213:2003 and blends of mineral oil and liquid biofuel.

### Appliances fitted in bathrooms and shower rooms

**4.2** Open-flued oil-fired appliances should not be installed in rooms such as bathrooms and bedrooms where there is an increased risk of carbon monoxide poisoning. Where locating *combustion appliances* in such rooms cannot be avoided, a way of meeting the requirements would be to provide *room-sealed appliances*.

### Air supply to appliances

**4.3** A way of meeting the requirements would be to adopt the general guidance given in Section 1, starting at Paragraph 1.2, and to provide permanently open air vents as shown in Diagram 40 in rooms or spaces containing appliances. An example calculation illustrating the use of this guidance is given in Appendix D. Where manufacturers' *installation instructions* require greater areas of permanently open air vents than those shown in Diagram 40, the manufacturers' advice should be followed.

### Size of flues (other than balanced flues and flues designed to discharge through or adjacent to walls)

**4.4** *Flues* should be sized to suit the intended appliance such that they ensure adequate discharge velocity to prevent flow reversal problems but do not impose excessive flow resistances. A way of meeting the requirements would be to use:

- a. connecting *fluepipes* of the same size as the appliance *flue outlet*; and
- b. *flues* in *chimneys* of the same cross-sectional area as the appliance *flue outlet*.

When constructing masonry or *flueblock chimneys*, a way of doing this would be to:

- i. make the *flue* the same size as the appliance *flue outlet*; or

- ii. make the *flue* larger and of a size that would allow the later insertion of a suitable flexible *flue liner* matching the appliance to be installed.

**4.5** Larger *flues* may need to be provided where appliance manufacturers' *installation instructions* demand this.

### Outlets from flues and flue heights

**4.6** The outlet from a *flue* should be so situated externally as to ensure: the correct operation of a *natural draught flue*; the intake of air if a *balanced flue*; and dispersal of the products of combustion.

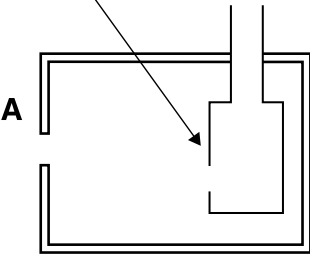
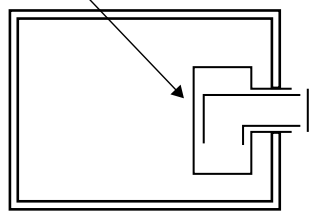
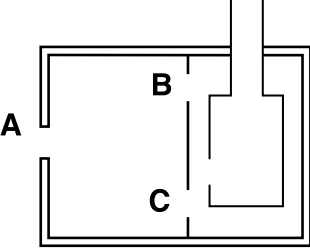
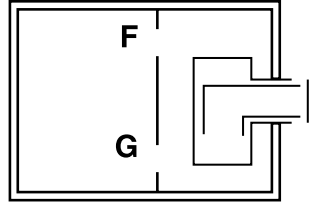
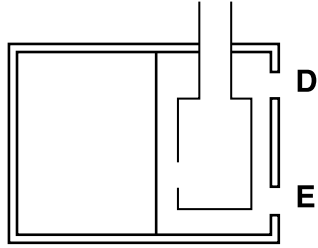
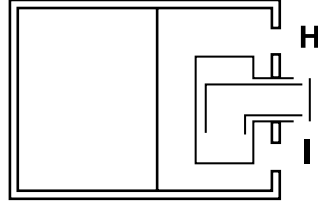
**4.7** A way of meeting the requirement could be to follow the guidance in Diagram 41. The separations given in the Table to Diagram 41 are minimum values that may have to be increased where there is a risk that local factors such as wind patterns could disrupt the operation of the *flue* or where a *natural draught flue* would not be tall enough to clear the products of combustion of an *open-flued appliance*. For *flues* in proximity to roof windows the minimum separation distances identified in Diagram 35 should be applied.

**Note:** The plume of wet flue products from condensing boilers, positioned in accordance with the safety distances set out in Diagram 41, can sometimes be considered a nuisance for neighbouring properties. Whilst this nuisance is not considered to be within the scope of building regulations, such installations could be considered as a 'Statutory Nuisance' as set out in the Environmental Protection Act. As such, installers may wish to adopt the guidance in Chapter 6 of the *Guide to Condensing Boiler Installation Assessment Procedure for Dwellings*.

**Care may also need to be taken to locate *flue outlets* away from parts of the building that may be damaged by frequent wetting.**

**4.8** *Flue outlets* should be protected with terminal guards if persons could come into contact with them or if they could be damaged. If a *flue outlet* is in a vulnerable position, such as where the *flue* discharges at a point within reach of the ground, balcony, veranda or a window, it should be designed to prevent the entry of any matter that could obstruct the flow.

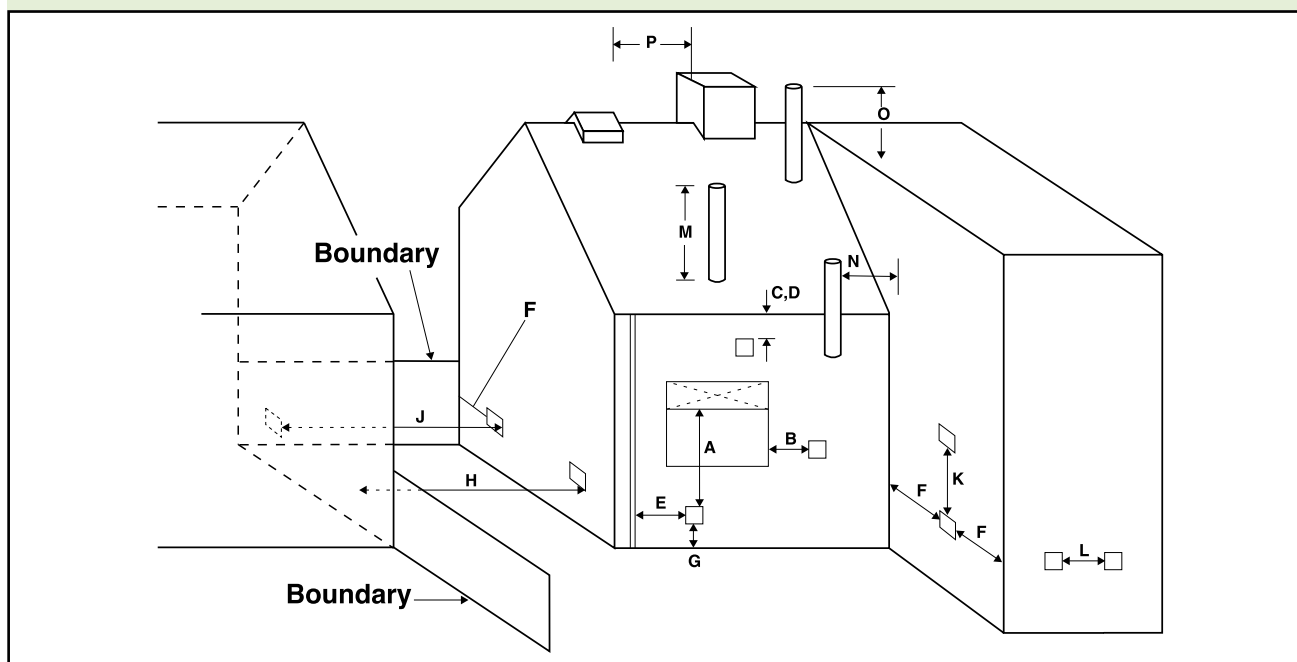
Diagram 40 **Free areas of permanently open air vents for oil-fired appliance installations**

	Open flued	Room sealed
<b>Appliance in a room or space</b>	<p><b>Open flued appliance</b></p>  <p><b>A</b></p> <p><math>A = 550\text{mm}^2</math> per kW output (see Note 3 and 5)</p>	<p><b>Room-sealed appliance</b></p>  <p><b>No vent needed</b></p>
<b>Appliance in an appliance compartment ventilated via an adjoining room or space</b>	 <p><b>A</b></p> <p><math>A = 550\text{mm}^2</math> per kW output (see Note 3 and 5) <math>B = 1100\text{mm}^2</math> per kW output <math>C = 1650\text{mm}^2</math> per kW output</p>	 <p><b>F</b></p> <p><math>F = 1100\text{mm}^2</math> per kW output <math>G = F</math></p>
<b>Appliance in an appliance compartment ventilated direct to outside</b>	 <p><b>D</b></p> <p><math>D = 550\text{mm}^2</math> per kW output <math>E = 1100\text{mm}^2</math> per kW output</p>	 <p><b>H</b></p> <p><math>H = 550\text{mm}^2</math> per kW output <math>I = H</math></p>

**Notes:**

1. A, D, E, H and I are permanently open vents to the outside. B, C, F and G are permanently open vents between an appliance compartment and a room or space.
2. The area given above is the free area of the vent(s) or the equivalent free area for ventilators of more complex design.
3. Vent A should be increased by a further  $550\text{mm}^2$  per kW output if the appliance is fitted with a draught break.
4. Divide the area given above in  $\text{mm}^2$  by 100 to find the corresponding area in  $\text{cm}^2$ .
5. In older dwellings with an air permeability which is more than  $5.0\text{m}^3/\text{hr}/\text{m}^2$  the first  $5\text{kW}(\text{net})$  can be ignored.

**Diagram 41 Location of outlets from flues serving oil-fired appliances**



**Table to Diagram 41 Location of outlets from flues serving oil-fired appliances**

Minimum separation distances for terminals in mm

Location of outlet (1)		Appliance with pressure jet burner	Appliance with vaporising burner
A	Below an opening (2, 3)	600	Should not be used
B	Horizontally to an opening (2, 3)	600	Should not be used
C	Below a plastic/painted gutter, drainage pipe or eaves if combustible material protected (4)	75	Should not be used
D	Below a balcony or a plastic/painted gutter, drainage pipe or eaves without protection to combustible material	600	Should not be used
E	From vertical sanitary pipework	300	Should not be used
F	From an external or internal corner or from a surface or boundary alongside the terminal	300	Should not be used
G	Above ground or balcony level	300	Should not be used
H	From a surface or boundary facing the terminal	600	Should not be used
J	From a terminal facing the terminal	1200	Should not be used
K	Vertically from a terminal on the same wall	1500	Should not be used
L	Horizontally from a terminal on the same wall	750	Should not be used
M	Above the highest point of an intersection with the roof	600 (6)	1000 (5)
N	From a vertical structure to the side of the terminal	750 (6)	2300
O	Above a vertical structure which is less than 750mm (pressure jet burner) or 2300mm (vaporising burner) horizontally from the side of the terminal	600 (6)	1000 (5)
P	From a ridge terminal to a vertical structure on the roof	1500	Should not be used

**Notes:**

- Terminals should only be positioned on walls where appliances have been approved for such configurations when tested in accordance with BS EN 303-1:1999 or OFTEC standards OFS A100 or OFS A101.
- An opening means an openable element, such as an openable window, or a permanent opening such as a permanently open air vent.
- Notwithstanding the dimensions above, a terminal should be at least 300mm from combustible material, e.g. a window frame.
- A way of providing protection of combustible material would be to fit a heat shield at least 750mm wide.
- Where a terminal is used with a vaporising burner, the terminal should be at least 2300mm horizontally from the roof.
- Outlets for vertical balanced flues in locations M, N and O should be in accordance with manufacturer's instructions.

## Flues for oil-fired appliances: flue gas temperature

**4.9** Satisfactory provision of *chimneys* and *fluepipes* depends upon the flue gas temperature to be expected in normal service and separate guidance is given in this Approved Document according to whether the proposed installation will have a flue gas temperature more than or less than 250°C as measured by a suitable method such as those in OFTEC Standards A100 or A101. Suitable *chimney* systems may then be selected based on their performance *designation* having been tested in accordance with the relevant European standard.

**4.10** Flue gas temperatures depend upon appliance types and the age of their design. Modern boilers bearing the CE mark, indicating compliance with the *Boiler (Efficiency) Regulations (1993)*, normally have flue gas temperatures not exceeding 250°C. Condensing oil-fired appliances will normally produce flue gas temperatures well below 100°C. Information for individual appliances should be sought from the manufacturer's *installation instructions*, from the manufacturers themselves or from OFTEC. Where this is not available, *flues* should be constructed for an assumed flue gas temperature greater than 250°C.

## Provisions for flue gas temperatures in excess of 250°C

**4.11** A way of making satisfactory provision for oil appliances in these cases would be to follow the guidance given in Sections 1 and 2 for connecting *fluepipes* and masonry or *flueblock chimneys* or to provide a *factory-made metal chimney* in accordance with Paragraphs 1.42 to 1.46 in Section 1 (but not Paragraph 1.42(b)). However, other products may be acceptable if they have been *certified* for this purpose.

## Provisions for flue gas temperatures not exceeding 250°C

**4.12** Satisfactory provision of *chimneys* and *fluepipes* for oil appliances in these cases may be achieved by:

- a. following the guidance on the selection of components and the manner of their installation as given in Paragraphs 4.13 to 4.20 and the references to Section 1 or (if the intended appliance is new and of known type);
- b. i) using factory-made components that achieve a performance at least equal to that corresponding to the *designation* given in Table 8 (for the intended appliance type) when tested to an appropriate European *chimney* standard (BS EN); and

- ii) installing these components in accordance with the guidance in Paragraphs 4.13 to 4.20 and Section 1, as relevant, and in accordance with the appliance manufacturer's and component manufacturer's *installation instructions*.

**Table 8 Minimum performance designations for chimney and fluepipe components for use with new oil-fired appliances with flue gas temperature less than 250°C**

Appliance type	Minimum designation	Fuel type
Condensing boiler, including combination boiler, range cooker, range cooker/boiler – with pressure-jet burners	T120 N2 W1 O	Class C2 oil (kerosene) Liquid biofuel conforming to EN 14213:2003
Condensing boiler, including combination boiler, range cooker, range cooker/boiler – with pressure-jet burners	T160 N2 W2 O	Class D oil (heating oil)
Non-condensing boiler, including combination boiler, range cooker, range cooker/boiler – with pressure-jet burners	T250 N2 D1 O	Class C2 oil (kerosene) Liquid biofuel conforming to EN 14213:2003
Non-condensing boiler, including combination boiler, range cooker, range cooker/boiler – with pressure-jet burners	T250 N2 D2 O	Class D oil (heating oil)
Cooker and room heater – with vaporising burner	T160 N2 D1 O	Class C2 oil (kerosene)
Cooker and room heater – with vaporising burner	T250 N2 D2 O	Class D oil (heating oil)

**Notes:**

- The designation of chimney products is described in Appendix G. The BS EN for the product will specify its full designation and marking requirements.
- These are default designations. Where the appliance manufacturer's installation instructions specify a higher designation, this should be complied with.
- Refer to the appliance manufacturer regarding the suitability of the appliance and flue system for use with oil / bio-liquid blends.

## Connecting fluepipe components

**4.13** Connecting *fluepipes* can be constructed using the following components:

- a. any of the options listed in Paragraph 1.32; or
- b. sheet metal *fluepipes* as described in BS EN 1856-2:2004; or
- c. fibre cement pipes as described in BS EN 1857:2003+A1:2008; or
- d. any other component that has been certified as suitable for this purpose.

## Masonry chimneys

**4.14** Masonry *chimneys* can be built in accordance with Paragraphs 1.27 and 1.28 in Section 1.

## Flueblock chimneys

**4.15** *Chimneys* can be constructed from factory-made flueblock systems primarily designed for solid fuel, as described in Paragraphs 1.29 and 1.30 in Section 1. They can also be constructed from factory-made flueblock systems comprising straight blocks, recess units, lintel blocks, offset blocks, transfer blocks and jointing materials complying with:

- a. BS EN 1858:2003 for concrete flueblocks; or
- b. BS EN 1806:2006 for clay/ceramic flueblocks, with a performance at least equal to the *designation* given in Table 8 for the intended appliance type.

**4.16** *Flueblock chimneys* should be installed with sealed joints in accordance with the flueblock manufacturer's *installation instructions*. Where bends or offsets are required, these should be formed using matching factory-made components. Flueblocks which are not intended to be bonded into surrounding masonry should be supported and restrained in accordance with the manufacturer's *installation instructions*.

## Factory-made metal chimneys

**4.17** *Chimneys* for oil-fired appliances can be constructed using the systems described in Paragraphs 1.42 to 1.46 in Section 1.

## Location and shielding of flues

**4.18** A way of protecting the building fabric from the heat dissipation from *flues*, where flue gas temperatures are not expected to exceed 250°C, would be to follow the guidance in Table 9.

**4.19** Where a *fluepipe* or *chimney* penetrates a *fire compartment* wall or floor, it must not breach the fire separation requirements of Part B. See Approved Document B for more guidance.

**4.20** *Fluepipes* and factory-made *chimneys* should also be guarded if they could be at risk of damage or if they present a hazard to people that is not immediately apparent such as when they traverse intermediate floors out of sight of the appliance.

**Table 9 Protecting buildings from hot flues for flue gas temperatures not more than 250°C**

Flue within:	Protection measures
Connecting fluepipe	Flues should be at least 25mm from any combustible material (measured from the outer surface of the flue wall, or the outer surface of the inner wall in the case of multi-walled products). Where passing through a combustible wall, floor or roof (other than a compartment wall floor or roof) this separation can be achieved by a non-combustible sleeve enclosing the fluepipe or chimney with a 25mm air-space to the relevant flue wall. (The air-space could be wholly or partially filled with non-combustible insulating material.)
Factory-made chimney designated in accordance with BS EN 1856-1:2003	
Factory-made chimney designated in accordance with BS EN 1856-1:2003 and BS EN 1856-2:2004	Install in accordance with Paragraph 1.45 of this Approved Document with minimum separation distances according to flue designation.
Masonry chimney	Provide at least 25mm of masonry between flues and any combustible material.
Flueblock chimney	Provide flueblock walls at least 25mm thick.
Flue assemblies for room-sealed appliances	<ol style="list-style-type: none"> <li>a) flues passing through combustible walls should be surrounded by insulating material at least 50mm thick.</li> <li>b) provide a clearance of at least 50mm from the edge of the flue outlet to any combustible wall cladding.</li> </ol>

## Relining of flues in chimneys

**4.21** Lining or relining *flues* may be building work and, in any case, such work should be carried out so that the objectives of requirements J2 to J5 are met (see Paragraphs 1.34 and 1.35). For *flue liners* serving oil appliances, ways of meeting the requirements include the use of:

- a. linings suitable for use if the flue gas temperature can be expected to exceed 250°C such as:
  - i. liners as described in Paragraph 1.27;
  - ii. liners as described in Paragraph 2.20;
  - iii. flexible stainless steel liners designated in accordance with BS EN 1858:2008;
  - iv. other systems which have been certified as suitable for this purpose.

- b. linings suitable for use if the flue gas temperature is unlikely to exceed 250°C such as:
  - i. any of the linings described in (a) above;
  - ii. other systems which have been certified as suitable for this purpose;
  - iii. (if the appliance is new and of known type) flue lining systems that have a performance at least equal to that corresponding to the *designation* given in Table 8 for the intended appliance type.

**4.22** Flexible metal *flue liners* should be installed in one complete length without joints within the *chimney*. Other than for sealing at the top and the bottom, the space between the *chimney* and the liner should be left empty unless this is contrary to the manufacturer's instructions. Double-skin flexible *flue liners* should be installed in accordance with the manufacturer's *installation instructions*. Liners should be installed in accordance with BS EN 15827-1:2007.

## Flues for appliances burning Class D oil

**4.23** *Flues* which may be expected to serve appliances burning Class D oil should be made of materials which are resistant to acids of sulphur, i.e. minimum flue *designation* 'D2' for non-condensing appliances or 'W2' for condensing appliances, according to the *designation* system in BS EN 1443:2003 and related flue standards.

## Hearths for oil-fired appliances

**4.24** *Hearths* are needed to prevent the building catching fire and, whilst it is not a health and safety provision, it is customary to top them with a tray for collecting spilled fuel.

**4.25** If the operation of an appliance is unlikely to cause the temperature of the floor below it to exceed 100°C, as shown using an appropriate test procedure such as those in *OFTEC Standards A 100 and A 101*, special measures may be unnecessary beyond the provision of a rigid, imperforate, and non-absorbent sheet of *non-combustible material* such as a steel tray. This may be provided as an integral part of the appliance.

**4.26** If the appliance could cause the temperature of the floor below it to exceed 100°C, a more substantial *hearth* is required. A way of meeting the requirement would be to provide a *hearth* of solid *non-combustible material* at least 125mm thick (which may include the thickness of any non-combustible floor) with plan dimensions not less than those shown in Diagram 24 in Section 2. It should have no combustible material below it unless there is an air-space of at least 50mm between the material and the underside of the *hearth*, or there is a distance of at least 250mm

between the material and the top of the *hearth* (see Diagram 25 in Section 2).

**4.27** To provide a region around the appliance which is free of any combustible material, the appliance should not be placed closer to the edges of the *hearth* nor closer to any combustible material which is laid over the *hearth* than the distances shown in Diagram 42. The perimeter of this safe region should be marked to provide a warning to the building occupants and to discourage combustible floor finishes such as carpet from being laid too close to the appliance. A way of achieving this would be to provide a change in level.

## Shielding of oil-fired appliances

**4.28** Combustible materials adjacent to oil-fired appliances may need protection from the effects of heat. Special measures may be unnecessary if the materials will not be subjected to temperatures in excess of 100°C, but otherwise a way of meeting the requirement would be to protect combustible fabric with:

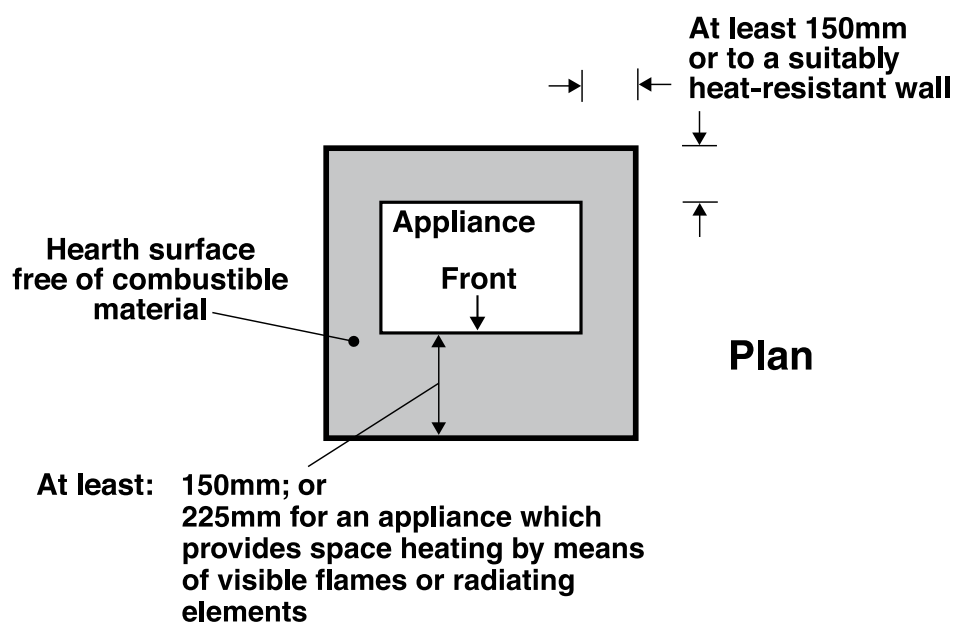
- a. a shield of *non-combustible material*, such as insulating board with fire-resistant surface; or
- b. an air-space of at least 75mm (see Diagram 39 in Section 3).

**4.29** Appliances having surface temperatures during normal operation of no more than 100°C would not normally require shielding.

## Alternative approach

The requirements may also be met by adopting the relevant recommendations in the publication listed below to achieve an equivalent level of performance to that obtained by following the guidance in this Approved Document: BS 5410-1:1997 *Code of practice for oil firing. Installations up to 45kW output capacity for space heating and hot water supply purposes*.

Diagram 42 **Location of an oil-fired appliance in relation to its hearth.**  
**Minimum dimensions of the heat-resistant material in the hearth and the clear zone of non-combustible surface**



# Section 5: Provisions for liquid fuel storage and supply

## Performance

**5.1** In the Secretary of State's view requirements J6 and J7 will be met if:

- a. oil and LPG fuel storage installations including the pipework connecting them to the *combustion appliances* in the buildings they serve are located and constructed so that they are reasonably protected from fires which may occur in buildings or beyond *boundaries*;
- b. oil storage tanks, their ancillary equipment and the pipework connecting them to *combustion appliances* in buildings used wholly or mainly for private dwellings:
  - i. are reasonably resistant to physical damage and corrosion and are designed and installed so as to minimise the risk of oil escaping during the filling or maintenance of the tank; and
  - ii. incorporate secondary containment when there is a significant risk of pollution; and
  - iii. are labelled with information on how to respond to a leak.

## Heating oil storage installations

**5.2** Guidance is given in this Approved Document on ways of meeting requirements J6 and J7 when proposing to construct oil storage systems with above-ground or semi-buried tanks of 3500 litres *capacity* or less, used exclusively for heating oil. Heating oils comprise Class C2 oil (kerosene) or Class D oil (gas oil) as specified in BS 2869:1998, liquid biofuel conforming to EN 14213:2003 and blends of mineral oil and liquid biofuel. A way of meeting requirements J6 and J7 for such installations would be to follow the relevant recommendations in BS 5410-1:1997, whilst also adopting the guidance in paragraphs 5.4 to 5.12.

**5.3** Requirement J7 does not apply to oil storage systems where the *capacity* of the tank exceeds 3500 litres, or where the tank is fully buried or where the building served is not wholly or mainly used as one or more private dwellings. However, requirement J6 applies to oil storage systems serving buildings of all descriptions, where the capacity of the tank exceeds 90 litres, with no upper *capacity* limit on application, and including cases where the tank is buried. For tanks with capacities in excess of 3500 litres, advice on ways of complying with requirements J6 and any other fire precautions legislation may be sought from the Fire Authority. In England tanks serving buildings which are not wholly or

mainly used as private dwellings are likely to be subject to the Control of Pollution (Oil Storage) (England) Regulations 2001 (see paragraph 5.7).

## Protective measures against fire

**5.4** A way of achieving compliance with requirement J6 would be to adopt the guidance given in Table 10, which also offers advice on reducing the risk of fuel storage system fires igniting buildings and to make provision against the installation becoming overgrown. This can be achieved with a hard surface beneath the tank such as concrete, or paving slabs at least 42mm thick, extending out at least 300mm beyond the perimeter of the tank (or its external skin if it is of the integrally banded type).

**Table 10 Fire protection for oil storage tanks**

Location of tank	Protection usually satisfactory
Within a building	Locate tanks in a place of special fire hazard which should be directly ventilated to outside. Without prejudice to the need for compliance with all the requirements in Schedule 1, the need to comply with Part B should particularly be taken into account.
Less than 1800mm from any part of a building	<ol style="list-style-type: none"> <li>a) Make building walls imperforate (1) within 1800mm of tanks with at least 30 minutes fire resistance (2) to internal fire and construct eaves.</li> <li>b) Provide a fire wall (3) between the tank and any part of the building within 1800mm of the tank and construct eaves as in (a) above. The fire wall should extend at least 300mm higher and wider than the affected parts of the tank.</li> </ol>
Less than 760mm from a boundary	Provide a fire wall between the tank and the boundary or a boundary wall having at least 30 minutes fire resistance to fire on either side. The fire wall or the boundary wall should extend at least 300mm higher and wider than the top and sides of the tank.
At least 1800mm from the building and at least 760mm from a boundary	No further provisions necessary.

**Notes:**

1. Excluding small openings such as air bricks etc.
2. Fire resistance in terms of insulation, integrity and stability as determined by testing to the relevant parts of BS 476 or BS EN 1363 or BS EN 1364.
3. Fire walls are imperforate non-combustible walls or screens, such as masonry walls or fire-rated composite panel screens.

**5.5** *Fire walls* should be built to be stable so as not to pose a danger to people around them. A way of achieving this when constructing masonry walls would be to follow the guidance on wall thickness in relation to height given in *Your garden walls: Better to be safe than sorry* (See 'Other Publications referred to').

## Oil supply pipe systems: means of automatic isolation

**5.6** A way of meeting the requirement would be to install fuel pipework which is resistant to the effects of fire and to fit a proprietary fire valve system in accordance with the relevant recommendations in BS 5410-1:1997, Sections 8.2 and 8.3.

## Provisions where there is a risk of oil pollution

**5.7** The Control of Pollution (Oil Storage) (England) Regulations 2001 (SI 2001/2954) came into force on 1 March 2002. They apply to a wide range of oil storage installations in England, but they do not apply to the storage of oil on any premises used wholly or mainly as one or more private dwellings, if the *capacity* of the tank is 3500 litres or less. Advice on the construction of above-ground oil storage tanks that may be subject to these Regulations is contained in *Above Ground Oil Storage Tanks: PPG2 (2004)*.

**Note:** Below ground oil storage is not recommended where other options are available as underground tanks are difficult to inspect and leaks may not be immediately obvious. Some guidance and further sources of reference are contained in *installation, decommissioning and removal of underground storage tanks: PPG27(2002)*.

**5.8** Requirement J6 applies to oil storage tanks of 3500 litres or less serving *combustion appliances* in buildings used wholly or mainly as private dwellings. In such cases, secondary containment should be provided where there is a significant risk of oil pollution. For the purposes of requirement J6, there is a significant risk of pollution if the oil storage installation:

- has a total *capacity* of more than 2500 litres; or
- is located within 10m of inland freshwaters or coastal waters; or
- is located where spillage could run into an open drain or to a loose-fitting manhole cover; or
- is located within 50m of sources of potable water, such as wells, bore-holes or springs; or
- is located where oil spilled from the installation could reach the waters listed above by running across hard ground; or
- is located where tank vent pipe outlets cannot be seen from the intended filling point.

- is located within Zone 1 (inner protection zone) of an Environment Agency Groundwater Source Protection Zone (SPZ).

**Note:** The location of SPZs is shown on the Environment Agency's Groundwater Sources map available online at [www.environment-agency.gov.uk/research/library/maps](http://www.environment-agency.gov.uk/research/library/maps).

**5.9** Inland freshwaters include streams, rivers, reservoirs and lakes, as well as ditches and ground drainage (including perforated drainage pipes) that feed into them.

**5.10** When secondary containment is considered necessary, a way of meeting the requirement would be to:

- provide an integrally bundled prefabricated tank; or
- construct a bund from masonry or concrete in accordance with the general guidance in *Above Ground Oil Storage Tanks: PPG2 (2004)* and the specific advice in *Masonry Bunds for Oil Storage Tanks or Concrete Bunds for Oil Storage Tanks*, as appropriate. However:
- where the bund walls are part of the walls of a chamber or building enclosing the tank, any door through such walls should be above bund level; and
- specialist advice should be sought where the bund has a structural role as part of a building.

**5.11** Bunds, whether part of prefabricated tank systems or constructed on site, should have a *capacity* of at least 110 per cent of the largest tank they contain. Integrally bundled oil tanks that comply with the following standards will meet this provision:

- OFS T100 Oil Firing Equipment Standard – Polyethylene Oil Storage Tanks for Distillate Fuels (2008);
- OFS T100 Oil Firing Equipment Standard – Steel Oil Storage Tanks and Tank Bunds for use with Distillate Fuels, Lubrication Oils and Waste Oils (2008).

**5.12** An oil storage installation should carry a label in a prominent position giving advice on what to do if an oil spill occurs and the telephone number of the Environment Agency's Emergency Hotline (see Appendix F).

## LPG storage installations

**5.13** LPG installations are controlled by legislation enforced by the HSE or their agents. Factors which determine the amount of building work necessary for a LPG storage installation to comply include its *capacity*, whether tanks are installed above or below ground and the nature of the premises they serve. A storage installation may be shown to comply with the legislation by constructing it in accordance with an appropriate industry Code of Practice, prepared in

consultation with the HSE. However, for an installation of up to 1.1 tonne *capacity*, whose tank stands in the open air, following the guidance in this Approved Document and the relevant guidance in Approved Document B, will normally ensure that no further building work is needed to comply with other legislation.

## Tank location and protective measures

**5.14** For LPG storage systems of up to 1.1 tonne *capacity*, comprising one tank standing in the open air, a way of meeting the requirement J6 would be to comply with the relevant recommendations in the UKLPG Code Of Practice 1: Bulk LPG Storage at Fixed Installations Part 1 (2009) and BS 5482-1:2005 (see Appendix F and 'Other Publications referred to') whilst also adopting the following guidance:

**5.15** The LPG tank should be installed outdoors and not within an open pit. The tank should be adequately separated from buildings, the *boundary* and any fixed sources of ignition to enable safe dispersal in the event of venting or leaks and in the event of fire to reduce the risk of fire spreading. A way of meeting the requirements in normal situations would be to adopt the separation distances in Table 11 and Diagram 43, which also offers advice on reducing the risk of LPG storage fires igniting the building. Drains, gullies and cellar hatches within the separation distances should be protected from gas entry.

**5.16** *Fire walls* may be free-standing walls built between the tank and the building, *boundary* and fixed source of ignition (see Diagram 43 (b)) or a part of the building or a boundary wall belonging to the property. Where a *fire wall* is part of the building or a boundary wall, it should be located in accordance with Diagram 43(c) and, if part of the building, constructed in accordance with Diagram 43(d).

**5.17** Suitable *fire walls* would be imperforate and of solid masonry, concrete or similar construction. They should have a *fire resistance* (insulation, integrity and stability (REI)) of at least 30 minutes but, if part of the building as shown in Diagram 43 (d), they should have a *fire resistance* (REI) of at least 60 minutes. To ensure good ventilation, *fire walls* should not normally be built on more than one side of a tank.

**5.18** A *fire wall* should be at least as high as the pressure relief valve. It should extend horizontally such that the separation specified in Table 11 (Column B) is maintained:

- when measured around the ends of the *fire wall* as shown in Diagram 43(b); or
- when measured to the ends of the *fire wall* as shown in Diagram 43(c), if the *fire wall* is the *boundary* or part of the building.

## Location and support of cylinders

**5.19** Where an LPG storage installation consists of a set of cylinders, a way of meeting the requirements would be to follow the provisions below and as shown in Diagram 44.

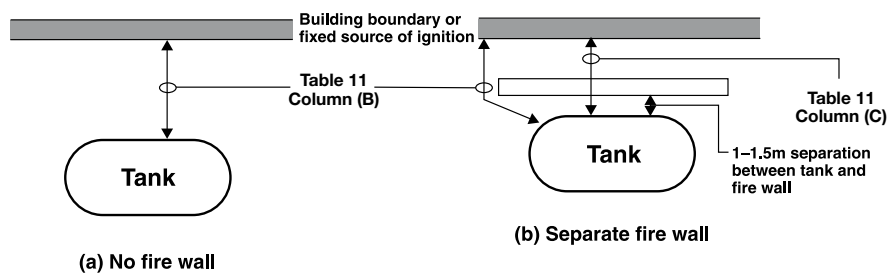
**5.20** Provisions should enable cylinders to stand upright, secured by straps or chains against a wall outside the building in a well-ventilated position at ground level, where they are readily accessible, reasonably protected from physical damage and where they do not obstruct exit routes from the building. Satisfactory building work provisions would be to provide a firm level base such as concrete at least 50mm thick or paving slabs bedded on mortar at a location so that cylinder valves will be:

- at least 1m horizontally and 300mm vertically from openings in the building or heat sources such as flue terminals and tumble-dryer vents; and
- at least 2m horizontally from drains without traps, unsealed gullies or cellar hatches unless an intervening wall not less than 250mm high is provided.

**Table 11 Fire protection for LPG storage tanks (see Diagram 43)**

(A) Capacity of tank not exceeding (tonnes):	Minimum separation distances from buildings, boundaries or fixed sources of ignition (metres)	
	(B) To a tank with no fire wall or to a tank around a fire wall	(C) To a tank shielded by a fire wall
0.25	2.5	0.3
1.1	3	1.5

**Diagram 43 Separation or shielding of liquefied petroleum gas tanks of up to 1.1 tonne capacity from buildings, boundaries and fixed sources of ignition**



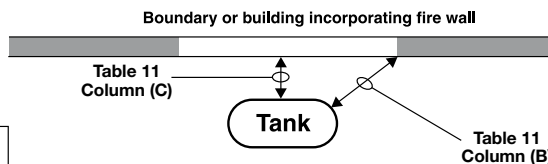
## Example

a 1.1 tonne tank could be located:

3m from a boundary  
(Diagram (a))

or

2m from a boundary with an intervening fire wall. The fire wall would stand between 1m and 1.5m from the tank and be wide enough to ensure that the shortest path from tank to boundary remains 3m (Diagram (b))



(c) Boundary incorporating fire wall  
or  
Building incorporating fire wall  
(see also Diagram (d) below)

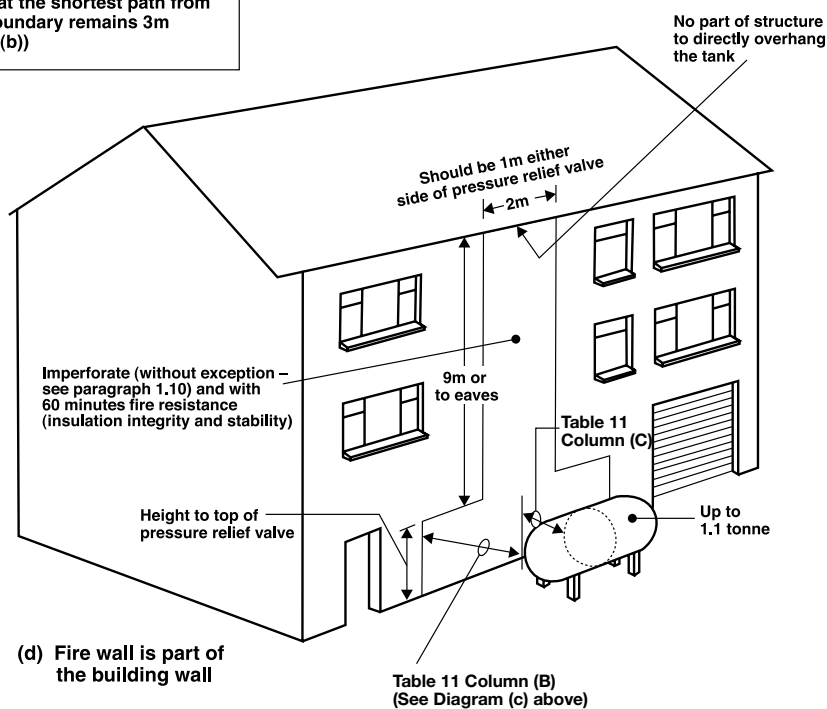
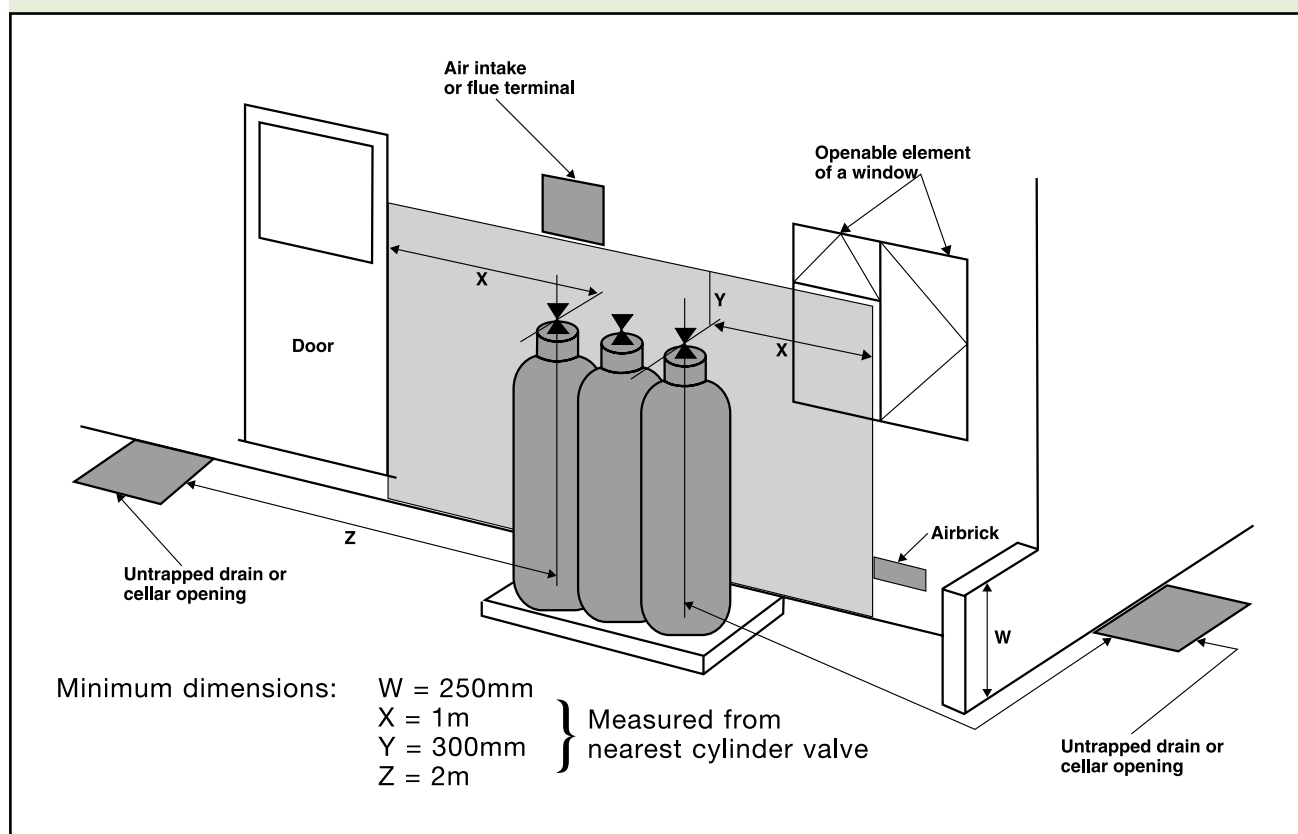


Diagram 44 Location of LPG cylinders



## LPG pipework (Informative)

**5.21** For the purposes of the Gas Safety (Installation and Use) Regulations 1998 (GSIUR), where the LPG service pipework runs underground from the LPG tank to the premises it should be manufactured of non-corroding material. Pipe entering the building should be manufactured from metallic material and the transition joints between the non-metallic and metallic pipe should be located outdoors. The pipe should enter the building above ground and be sleeved. The sleeve should be continuous through the external wall and be sealed at the inner wall to ensure that any escapes of gas are vented to the outside only. Further guidance is available in UKLPG Code of Practice 22 and Institution of Gas Engineers and Managers standard IG/TD/4.

**5.22** In respect of installation pipework subject to the provisions of the GSIUR, Regulation 19(6) of the GSIUR requires that installation pipework should not be installed in any shaft, duct or void which is not adequately ventilated. This is also applicable to LPG pipework in buildings not subject to GSIUR. Guidance on the ventilation of pipe in ducts can be found in BS 8131:1997 Code of Practice for accommodation of building services in ducts.

# Appendix A: Checklist for checking and testing of hearths, fireplaces, flues and chimneys

**EXAMPLES: SEE PARAGRAPH 1.55**

## Hearth, fireplace, flues and chimneys

The checklist can help you to ensure hearths, fireplaces, flues and chimneys are satisfactory. If you have been directly engaged, copies should also be offered to the client and to the Building Control Body to show what you have done to comply with the requirements of Part J. If you are a sub-contractor, a copy should be offered to the main contractor.

1. <b>Building address, where work has been carried out</b> .....				
.....				
.....				
2. <b>Identification of hearth, fireplace, chimney or flue.</b>	<i>Example:</i> Fireplace in lounge	<i>Example:</i> Gas fire in rear addition bedroom	<i>Example:</i> Small boiler room	
3. <b>Firing capability: solid fuel/gas/oil/all.</b>	All	Gas only	Oil only	
4. <b>Intended type of appliance. State type or make. If open fire give finished fireplace opening dimensions.</b>	Open fire 480 W x 560 H (mm)	Radiant/convactor fire 6kW input	Oil fire boiler 18kW output (pressure jet)	
5. <b>Ventilation provisions for the appliance: State type and area of permanently open air vents.</b>	2 through wall ventilators each 10,000mm <sup>2</sup> (100cm <sup>2</sup> )	Not fitted	Vents to outside: Top 9,900mm <sup>2</sup> Bottom 19,800mm <sup>2</sup>	
6. <b>Chimney or flue construction</b>				
a) <b>State the type and make and whether new or existing.</b>	New. Brick with clay liners	Existing masonry	S.S. prefab to BS 4543-2	
b) <b>Internal flue size (and equivalent height, where calculated – natural draught gas appliances only).</b>	200mm Ø	125mm Ø (H <sub>0</sub> =3.3m)	127mm Ø	
c) <b>If clay or concrete flue liners used confirm they are correctly jointed with socket end uppermost and state joining materials used.</b>	Sockets uppermost Jointed by fire cement	Not applicable	Not applicable	
d) <b>If an existing chimney has been refurbished with a new liner, type or make of liner fitted.</b>	Not applicable to BS 715	Flexible metal liner	Not applicable	
e) <b>Details of flue outlet terminal and diagram reference.</b>				
	<b>Outlet detail:</b>	Smith Ltd Louvred pot 200mm Ø	125mm Ø GC1 terminal	Maker's recommended terminal
	<b>Compiles with:</b>	As Diagram 17, AD J	As BS 5440-1:2008	As Diagram 41, AD J
f) <b>Number and angle of bends.</b>	2 x 45°	2 x 45°	1 x 90° Tee	
g) <b>Provision for cleaning and recommended frequency.</b>	Sweep annually via fireplace opening	Annual service by Gas Safe Register engineer	Sweep annually via base of Tee and via appliance	
7. <b>Hearth, form of construction. New or existing?</b>				
	<u>New.</u> Tiles on concrete floor. 125mm thick. As Diagram 25 AD J	<u>Existing</u> hearth for solid fuel fire, with fender.	<u>New.</u> Solid floor Min 125mm concrete above DPM. As Diagram 42, ADJ	
8. <b>Inspection and testing after completion</b>				
<b>Test carried out by:</b>				
<b>Test (Appendix E in AD J) and results</b>				
<b>Flue inspection</b>	<b>visual</b>	Not possible, bends	Not possible, bends	Checked to Section 10, BS7566:Part 3: 1992 – OK
	<b>sweeping</b>	OK	Not applicable	OK
	<b>coring ball</b>	OK	Not applicable	OK
	<b>smoke</b>	OK	Not applicable	OK
	<b>Appliance (where included) spillage</b>	Not included	OK	OK

I/We the undersigned confirm that the above details are correct. In my opinion, these works comply with the relevant requirements in Part J of Schedule 1 to the Building Regulations.

Print name and title ..... Profession .....

Capacity ... (e.g. "Proprietor of Smith's Flues", Authorising Engineer for Brown plc) ..... Tel no. ....

Address ..... Postcode .....

Signed ..... Date .....

Registered membership of ... (e.g. GasSafe, OFTEC, HETAS, NACE, NACS) .....

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<h2 style="text-align: center;">Hearth, fireplace, flues and chimneys</h2> <p>The checklist can help you to ensure that hearths, fireplaces, flues and chimneys are satisfactory. If you have been directly engaged, copies should also be offered to the client and to the Building Control Body to show what you have done to comply with the requirements of Part J. If you are a sub-contractor, a copy should be offered to the main contractor.</p>	
<b>1. Building address, where work has been carried out.</b> ..... ..... .....	
<b>2. Identification of hearth, fireplace, chimney or flue.</b>	
<b>3. Firing capability: solid fuel/gas/oil/all.</b>	
<b>4. Intended type of appliance. State type or make. If open fire give finished fireplace opening dimensions.</b>	
<b>5. Ventilation provisions for the appliance: State type and area of permanently open air vents.</b>	
<b>6. Chimney or flue construction</b> a) <b>State the type and make and whether new or existing.</b> b) <b>Internal flue size (and equivalent height, where calculated – natural draught gas appliances only).</b> c) <b>If clay or concrete flue liners used confirm they are correctly jointed with socket end uppermost and state joining materials used.</b> d) <b>If an existing chimney has been refurbished with a new liner, type or make of liner fitted.</b> e) <b>Details of flue outlet terminal and diagram reference.</b> <div style="text-align: right;"> <b>Outlet detail:</b>  <b>Complies with:</b> </div> f) <b>Number and angle of bends.</b> g) <b>Provision for cleaning and recommended frequency.</b>	
<b>7. Hearth, form of construction. New or existing?</b>	
<b>8. Inspection and testing after completion</b> <b>Test carried out by:</b> <b>Test (Appendix E in AD J) and results</b> <div style="display: flex; justify-content: space-between;"> <div> <b>Flue inspection</b>    <b>Appliance (where included) spillage</b> </div> <div style="text-align: right;"> <b>visual</b>  <b>sweeping</b>  <b>coring ball</b>  <b>smoke</b> </div> </div>	
<p>I/We the undersigned confirm that the above details are correct. In my opinion, these works comply with the relevant requirements in Part J of Schedule 1 to the Building Regulations.</p> <p>Print name and title ..... Profession .....</p> <p>Capacity ...(e.g. "Proprietor of Smith's Flues", Authorising Engineer for Brown plc)..... Tel no. ....</p> <p>Address ..... Postcode .....</p> <p>Signed ..... Date .....</p> <p>Registered membership of ... (e.g. GasSafe, OFTEC, HETAS, NACE, NACS) .....</p>	

# Appendix B: Opening areas of large or unusual fireplaces

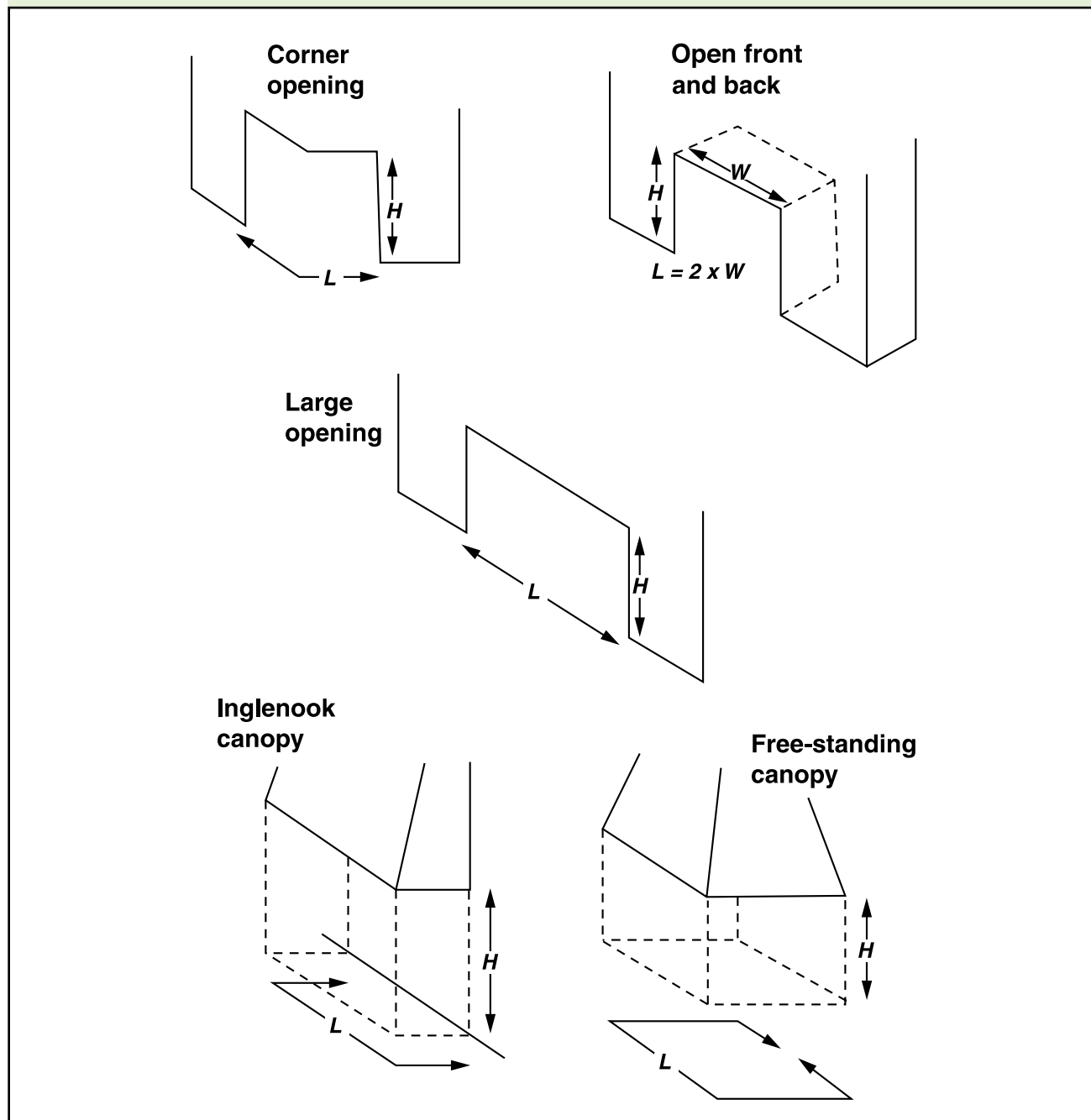
## (SEE PARAGRAPH 2.7)

**B1** The opening area of a fireplace should be calculated from the following formula:

$$\text{Fireplace opening area (mm}^2\text{)} = \left( \frac{\text{Total horizontal length of fireplace opening}}{L \text{ (mm)}} \right) \times \left( \frac{\text{Height of fireplace opening}}{H \text{ (mm)}} \right)$$

**B2** Examples of L and H for large and unusual fireplace openings are shown in Diagram 45.

Diagram 45 **Large or unusual fireplace openings. (Note: for use with this Appendix, measure L, H and W in mm)**



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## Appendix C: Example calculation of the ventilation requirements of a gas-fired appliance

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### (SEE DIAGRAM 32)

**C1** An open-flued boiler with a rated input of 15kW (net) is installed in an *appliance compartment* such as a boiler room, which is ventilated directly to the outside. The design of the boiler is such that it requires cooling air in these circumstances.

**C2** The cooling air is exhausted via vent D, which has an area:

$$15\text{kW} \times 500 \frac{\text{mm}^2}{\text{kW}} = 7500\text{mm}^2$$

**C3** Vent E allows the cooling air to enter, as well as admitting the air needed for combustion and the safe operation of the *flue*. It has an area:

$$15\text{kW} \times 1000 \frac{\text{mm}^2}{\text{kW}} = 15,000\text{mm}^2$$

**C4** The ventilation areas in cm<sup>2</sup> can be found by dividing the results given above in mm<sup>2</sup> by 100.

## Appendix D: Example calculation of the ventilation requirements of an oil-fired appliance

### (SEE DIAGRAM 40)

**D1** An *open-flued appliance* is installed in an *appliance compartment* such as a cupboard, which is ventilated via an adjoining room. The air permeability of the dwelling is 6.0 m<sup>3</sup>/(h.m<sup>2</sup>) at 50Pa. The appliance has a rated output of 11kW, i.e. 6kW more than the rating at which permanent ventilation openings become necessary for the adjoining room.

**D2** Air for combustion and the safe operation of the *flue* enters the adjoining room partially through infiltration, with the balance entering via vent A, whose area is calculated as follows:

$$(11\text{kW} - 5\text{kW}) \times 550 \frac{\text{mm}^2}{\text{kW}} = 3300\text{mm}^2$$

**D3** The cooling air for the *appliance compartment* is exhausted through vent B, which has an area:

$$11\text{kW} \times 1100 \frac{\text{mm}^2}{\text{kW}} = 12,100\text{mm}^2$$

**D4** All of the air for combustion and the safe operation of the *flue* as well as cooling air enters the *appliance compartment* through vent C, which has an area:

$$11\text{kW} \times 1650 \frac{\text{mm}^2}{\text{kW}} = 18,150\text{mm}^2$$

**D5** The ventilation areas in cm<sup>2</sup> can be found by dividing the results given above in mm<sup>2</sup> by 100.

# Appendix E: Methods of checking compliance with requirement J2

## (SEE PARAGRAPHS 1.36 AND 1.54)

**E1** This Appendix describes ways of checking the compliance with J2 of existing, relined or new *flues*, and (where included in the work) the *combustion appliance*. It applies only to *natural draught flues* intended for *open-flued appliances*. The procedures described are used only to assess whether the *flue* in the *chimney*, the connecting *fluepipe* (and flue gas passages in the appliance) are free of obstruction and acceptably gas-tight. In addition, appliance performance tests, including flue spillage tests to check for compliance with J2, should be carried out when an appliance is commissioned to check for compliance with Part L and as required by the Gas Safety (Installation and Use) Regulations.

**E2** Tests on *flues* should be carried out at the most appropriate time during the building work. Where possible, for example, smoke tests should be performed when the structure of a *chimney* is visible and before the application of finishes such as plaster or dry lining that could obscure sight of smoke leakage during testing.

## Testing applications

### Tests for existing flues

**E3** *Flues* in existing *chimneys* can be obstructed by nests, debris resulting from deterioration of the structure (e.g. brickwork, flue lining material or pieces of *chimney* pot) and by soot and tar. *Flues* in existing *chimneys* may also leak as a result of holes or cracks appearing in the structure and linings, particularly at joints. The top, exposed part of a *chimney* is particularly prone to decay. A way of checking the state of a *flue* prior to bringing it back into use would be to do the following:

- a. Sweep the *flue*. This is intended to clean the *flue* to demonstrate that it is essentially free from obstructions and to enable better visual inspection and testing of the *flue*. Tar deposits caused by burning wood may be especially hard to dislodge and should be removed. The debris that comes down the *chimney* when sweeping should be examined for excessive quantities of lining or brick that are signs that further repairs are necessary.
- b. Carry out a visual inspection of the accessible parts to identify:
  - i. Deterioration in the structure, connections or linings which could affect the flue's gas-tightness and safe performance with the proposed *combustion appliance*. Examine the interior of the *flue* and the exterior of the *chimney* including in the roof-space. The presence of smoke or tar stains on the exterior of a chimney/breast is a sign of leaks that possibly indicate damage;

- ii. Modifications made whilst the *flue* was out of service, such as the fitting of a ventilator terminal, which would be incompatible with using the *flue* with the intended appliance;
- iii. Correct lining and lining sizes for the proposed new application.
- c. Perform checks where necessary to demonstrate that the *flue* is free from restriction: a visual check may be sufficient where the full length of the *flue* can be seen. In cases of doubt, a way of checking this would be to carry out a coring ball test.
- d. Check the gas-tightness of the *flue* by carrying out a smoke test.

## New masonry and flueblock chimneys

**E4** Check during construction that liners are installed the right way up, with sockets facing upwards and joints are sealed so that moisture and condensate will be contained in the *chimney*.

**E5** *Flues* in new masonry *chimneys* can be obstructed, particularly at bends, by debris left during construction or by excess mortar falling into the *flue* or by jointing material extruded from between liners and flueblocks. The *flues* should be checked to demonstrate that they have been correctly constructed and are free of restrictions and acceptably gas-tight.

A way of checking the condition of a new *flue* prior to bringing it into use would be to do the following:

- a. Carry out a visual inspection of the accessible parts to check that the lining, liners or flueblocks are of the correct materials and of suitable size for the proposed application.
- b. Perform checks where necessary to demonstrate that the *flue* is free from restriction: a visual check may be sufficient where the full length of the *flue* can be seen. In cases of doubt, a way of checking this would be to carry out a coring ball test or to sweep the *flue*, which may be more effective at removing flexible debris that might not be dislodged by a coring ball.
- c. Check the operation and gas-tightness of the *flue* by carrying out a smoke test.

## New factory-made metal chimneys

**E6** A checklist for the visual inspection of a newly completed *factory-made metal chimney* is given in BS EN 15287-1:2007 and additional checks or particular variants may be included in manufacturers' *installation instructions*. Following inspection, the *chimney* should be subjected to a smoke test.

## Relined flues

**E7** A *flue* which has been relined may be checked to show that it is free from restrictions, such as from surplus material (where that can occur) and that it is acceptably gas-tight by using the same tests as would be applied in the case of a newly built *flue*. However, a *flue* which has been relined with a flexible metal liner in accordance with Paragraph 3.36 of this Approved Document may be assumed to be unobstructed and acceptably gas-tight. (The use of a coring ball or inappropriate sweeps brushes can seriously damage a flexible metal *flue liner*.)

## Appliances

**E8** Where a *combustion appliance* is provided and connected up to the flue system as part of the work, the complete system of appliance and *flue* should be tested for gas-tightness in addition to testing the *flue* separately as above. For gas appliances, an appropriate spillage test procedure is given in BS 5440-1:2008. For oil- and solid-fuel fired appliances, suitable test procedures are given in BS 5410-1:1997 and BS EN 15287-1:2007 Annex O respectively.

## Flue test procedures

### Coring ball test

**E9** This test may be appropriate for proving the minimum diameter of circular *flues*. It may also be used to check for obstructions in square *flues* but will not detect obstructions in the corners. (A purpose-made coring ball or plate may need to be used if the *flue* is rectangular.) It is not applicable to *fluepipes* and should not be used with flexible metal *flue liners*. It should be carried out before smoke testing.

**E10** A heavy ball, with a diameter about 25mm less than that of the *flue*, is lowered on a rope from the *flue outlet* to the bottom of the *flue*. If an obstruction is encountered, the blockage should be removed and the test repeated.

### Smoke testing

**E11** Where an existing *flue* is to be checked with a smoke test, it should first be swept.

**E12** Two smoke testing procedures are described below. Test I confirms the gas-tightness of the whole *flue* and may be used for one serving a solid fuel appliance or if there is any doubt over the condition of a gas or oil *flue*. Test II may be used where the *flue* is to serve a gas-fired appliance. Neither test is a substitute for any spillage or flue draught interference test required when commissioning the appliance. Other smoke testing procedures could be used where these form part of the procedure for the installation of an approved flue or relining system

### Smoke test I

**E13** All doors and windows in the room served by the *flue* should be closed. The *flue* should first be warmed to establish a draught, e.g. with a blow lamp or electric heater. A suitable number of flue testing smoke pellets are placed at the base of the *flue*, such as in the *fireplace recess* or in the appliance if it is fitted, and ignited. When smoke starts to form, the base of the *flue* or fireplace opening should be sealed or the appliance should be closed, so that the smoke can only enter the *flue*. (For example, the recess opening should be closed off with a board or plate, sealed at the edges or, if the pellets are in the appliance, its doors, ashpit covers and vents should be closed.)

**E14** Smoke should be seen to issue freely from the *flue outlet* or terminal. When this is established, the top of the *flue* is sealed. The full length of the *flue* should then be checked, bearing in mind Paragraph E19; there should be no significant leakage. The test should be allowed to continue for at least 5 minutes. The closures at the top and bottom of the *flue* should then be removed.

### Smoke test II

**E15** All doors and windows in the room served by the *flue* should be closed. The *flue* should first be warmed to establish a draught. A suitable flue-testing smoke pellet is ignited at the base of the *flue* or in the intended position of the appliance, so that the smoke is drawn into the *flue* with the rising draught. (If the pellets are placed in a recess at the base of the *flue*, the opening between the room and the recess should be partially closed, such as with a board, but so as to leave an air entry gap of about 25mm at the bottom.)

**E16** Smoke should be seen to issue freely from the *flue outlet* or terminal and not to spill back into the room. There should be no significant leakage of smoke from the length of the *chimney* inside or outside of the building.

**E17** Smoke tests I and II are in line with the recommendations in BS 5440-1:2008.

### Notes in relation to testing

**E18** Where warming of the *flue* is specified, this is intended to establish a draught, but this may take more than 10 minutes in the case of large or cold *flues*.

**E19** Appliances, where fitted, should not be under fire at the time of carrying out the test. During a smoke test, smoke should not emerge from the outlet of any other *flue*, as this indicates leakage between *flues*. When checking for smoke leakage from a *flue*, it should be borne in mind that smoke from a faulty *flue* can emerge some distance away from the original fault. In such cases, the smoke could emerge from such places as barge overhangs in the end of terrace dwellings or from window reveals in cavity walls.

**E20** The purpose of carrying out smoke testing is to check that flue gases will rise freely through the *flue* and to identify whether there are any faults, such as incorrectly sealed joints or damage that would cause the flue gases to escape into the dwelling.

**E21** It should be noted that smoke pellets create a pressure significantly higher than the pressure required in the product standards for *natural draught chimneys* and for *flues* having a gas-tightness *designation* of N1. *Flues* to this *designation* are permitted to have a leakage rate of up to 2 litre/s/m<sup>2</sup> flue wall area. Some smoke leakage may therefore be seen during smoke tests and it can be a matter of expert judgement of whether leakage indicates failure.

**E22** However, wisps of smoke visible on the outside of the *chimney* or near joints between *chimney* sections do not necessarily indicate a fault. If forceful plumes, or large volumes of smoke are seen, this could indicate a major fault such as an incorrectly made connection or joint, or a damaged section of *chimney* that requires investigation and remedial action followed by a repeat of the test.

# Appendix F: Assessing air permeability of older dwellings in relation to permanent ventilation requirements

**F1** The minimum requirements for permanent ventilation for certain appliances depend on a knowledge of the air-tightness of the dwelling where they are to be installed. Dwellings built after 2008 are likely to have evidence of the air-tightness either through an individual air permeability test certificate or through representative testing of the same design of dwelling on the same housing development.

**F2** Older houses are unlikely to have been tested but are unlikely to achieve an air permeability of less than  $5.0 \text{ m}^3/(\text{h.m}^2)$  at 50 Pa unless the building fabric has been substantially upgraded. That would include all or most of the following measures:

- Full double (or triple) glazing
- Effective closures on trickle vents and other controllable ventilation devices
- All external doors with integral draught seals and letter box seals
- Internal and external sealing around external doors and window frames
- Filled cavity or solid walls
- Impermeable overlay and edge sealing of suspended ground floors
- Careful sealing at junctions between building elements such as between walls and floors or ceilings
- Careful sealing around loft hatch
- Careful sealing around *chimney* or flue penetrations
- Careful sealing around internal soil pipe
- Careful sealing around domestic water and heating pipes passing into externally ventilated spaces
- Careful sealing of all service penetrations in the building fabric (electricity, gas, water, drainage, phone, TV aerial, etc.)
- Internal warning pipe for WC
- All cable channels for light switches and power sockets sealed
- All cable entry for lighting and ceiling roses sealed. Recessed lighting should not penetrate ceilings separating loft spaces.

**F3** Failure to implement even a few of these measures will typically mean that the overall air permeability will probably exceed  $5.0 \text{ m}^3/(\text{h.m}^2)$  at 50 Pa. However, individual rooms in some older houses with solid walls and solid floors can be inherently air-tight when fitted with modern glazing. The situation may therefore need to be assessed with respect both to the overall dwelling and to the individual room where the appliance is to be fitted. If in doubt then assume that the air permeability is lower than  $5.0 \text{ m}^3/(\text{h.m}^2)$  at 50 Pa and fit the appropriate permanent ventilation or seek specialist advice.

Further information on sources of air leakage can be found in GPG224 *Improving airtightness in dwellings*.

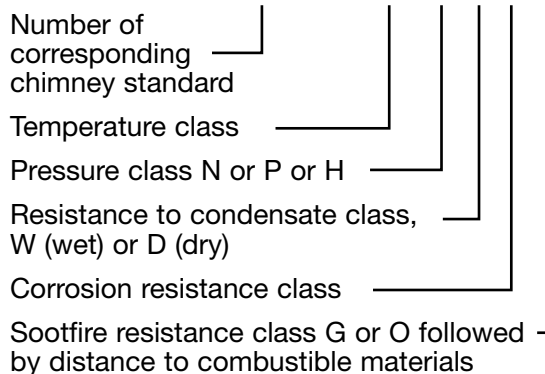
# Appendix G: European chimney designations

**G1** This informative appendix provides a summary of the European *chimney designation* scheme. The essence of the scheme is a series of code letters based on the general *chimney designation* scheme of BS EN 1443:2003, an example of which and their explanation is given below.

## Designation

**G2** The *designation* of a *chimney* consists of :

Chimney      EN 1234 – T 450 N2 D 1 G50



**G3** European *chimney* standards have been developed based on the material of the *flue liner* e.g. clay/ceramic, concrete, metal, and plastic. Some material based standards have adopted a different shortened *designation* e.g. for clay *flue liners* a *designation* Liner – EN 1457-300-A1-N2 means it is suitable for a *chimney* with the *designation* T600 N2 D 3 G, with a nominal size of 300mm.

**G4** The *designation* of the corrosion resistance class of a metal *chimney* product is dealt with in BS EN 1856-1 and BS EN 1856-2 by a two-fold approach. A minimum material specification and thickness is allowed which is dependent on that which is permitted in member states regulations, where these exist. Products upon which a declaration has been made in this manner are designated Vm. The alternative approach involves the choice of one of three corrosion resistance tests. Products meeting the tests carry the *designation* V1, V2 or V3, as appropriate allow the product to be designated with the Corrosion resistance class 1, 2, or 3 respectively. The material specification still forms part of the overall *designation*, and appears alongside the 'V' letter, e.g. Vx-L40045. The material specification for the liner (or connecting pipe) is formed by the letter 'L' followed by five digits. The first two digits represent the material type and the last three digits represent the material thickness in multiples of 0.01mm.

**G5** For the UK, guidance on the minimum material specification appropriate for the various applications in terms of corrosion resistance (solid fuel, gas and oil) is given in the UK National Annex to BS EN 1856-1 and -2.

For further examples of shortened *designation* refer to the specific product standards.

**G6** In selecting an appliance for a given *chimney designation*, the appliance, irrespective of the fuel used, is required to generate combustion products with characteristics equal or less than those designated for the *chimney*. When selecting a *chimney* suitable for a given appliance, any *chimney* with performance characteristics equal to or higher than those appropriate for the appliance may be used.

## Temperature classes

**G7** Temperature classes are set out in Table G1 and expressed as 'T' followed by a number which is less than or equal to the nominal working temperature, i.e., the average flue gas temperature obtained during the nominal/rated output test (usually the maximum operating level);

Table G1 Temperature classes

Temperature class	Nominal working temperature °C
T 080	≤ 80
T 100	≤ 100
T 120	≤ 120
T 140	≤ 140
T 160	≤ 160
T 200	≤ 200
T 250	≤ 250
T 300	≤ 300
T 400	≤ 400
T 450	≤ 450
T 600	≤ 600

## Pressure classes

**G8** Pressure classes are set out in Table G2 and expressed as either 'N', 'P' or 'H' followed by either '1' or '2'. N relates in general to *natural draught chimneys* i.e. operating under negative pressure where the value 1 or 2 allows for a different class of product; metal *chimneys* to BS EN 1856-1 have the class N1. In the UK the value N2 will be assigned as a minimum to masonry *chimneys*. P and H relate to *chimneys* which operate under positive pressure e.g. for fan assisted applications and diesel generators respectively. The pressure *designation* depends on the gas tightness it achieves, the lower number being the more onerous, the higher allowed leakage for positive pressure application being intended to external installations.

Table G2 Pressure classes

Pressure class	Test pressure Pa	Gas tightness – Maximum leakage rate L/s/m <sup>2</sup>
N1	40	2.0
N2	20	3.0
P1	200	0.006
P2	200	0.120
H1	5000	0.006
H2	5000	0.120

## Condensate resistance classes

**G9** Condensate resistance class – expressed as either ‘W’ for wet or ‘D’ for dry operations. A product designated ‘W’, able to contain condensates within the *flue*, is aimed at condensing appliances. A product designated ‘D’ would usually have flue gas temperatures high enough to avoid condensate formation.

## Corrosion resistance classes

**G10** Corrosion resistance classes are set out in Table G3 – this is fuel dependant and expressed as 1, 2 or 3.

Table G3 Corrosion resistance classes (from BS EN 1443-2003)

Corrosion resistance class	1 Possible fuel types	2 Possible fuel types	3 Possible fuel types
gas	Gas: sulphur-content $\leq 50 \text{ mg/m}^3$ Natural gas L + H	Gas Natural gas L + H	Gas Natural gas L + H
liquid	Kerosene: sulphur-content $\leq 50 \text{ mg/m}^3$	Oil: sulphur-content $\leq 0.2 \text{ mass \%}$ kerosene: sulphur-content $\geq 50 \text{ mg/m}^3$	Oil: sulphur-content $> 0.2 \text{ mass \%}$ kerosene: sulphur-content $\geq 50 \text{ mg/m}^3$
wood		Wood in open fire places	Wood in open fire places Wood in closed stoves
coal			Coal
peat			Peat

## Sootfire resistance classes

**G11** Sootfire resistance class – expressed as either ‘G’ with sootfire resistance, or ‘O’ without. A product assigned the *designation* ‘G’ has been tested at 1000°C for 30 minutes.

## Distance to combustible material

**G12** The *designation* of the minimum distance from the outer surface of the *chimney* to combustible material is given as xx expressed in millimetres (e.g. the distance ‘x-x’ identified in paragraph 1.45 and diagram 13).

## Appendix H: Addresses

**ACE** (Amalgamated Chimney Engineers): White Acre, Metherringham Fen, Lincoln LN4 3AL

Tel 01526 32 30 09 Fax 01526 32 31 81

**BFCMA** (British Flue and Chimney Manufacturers Association): 2 Waltham Court, Milley Lane, Hare Hatch, Reading, Berkshire RG10 9TH

Tel 0118 940 3416 Fax 0118 940 6258  
info@feta.co.uk www.feta.co.uk

**BRE** (Building Research Establishment Ltd.): Bucknalls Lane, Garston, Watford, Hertfordshire WD25 9XX

Tel 01923 66 4000 Fax 01923 66 4010  
enquiries@bre.co.uk www.bre.co.uk

**BSI** (British Standards Institution): 389 Chiswick High Road, London W4 4AL

Tel 020 8996 9000 Fax 020 8996 7400  
www.bsigroup.com

**CIBSE** (Chartered Institution of Building Services Engineers): 222 Balham High Road, London SW12 9BS

Tel 020 8675 5211 Fax 020 8675 5449  
www.cibse.org

**Gas Safe Register:** PO Box 6804, Basingstoke RG24 4NB

Tel 0800 408 5500  
www.gassaferegister.co.uk

**Environment Agency:** Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol BS32 4UD

08708 506506  
www.environment-agency.gov.uk

Environment Agency Emergency Hotline  
0800 80 70 60

**HETAS** (Heating Equipment Testing and Approval Scheme): Orchard Business Centre, Stoke Orchard, Cheltenham, Gloucestershire GL52 7RZ

Tel 0845 634 5626  
www.hetas.co.uk

**HSE** (Health and Safety Executive): (1G) Redgrave Court, Merton Road, Merseyside L20 7HS

Tel 0845 345 0055  
www.hse.gov.uk

HSE Infoline: 0845 345 0055

Gas safety advice line: 0800 300 363

**IGEM** (Institution of Gas Engineers & Managers): IGEM House, High Street, Kegworth, Derbyshire DE74 2DA

Tel 0844 375 4436 Fax 01509 678198  
www.igem.org.uk

**UKLPG:** Unit 14, Bow Court, Fletchworth Gate Burnsall Road, Coventry CV5 6SP

www.uklpg.org

**NACE** (National Association of Chimney Engineers): PO Box 849, Metherringham Lincoln LN4 3WU

Tel 01526 322555  
www.nace.org.uk

**NACS** (National Association of Chimney Sweeps): Unit 15, Emerald Way, Stone Business Park, Stone, Staffordshire ST15 0SR

Tel 01785 811732 Fax 01785 811712  
nacs@chimneyworks.co.uk  
www.chimneyworks.co.uk

**NFA** (National Fireplace Association): PO Box 583, High Wycombe, Bucks HP15 6XT

Tel 0845 643 1901 Fax 0845 643 1902  
www.fireplace.co.uk

**OFTEC** (Oil Firing Technical Association Ltd): Foxwood House, Dobbs Lane, Kesgrave Ipswich IP5 2QQ

Tel 0845 65 85 080 Fax 0845 65 85 181  
enquiries@oftec.org www.oftec.org

**SFA** (Solid Fuel Association): 7 Swanwick Court, Alfreton, Derbyshire DE55 7AS

Tel 01773 835 400 Fax 01773 834 351  
sfa@solidfuel.co.uk www.solidfuel.co.uk

# Standards referred to

## **BS 41:1973 (1998)**

Specification for cast iron spigot and socket flue or smoke pipes and fittings.

## **BS EN 303-1:1999**

Heating Boilers. Heating boilers with forced draught burners. Terminology general requirements, testing and marking.

## **BS 476-4:1970 (2007)**

Fire tests on building materials and structures. Non-combustibility test for materials. AMD 2483 and AMD 4390.

## **BS 476-11:1982 (2007)**

Fire tests on building materials and structures. Method for assessing the heat emission from building materials.

## **BS 476-20:1987**

Fire tests on building materials and structures. Method for determination of the fire resistance of elements of construction (general principles).

## **BS 476-21:1987**

Fire tests on building materials and structures. Methods for determination of the fire resistance of loadbearing elements of construction.

## **BS 476-22:1987**

Fire tests on building materials and structures. Methods for determination of the fire resistance of non-loadbearing elements of construction.

## **BS EN 449:2002 + A1:2007**

Specification for Dedicated Liquid Petroleum Gas Appliances. Domestic Flueless Space Heaters (including Diffusive Catalytic Combustion Heaters).

## **BS 715:2005**

Specification for metal flue pipes, fittings, terminals and accessories for gas-fired appliances with a rated input not exceeding 60kW. AMD 8413.

## **BS 799-5:1987**

Oil Burning Equipment. Specification for Oil Storage Tanks.

## **BS 1181:1999**

Specification for clay flue linings and flue terminals.

## **BS 1251:1987**

Specification for open fireplace components.

## **BS EN 1443:2003**

Chimneys. General Requirements.

## **BS 1449-2:1983**

Specification for stainless and heat-resisting steel plate, sheet and strip. AMD 4807, AMD 6646 and AMD 8832.

## **BS EN 10268:2006**

Cold rolled steel flat products with high yield strength for cold forming. Technical delivery conditions.

## **BS EN 1457:2009**

Chimneys. Clay/ceramic flue liners. Requirements and test methods.

## **BS EN 1806:2006**

Chimneys. Clay/ceramic flue blocks for single wall chimneys. Requirements and test methods.

## **BS 1846-1:1994**

Glossary of Terms Relating to Solid Fuel Burning Equipment. 1994 Domestic appliances.

## **BS EN 1856-1:2003**

Chimneys. Requirements for metal chimneys. System chimney products.

## **BS EN 1856-2:2004**

Chimneys. Requirements for metal chimneys. Metal liners and connecting flue pipes.

## **BS EN 1857:2003 + A1:2008**

Chimneys. Components. Concrete flue liners.

## **BS EN 1858:2003**

Chimneys. Components. Concrete flue blocks.

## **BS EN 1859:2009**

Chimneys. Metal chimneys. Test methods.

## **BS 2869:2006**

Fuel oils for agricultural, domestic and industrial engines and boilers. Specification.

## **BS EN 1859:2000**

Chimney, Metal chimneys. Test methods.

## **BS 2869-2:1998**

Fuel oils for non-Marine use. Specification for fuel oil for agricultural and industrial engines and burners (Classes A2, C1, C2, D, E, F, G and H). AMD 6505.

## **BS 4543-1:1990**

Factory-made insulated chimneys. Methods of test. AMD 8379.

## **BS 4543-2:1990**

Factory-made insulated chimneys. Specification for chimneys with stainless steel flue linings for use with solid fuel fired appliances. AMD 8380.

## **BS 4543-3:1990**

Factory-made insulated chimneys. Specification for chimneys with stainless steel flue lining for use with oil fired appliances. AMD 8381.

## **BS 4876:1984**

Specification for performance requirements for domestic flued oil burning appliances (including test procedures).

## **BS 5410-1:1997**

Code of practice for oil firing. Installations up to 44kW output capacity for space heating and hot water supply purposes. AMD 3637.

## **BS 5410-2:1978**

Code of practice for oil firing. Installations of 45 kW and above output capacity for space heating, hot water and steam supply services.

## **BS 5440-1:2008**

Installation and maintenance of flues and ventilation for gas appliances of rated input not exceeding 70kW net (1st, 2nd and 3rd family gases). Specification for Installation and maintenance of flues.

**BS 5440-2:2000**

Installation and maintenance of flues and ventilation for gas appliances of rated input not exceeding 70kW net (1st, 2nd and 3rd Family Gases). Specification for installation and maintenance of ventilation for gas appliances.

**BS 5482-1:2005**

Code of practice for domestic butane- and propane-gas-burning installations. Installations at permanent dwellings, residential park homes and commercial premises, with installation pipework sizes not exceeding DN 25 for steel and DN 28 for corrugated stainless steel or copper.

**BS 5546:2000**

Specification for installation of hot water supplies for domestic purposes, using gas fired appliances of rated input not exceeding 70kW.

**BS 5854:1980 (1996)**

Code of practice for flues and flue structures in buildings.

**BS 5864:2004**

Specification for Installation in Domestic Premises of Gas-Fired Ducted-Air Heaters of Rated Input Not Exceeding 60kW.

**BS 5871-1:2005**

Specification for Installation of Gas Fires, Convectur Heaters, Fire/Back Boilers and Decorative Fuel Effect Gas Appliances. Gas Fires, Convectur Heaters and Fire/Back Boilers and heating stoves (1st, 2nd and 3rd Family Gases).

**BS 5871-2:2005**

Specification for Installation of Gas Fires, Convectur Heaters, Fire/Back Boilers and Decorative Fuel Effect Gas Appliances. Inset Live Fuel Effect Gas Fires of Heat Input Not Exceeding 15kW (2nd and 3rd Family Gases).

**BS 5871-3:2005**

Specification for Installation of Gas Fires, Convectur Heaters, Fire/Back Boilers and Decorative Fuel Effect Gas Appliances. Decorative Fuel Effect Gas Appliances of Heat Input Not Exceeding 20kW (2nd and 3rd Family Gases).

**BS 6172:2004**

Specification for Installation of Domestic Gas Cooking Appliances (1st, 2nd and 3rd Family Gases).

**BS 6173:2001**

Specification for Installation of Gas Fired Catering Appliances for Use in All Types of Catering Establishments (1st, 2nd and 3rd Family Gases).

**BS EN 15287-1:2007**

Chimneys. Design, installation and commissioning of chimneys. Chimneys for non-roomsealed heating appliances.

**BS 6798:2009**

Specification for Installation of Gas-Fired Boilers of Rated Input Not Exceeding 70kW.

**BS 6999:1989 (1996)**

Specification for Vitreous-Enamelled Low-Carbon-Steel Fluepipes, Other Components and Accessories for Solid-Fuel-Burning Appliances with a Maximum Rated Output of 45kW.

**BS 7435-1:1991 (1998)**

Fibre Cement Flue Pipes, Fittings and Terminals. Specification for Light Quality Fibre Cement Flue pipes, Fittings and Terminals.

**BS 7435-2:1991**

Fibre Cement Flue Pipes, Fittings and Terminals. Specifications for heavy quality cement flue pipes, fittings and terminals.

**BS 7566:**

Installation of Factory-Made Chimneys to BS 4543 for Domestic Appliances

**BS 7566-1:1992 (1998)**

Installation of Factory-Made Chimneys to BS 4543 for Domestic Appliances. Method of Specifying Installation Design Information.

**BS 7566-2:1992 (1998)**

Installation of Factory-Made Chimneys to BS 4543 for Domestic Appliances. Specification for Installation Design.

**BS 7566-4:1992 (1998)**

Installation of Factory-Made Chimneys to BS 4543 for Domestic Appliances. Recommendations for Installation Design and Installation.

**BS 8303-1:1994**

Installation of Domestic Heating and Cooking Appliances Burning Solid Mineral Fuels, Specification for the Design of Installations.

**BS 8303-2:1994**

Installation of Domestic Heating and Cooking Appliances Burning Solid Mineral Fuels, Specification for Installing and Commissioning on Site.

**BS 8303-3:1994**

Installation of Domestic Heating and Cooking Appliances Burning Solid Mineral Fuels, Recommendations for Design and on Site Installation.

**BS EN 10088-1:2005**

Stainless Steels. List of Stainless Steels.

**BS EN 13384-1:2002 + A2:2008**

Chimneys. Thermal and fluid dynamic calculation methods. Chimneys serving one appliance.

**BS EN 14213:2003**

Heating fuels. Fatty acid methyl esters (FAME). Requirements and test methods.

**BS EN 15287-1:2007**

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## Building Research Establishment

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## Chartered Institution of Building Services Engineers

CIBSE Guide B: Heating, Ventilating, Air Conditioning and Refrigeration, (2005). ISBN 978 1 90328 758 3

## Energy Saving Trust

GPG224 Improving airtightness in dwellings (2005).

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- Bulk LPG Storage at Fixed Installations (UKLPG Code of Practice, 2009) 5.14
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## The Building Regulations 2010

# Protection from falling, collision and impact

**APPROVED DOCUMENT**

**K**

- 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**

# Main changes in the 2013 edition

This approved document supports Part K: Protection from falling, collision and impact. It takes effect on 6 April 2013 for use in England\*. The 1998 edition (incorporating 2000 and 2010 amendments) will continue to apply to work started before 6 April 2013, or to work subject to a building notice, full plans application or initial notice submitted before 6 April 2013.

**The main changes in this approved document are that:**

- Approved Document M: Access to and use of buildings.
- to 'safe breaking' and the testing methods.
- National Annex in relation to the resistance of loads for barriers.
- 
- A new-style format is used, but there are no new technical requirements.
- Key terms have been updated and an index has been introduced.

\* This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No. 2) Order 2009.

# The approved documents

## What is an approved document?

The Secretary of State has approved a series of documents that give practical guidance about how to meet the requirements of the Building Regulations 2010 for England. Approved documents give guidance on each of the technical parts of the regulations and on regulation 7 (see the back of this document).

Approved documents set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirements of the Building Regulations to which they refer. If you follow the guidance in an approved document, there will be a presumption of compliance with the requirements covered by the guidance. However, compliance is not guaranteed; for example, 'normal' guidance may not apply if the particular case is unusual in some way.

Note that there may be other ways to comply with the requirements – *there is no obligation to adopt any particular solution contained in an approved document*. If you prefer to meet a relevant requirement in some other way than described in an approved document, you should discuss this with the relevant building control body.

In addition to guidance, some approved documents include provisions that must be followed exactly, as required by regulations or where methods of test or calculation have been prescribed by the Secretary of State.

This approved document relates only to the particular requirements of the Building Regulations that the document addresses. However, building work must also comply with any other applicable requirements of the Building Regulations.

## How to use this approved document

Each document uses the following conventions.

- a. Text against a green background is an extract from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations.
- b. Key terms, printed in green, are defined in Appendix A.
- c. When this approved document refers to a named standard or other document, the relevant version is listed in Appendix B (standards). However, if the issuing body has revised or updated the listed version of the standard or document, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations.

**NOTE:** Standards and technical approvals may also address aspects of performance or matters that are not covered by the Building Regulations, or they may recommend higher standards than required by the Building Regulations.

## Where you can get further help

If you do not understand the technical guidance or other information in this approved document or the additional detailed technical references to which it directs you, you can seek further help through a number of routes, some of which are listed below.

- a. The Planning Portal website: [www.planningportal.gov.uk](http://www.planningportal.gov.uk).
- b. *If you are the person undertaking the building work*: either from your local authority building control service or from an approved inspector.
- c. *If you are registered with a competent person scheme*: from the scheme operator.
- d. *If your query is highly technical*: from a specialist or an industry technical body for the relevant subject.

# The Building Regulations

The following is a high level summary of the Building Regulations relevant to most types of building work. Where there is any doubt you should consult the full text of the regulations, available at [www.legislation.gov.uk](http://www.legislation.gov.uk).

## Building work

Regulation 3 of the Building Regulations defines 'building work'. Building work includes:

- a. the erection or extension of a building
- b. the provision or extension of a controlled service or fitting
- c. the material alteration of a building or a controlled service or fitting.

Regulation 4 states that building work should be carried out in such a way that, when work is complete:

- a. for new buildings or work on a building that complied with the applicable requirements of the Building Regulations: the building complies with the applicable requirements of the Building Regulations
- b. for work on an existing building that did not comply with the applicable requirements of the Building Regulations:
  - (i) the work itself must comply with the applicable requirements of the Building Regulations
  - (ii) the building must be no more unsatisfactory in relation to the requirements than before the work was carried out.

## Material change of use

Regulation 5 defines a 'material change of use' in which a building or part of a building that was previously used for one purpose will be used for another.

The Building Regulations set out requirements that must be met before a building can be used for a new purpose. To meet the requirements, the building may need to be upgraded in some way.

## Materials and workmanship

In accordance with regulation 7, building work must be carried out in a workmanlike manner using adequate and proper materials. Guidance on materials and workmanship is given in Approved Document 7.

## Energy efficiency requirements

Part 6 of the Building Regulations imposes additional specific requirements for energy efficiency.

If a building is extended or renovated, the energy efficiency of the existing building or part of it may need to be upgraded.

## Notification of work

Most building work and material changes of use must be notified to a building control body unless one of the following applies.

- a. It is work that will be self-certified by a registered competent person or certified by a registered third party.
- b. It is work exempted from the need to notify by regulation 12(6A) of, or Schedule 4 to, the Building Regulations.

## Responsibility for compliance

People who are responsible for building work (e.g. agent, designer, builder or installer) must ensure that the work complies with all applicable requirements of the Building Regulations. The building owner may also be responsible for ensuring that work complies with the Building Regulations. If building work does not comply with the Building Regulations, the building owner may be served with an enforcement notice.

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# Approved Document K: Protection from falling, collision and impact

## Summary

**0.1** This approved document gives guidance on how to comply with Parts K1, K2, K3, K4, K5.1, K5.2, K5.3, K5.4 and K6 of the Building Regulations. It contains the following sections:

- Section 1:** Guidance on aspects of the geometry of stairs, special stairs, fixed ladders and handrails for and guarding of stairs
- Section 2:** Guidance on ramps and guarding of ramps
- Section 3:** Guidance on protection from falling
- Section 4:** Guidance on vehicle barriers and loading bays
- Section 5:** Guidance on protection against impact with glazing
- Section 6:** Guidance on protection from collision with open windows etc.
- Section 7:** Guidance on manifestation of glazing
- Section 8:** Guidance on safe opening and closing of windows etc.
- Section 9:** Guidance on safe access for cleaning windows etc.
- Section 10:** Guidance on protection against impact from and trapping by doors.

## Application

**0.2** Regulation 3 defines building work such that the following applies.

- a. Glazing which is installed in a location where there was none previously as part of the erection, extension or material alteration of a building (other than an exempt building), and the replacement of a whole unit (i.e. the frame and glazing) is building work and is subject to requirement K4 and K5.2.
- b. The replacement of glazing whilst retaining an existing frame (e.g. as a repair) is not building work, but the supply of the glazing may be subject to consumer protection legislation.

**0.3** Requirement K1 applies to means of access outside a building only when the access is part of the building (i.e. attached). For example, requirement K1 does not apply to steps on land leading to a building, but does apply to entrance steps which are part of the building.

**0.4** Regarding access routes.

- a. Where access and circulation routes form part of a means of escape for people in case of fire, refer to Approved Document B: Fire safety, Volume 1 – Dwellinghouses, and Volume 2 – Buildings other than dwellinghouses.
- b. For external pedestrian access and circulation routes to buildings, from the boundary of the site and car parking, reference should also be made to Approved Document M: Access to and use of buildings.

## Interaction with other legislation

**0.6** The guidance provided in this document is in relation to the permanent features which form part of the building providing reasonable safety in the appropriate circumstances. However, there may well be particular situations, such as access for maintenance required less frequently than once a month (e.g. see paragraph 1.42b), where such permanent features may be less appropriate. Where

this may be the case the Construction (Design and Management) Regulations 2007 provides detail on procedures for safe use of temporary means of access, together with focus on effective planning and management of risk.

- 0.7** Health and safety regulations such as the Workplace (Health, Safety and Welfare) Regulations 1992 may impose requirements on employers and those in control of premises used as workplaces in relation to certain physical characteristics of the workplace. Where such regulations apply there may be confusion as to whether the Building Regulations or health and safety requirements take precedence, as both will apply. Where an inspector for the purposes of the Health and Safety at Work, etc. Act 1974 has identified a contravention of such health and safety regulations they may seek to serve an improvement notice to secure compliance. In such circumstances the inspector is prevented by virtue of section 23(3) of the Health and Safety at Work, etc. Act 1974 from requiring measures which are more onerous than necessary to comply with any requirements of the Building Regulations, unless the specific requirement of health and safety regulations are themselves more onerous. Where applicable the following cross-referencing should be made.
- a. For building work relating to requirement K1 of the Building Regulations, regarding the design of stairs, ladders and ramps, see regulation 17 of the Workplace (Health, Safety and Welfare) Regulations 1992. Regulation 17 relates to permanent stairs, ladders and ramps on pedestrian routes within the workplace premises, including those used to give access for maintenance to parts of the workplace premises.
  - b. For building work relating to requirement K2 of the Building Regulations, regarding the avoidance of risk from falling when working at height, see regulation 6 of the Work at Height Regulations 2005.
  - c. For building work relating to requirement K3 of the Building Regulations, regarding the design of vehicle barriers and loading bays, see regulation 17 of the Workplace (Health, Safety and Welfare) Regulations 1992.
  - d. For building work relating to requirement K4 of the Building Regulations, regarding the prevention of personal injury, see regulation 14(1)(a) of the Workplace (Health, Safety and Welfare) Regulations 1992.
  - e. For building work relating to requirement K5.1 of the Building Regulations, regarding the requirements for projecting windows, skylights and ventilators, see regulation 15(2) of the Workplace (Health, Safety and Welfare) Regulations 1992.
  - f. For building work relating to requirement K5.2 of the Building Regulations, regarding the requirements for marking windows, transparent or translucent doors, gates and walls, see regulation 14(1)(b) of the Workplace (Health, Safety and Welfare) Regulations 1992.
  - g. For building work relating to requirement K5.3 of the Building Regulations, regarding the requirements for opening, closing or adjusting windows, skylights and ventilators, see regulation 15(1) of the Workplace (Health, Safety and Welfare) Regulations 1992.
  - h. For building work relating to requirement K5.4 of the Building Regulations, regarding the requirements for cleaning windows and skylights, etc., see regulation 16 of the Workplace (Health, Safety and Welfare) Regulations 1992.
  - i. For building work relating to requirement K6 of the Building Regulations, regarding the requirements for doors and gates, see regulation 18 of the Workplace (Health, Safety and Welfare) Regulations 1992.

# Requirement K1: Stairs, ladders and ramps

This approved document deals with the following requirement from Part K of Schedule 1 to the Building Regulations 2010.

Requirements	
<i>Requirement</i>	<i>Limits on application</i>
<b>Stairs, ladders and ramps</b>	
<b>K1.</b> Stairs, ladders and ramps shall be so designed, constructed and installed as to be safe for people moving between different levels in or about the building.	Requirement K1 applies only to stairs, ladders and ramps which form part of the building.

## Performance

In the Secretary of State's view, you can meet requirement K1 by ensuring that the steepness, **rise** and **going**, **handrails**, headroom, length and width of any stairs, **ladders** and **ramps** between levels are appropriate to afford reasonable safety to people gaining access to and moving about buildings. The standard of provision needed to give an acceptable level of safety for access and use depends on the circumstances.

- The standard of provision may need to be higher in a public building than in a dwelling, because people may not be familiar with the building and there may be more users.
- A lower standard of provision may be acceptable where access is required only for maintenance, because greater care can be expected from the people requiring to gain access.

# Section 1: Stairs and ladders

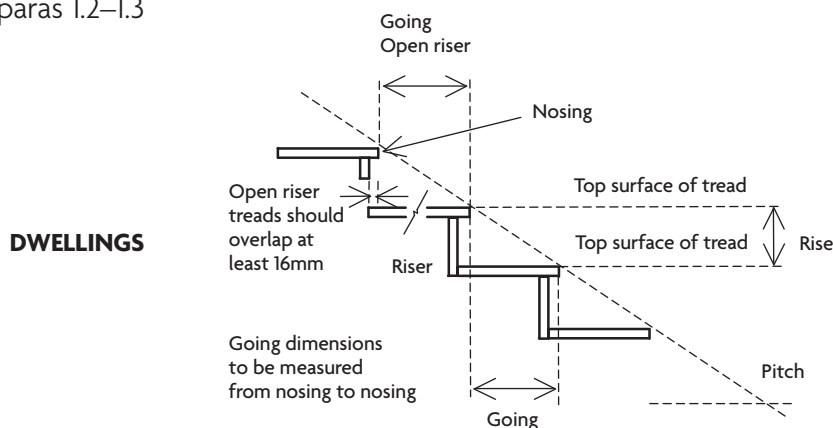
## Scope

- 1.1** The guidance provided in this document covers internal and external steps and stairs when they are part of the building. Additional guidance is provided in Approved Document M when external stepped access also forms part of the **principal entrances** and alternative **accessible entrances**, and when they form part of the access route to the building from the boundary of the site and car parking. See Approved Document M Section 1 (for buildings other than dwellings) and Section 6 (for dwellings).

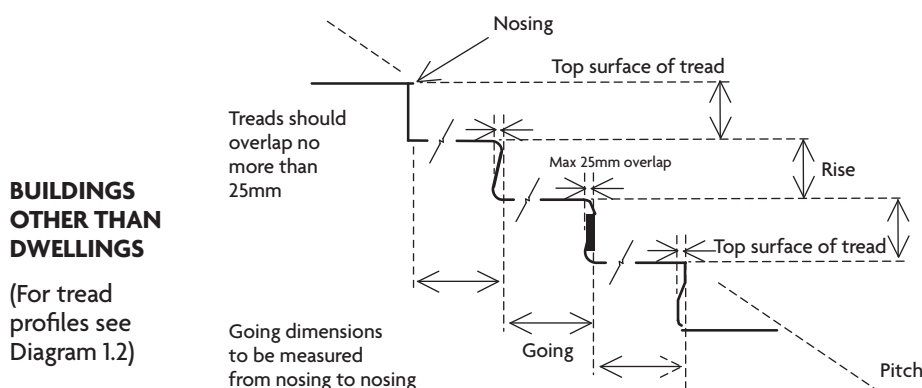
## Steepness of stairs – rise and going

- 1.2** Measure the **rise** and **going** as shown in Diagram 1.1. (For steps with **tapered treads**, see also paragraphs 1.25–1.27.)

See paras 1.2–1.3



Note: Two examples of tread profiles have been shown together for illustrative purposes only



Note: Four examples of tread profiles have been shown together for illustrative purposes only

Diagram 1.1 Measuring rise and going

- 1.3 In a **flight** of steps, for all steps use the measurements for **rise** and **going** given for the three stair categories in Table 1.1 below. Use any **rise** between the minimum and maximum with any **going** between the minimum and maximum, that complies with the relevant note contained in table 1.1.

**Table 1.1 Rise and going**

	Rise*		Going*	
	Minimum (mm)	Maximum (mm)	Minimum (mm)	Maximum (mm)
Private stair <sup>1, 2</sup>	150	220	220	300
Utility stair	150	190	250	400
General access stair <sup>3</sup>	150	170	250	400

Notes:

[1] The maximum **pitch** for a **private stair** is 42°.

[2] For dwellings, for external tapered steps and stairs that are part of the building the **going** of each step should be a minimum of 280mm.

[3] For school buildings, the preferred **going** is 280mm and **rise** is 150mm.

\* The normal relationship between the dimensions of the **rise** and **going** is: twice the **rise** plus the **going** ( $2R + G$ ) equals between 550mm and 700mm.

For existing buildings the dimensional requirements in Table 1.1 should be followed, unless due to dimensional constraints it is not possible. Any alternative proposal should be agreed with the relevant building control body and included in an access strategy (refer to Approved Document M).

## Stepped gangways in assembly buildings

- 1.4 The guidance provided in this document covers stairs or **ramps** that form part of the means of access within an assembly building such as a sports stadium, theatre or cinema. However, if steps are part of the gangways to areas for spectators, the gangways may need to be at different **pitches** to maintain sightlines for spectators – this may affect the main stairs. Apply all of the following guidance.
- Ensure that the maximum **pitch** for gangways to seating areas for spectators is 35°.
  - Align the ends of all rows of seats/wheelchair spaces so that the width of the gangway remains the same.
  - Provide **transverse gangways** to give access from the side to storey exits (**vomitory exits**) within the body of a seating layout.
  - Ensure that **transverse gangways** and **radial gangways** in auditoria with tiered seating do not cross. Offset the connections between **transverse gangways** and **radial gangways** so that the flow of people to the exits is smooth.
  - In stepped tiers, use the following measurements for each step in the gangway:
    - minimum height: 100mm
    - maximum height: 190mm

If there are two or more **risers** to each row of seats, make each step an equal height.
  - In a tier that is uninterrupted by cross-gangways, and where the **pitch** exceeds 25°, use a maximum number of steps of 40.

- g. Where an exit is approached from a stepped gangway, place a landing the width of the exit and a minimum of 1100mm deep immediately in front of the exit doors.
- h. For stepped side gangways, provide a **handrail** in accordance with paragraphs 1.34 and 1.36.
- i. In stepped tiers, maintain the same level between the seatway and the nearest step.
- j. Gangways should not be less than 1100mm wide unless used by not more than 50 persons, in which case gangways should be a minimum of 900mm.

## Construction of steps

### For all buildings

- 1.5** Have level treads on steps, ensuring that the **rise** and **going** of each step are consistent throughout a **flight** of steps and are in accordance with Table 1.1.

### For buildings other than dwellings

- 1.6** Use risers that are not open.

**NOTE:** The benefits of a riser that is not open are as follows.

- a. It removes the possibility of the front of a foot or a walking aid being caught underneath a tread during ascent, possibly causing a fall.
- b. It avoids the feeling of insecurity people get when looking through open risers on a stair.

- 1.7** For steps, apply both of the following guidance.

- a. Make step **nosings** apparent: use a material that will **contrast visually**, a minimum of 55mm wide, on both the tread and the riser.
- b. Avoid, if possible, step **nosings** that protrude over the tread below. If the **nosing** protrudes, ensure that this is by no more than 25mm (see Diagram 1.2).

- 1.8** If the soffit beneath a stair is less than 2m above floor level, protect the area beneath a stair with one of the following.

- a. **Guarding** and low level cane detection.
- b. A **barrier** giving the same degree of protection.

### For dwellings

- 1.9** Steps may have open risers if they comply with both of the following guidance.

- a. Overlap treads by a minimum of 16mm.
- b. Construct the steps so that a 100mm diameter sphere cannot pass through the open risers.

### For common access areas in buildings that contain flats

- 1.10** Provide a stair with steps that comply with all of the following guidance.

- a. Make step **nosings** apparent: use a material that will **contrast visually**, 50mm to 65mm wide on the tread and 30mm to 55mm on the riser.
- b. Use a suitable tread **nosing** profile, as shown in Diagram 1.2.
- c. Use risers which are not open.

See paras 1.5–1.10

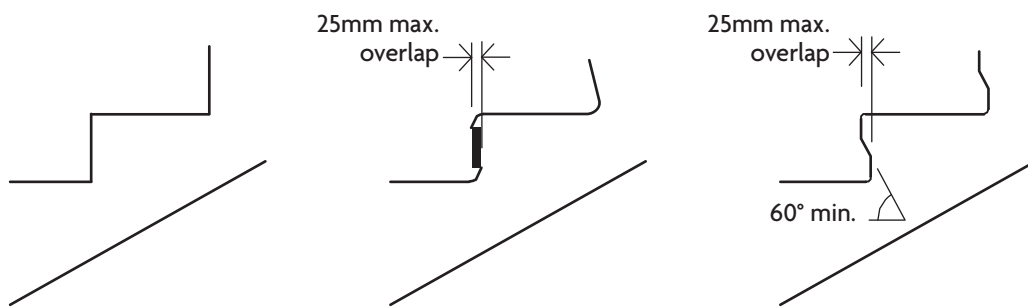


Diagram 1.2 Examples of suitable tread profiles

## Headroom for stairs

### For all buildings

1.11 On the access between levels, provide the minimum headroom shown in Diagram 1.3.

See para 1.11

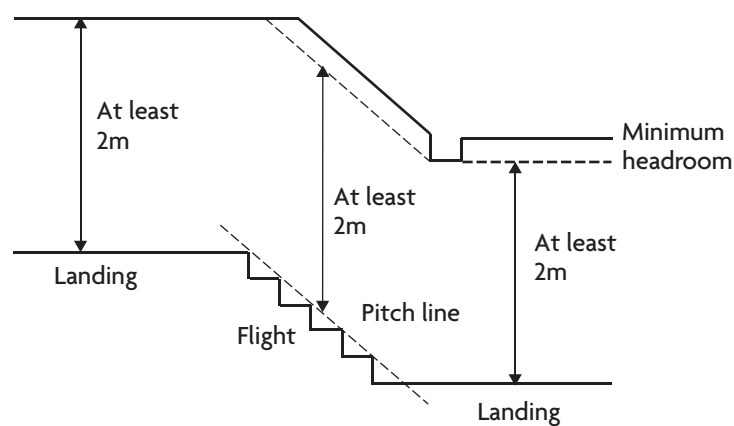


Diagram 1.3 Minimum headroom

### For buildings other than dwellings and for common access areas in buildings that contain flats

1.12 Provide all means of escape routes with a minimum clear headroom of 2m, except in doorways.

See para 1.13

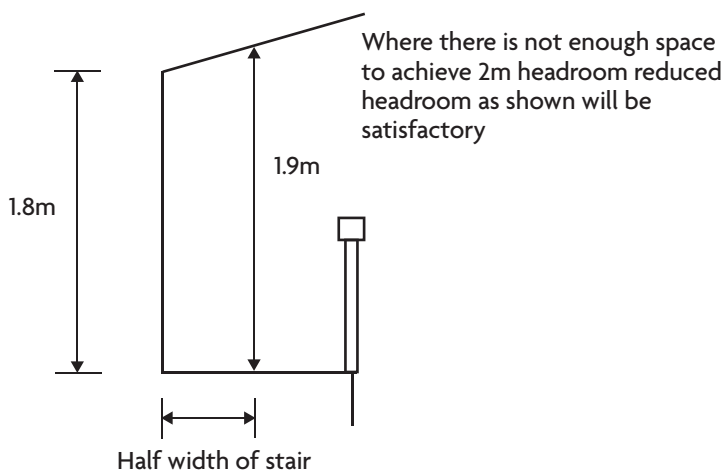


Diagram 1.4 Reduced headroom for loft conversions

### For loft conversions in dwellings

- 1.13** Where there is not enough space to achieve the height shown in Diagram 1.3, provide the reduced headroom shown in Diagram 1.4.

## Width of flights of stairs

### For buildings other than dwellings

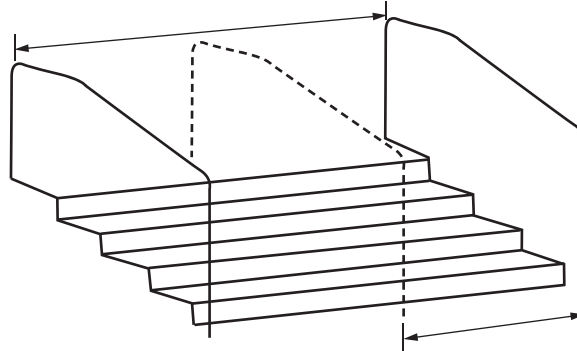
- 1.14** For stairs that form part of means of escape, refer also to Approved Document B: Fire safety, Volume 2 – Buildings other than dwellinghouses.
- 1.15** For flights of stairs, provide all of the following.
- A minimum stair width between enclosing walls, strings or upstands of 1200mm.
  - A minimum width between handrails of 1000mm.
  - If the flight is more than 2m wide, divide it into flights a minimum of 1000mm wide, as shown in Diagram 1.5
  - For access for maintenance, see paragraph 1.42.

### For dwellings

- 1.16** In exceptional circumstances where severely sloping plots are involved, a stepped change of level within the entrance storey may be unavoidable. In those instances ensure that stairs within the entrance storey of a dwelling have flights with a minimum stair width of 900mm.

See para 1.15

If more than 2m wide  
the flight should be divided



Divisions of flights should not be more than 2m wide,  
measured between the inside edges of handrails

Diagram 1.5 Dividing flights

## Length of flights of stairs

### For all buildings

- 1.17** If stairs have more than 36 risers in consecutive flights, make a minimum of one change of direction between flights, as shown in Diagram 1.6.

See paras 1.17 and 1.20

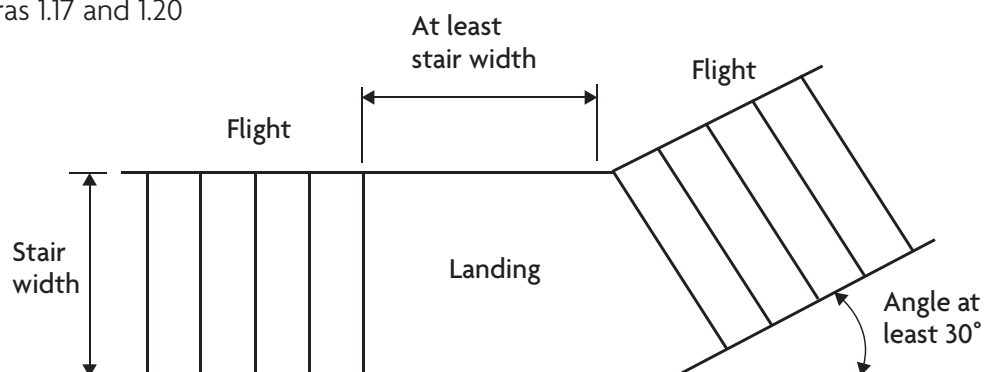


Diagram 1.6 Change of direction in flights

## For buildings other than dwellings and common access areas in buildings that contain flats

**1.18** Comply with all of the following.

- a. Do not have single steps.
- b. For flights between landings the maximum number of risers should be:
  - (i) utility stairs – 16 risers
  - (ii) general access stairs – 12 risers, but exceptionally no more than 16 in small premises where the plan area is restricted
  - (iii) stairs for access for maintenance, see paragraph 1.42.

## Landings for stairs

### For all buildings

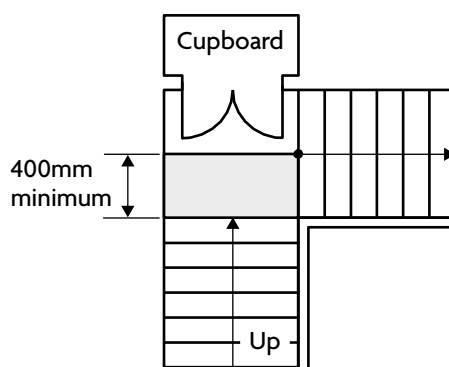
**1.19** For means of escape requirements, refer also to Approved Document B: Volume 1 – Dwellinghouses, and Volume 2 – Buildings other than dwellinghouses.

**1.20** At the top and bottom of every flight, provide landings the width and length at least as great as the smallest width of the flight (see Diagram 1.6).

**1.21** A landing:

- a. may include part of the floor of the building
- b. should be kept clear of permanent obstructions
- c. may have doors to cupboards and ducts that open over a landing at the top of a flight, as shown in Diagram 1.7, but only when they are kept shut or locked shut when under normal use.

See para 1.21



**Diagram 1.7** Cupboard onto landing

**1.22** Landings should be level, *with the following exception.*

A landing at the top or bottom of a flight that is formed by the ground may have a gradient, provided that:

- a. the maximum gradient along the direction of travel is 1:60
- b. the surface is paved ground or otherwise made permanently firm.

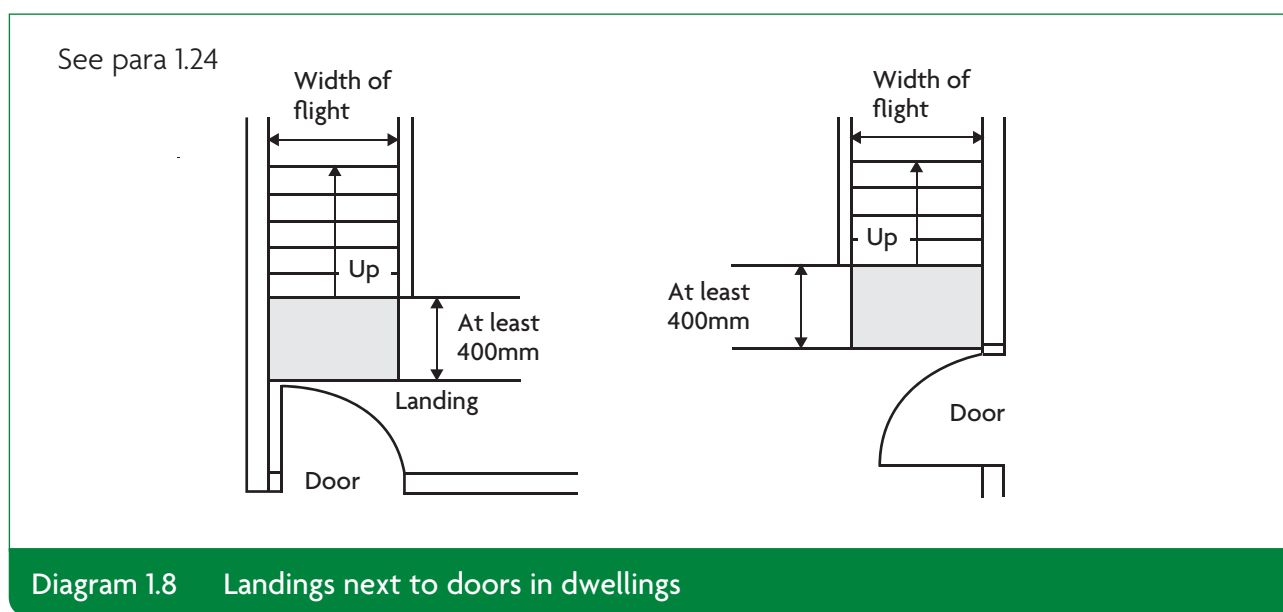
**For buildings other than dwellings**

**1.23** Provide all of the following.

- An unobstructed length a minimum of 1200mm on each landing.
- Doors that do not swing across landings, except where they comply with paragraph 1.21c.
- For access for maintenance, see paragraph 1.42.

**For dwellings**

**1.24** A door may swing across a landing at the bottom of a flight, but only as shown in Diagram 1.8.

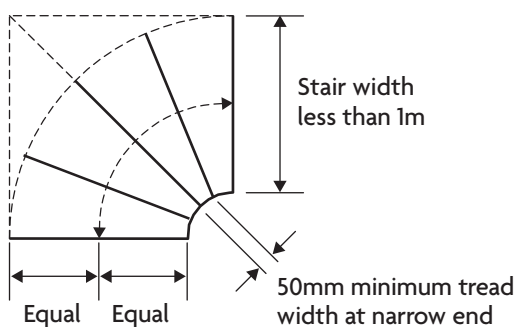
**Special stairs****Tapered treads**

**1.25** For the **rise** and **going**, comply with paragraphs 1.2 and 1.3. For the **going** of **tapered treads**, use the measurements shown in Diagram 1.9.

**1.26** For consecutive **tapered treads**, use the same **going**.

**1.27** If a stair consists of straight and **tapered treads**, ensure that the **going** of the **tapered treads** is not less than the **going** of the straight treads.

See paras 1.25–1.27



Measure going at centre of tread;  
measure from curved stair line, even when tread  
is in rectangular closure

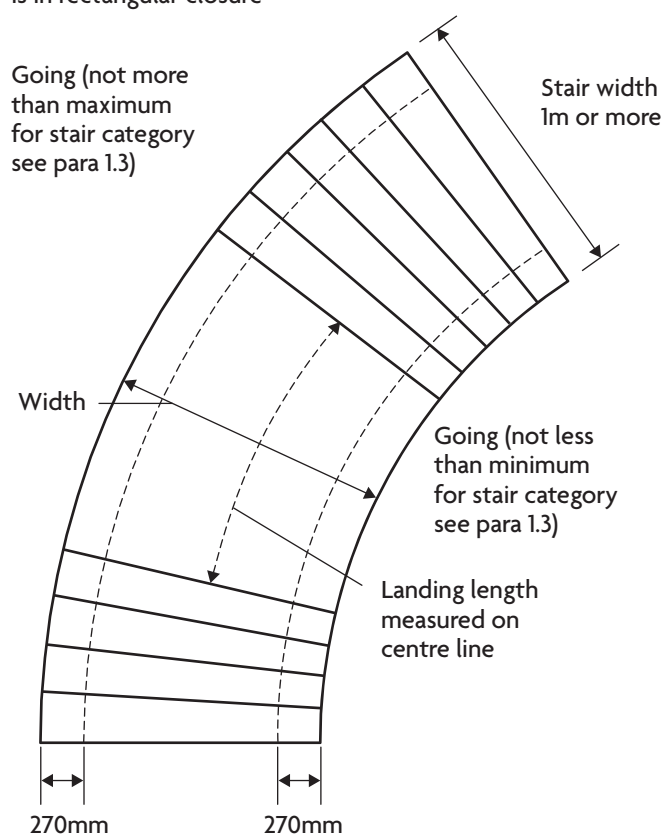


Diagram 1.9 Measuring tapered treads

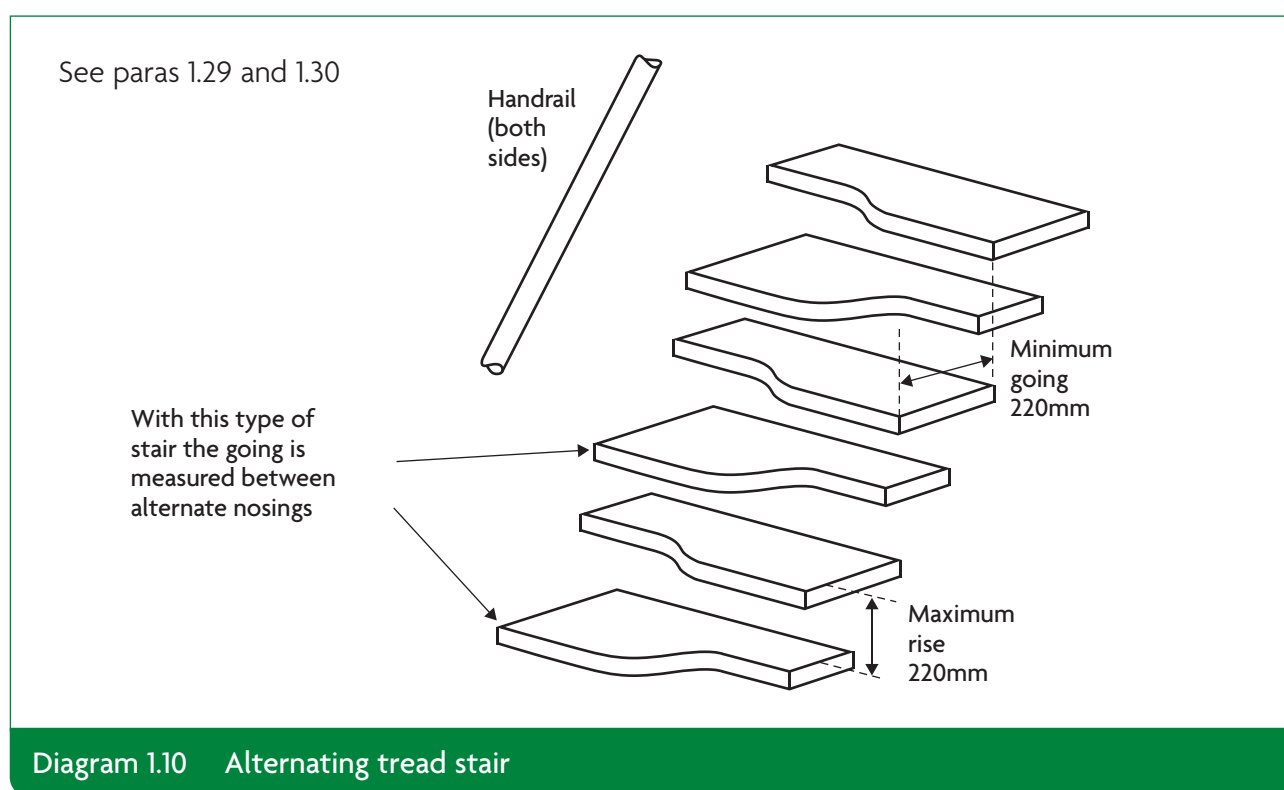
### Spiral and helical stairs

**1.28** Design [spiral stairs](#) and [helical stairs](#) in accordance with **BS 5395-2**.

### Alternating tread stairs in dwellings

**1.29** You may use [alternating tread stairs](#) – in one or more straight [flights](#) – only in a loft conversion, and only when there is not enough space for a stair that satisfies paragraphs 1.2–1.24, and the stair is for access to only one habitable room and, if desired, a bathroom and/or a WC (although this must not be the only WC in the dwelling).

- 1.30** The construction of an **alternating tread stair** should comply with all of the following.
- Comply with Diagram 1.10.
  - Make alternating steps uniform with parallel **nosings**.
  - Have slip-resistant surfaces on treads.
  - Ensure that the tread sizes over the wider part of the step are in line with the dimensions in Table 1.1.
  - Comply with paragraph 1.9b.
  - Provide a minimum clear headroom of 2m.



## Fixed ladders

### In dwellings

- 1.31** Do not use retractable **ladders** as means of escape. Refer to Approved Document B: Volume 1 – Dwellings, and Volume 2 – Buildings other than dwellings.
- 1.32** You may use a fixed **ladder** – with fixed **handrails** on both sides – only for access in a loft conversion that contains one habitable room, and only when there is not enough space without alteration to the existing space for a stair that satisfies the guidance for dwellings in paragraphs 1.2–1.24.

### For industrial buildings

- 1.33** Design and construct stairs, **ladders** and walkways, as appropriate, in accordance with **BS 5395-3** or **BS 4211**.

## Handrails for stairs

### For all buildings

**1.34** Provide **handrails** in accordance with all of the following.

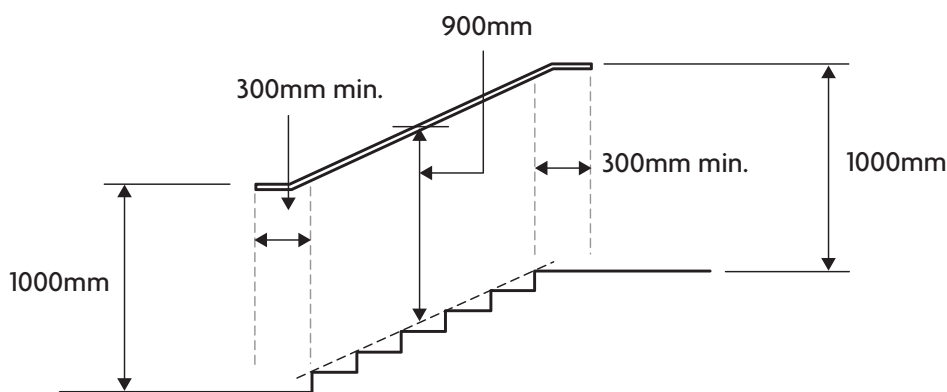
- Position the top of the **handrail** 900mm to 1000mm from the **pitch** line or floor.
- The **handrail** may form the top of a **guarding** if you can match the heights.
- If the stairs are 1000mm or wider: provide a **handrail** on both sides.

### For buildings other than dwellings and for common access areas in buildings that contain flats and do not have passenger lifts

**1.35** Provide suitable continuous **handrails**, as dimensioned in Diagram 1.11 (for blocks of flats) and Diagram 1.12 (for buildings other than dwellings), in accordance with both of the following.

- On each side of the **flights**.
- On each side of the landings.

See paras 1.34–1.35



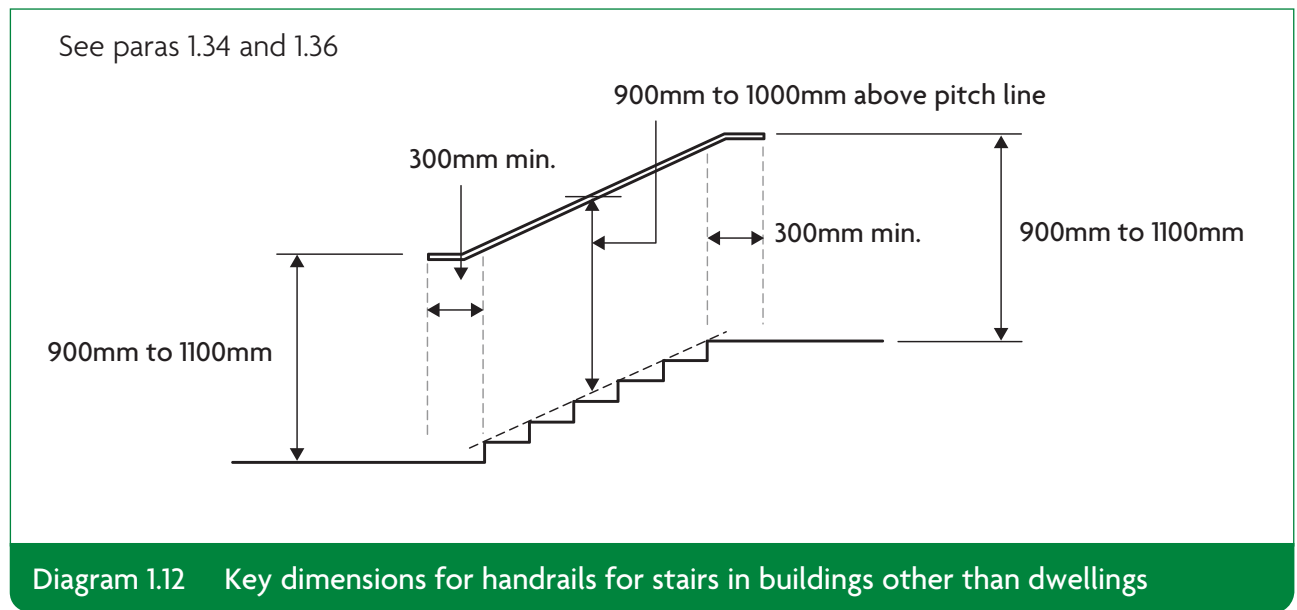
**Diagram 1.11** Key dimensions for handrails for common stairs in blocks of flats

### For buildings other than dwellings

**1.36** Provide **handrails** in accordance with all of the following (in addition to paragraph 1.34).

- Where there is full-height structural **guarding**, if you provide a second (lower) **handrail**, the vertical height from the **pitch** line of the steps (or the surface of the **ramp**) to the top of the second (lower) **handrail** should be 600mm.
- Use a continuous **handrail** along the **flights** and landings of a **ramped** or stepped **flight**.
- Ensure that **handrails** do not project into an access route.
- Ensure that the **handrail** will **contrast visually** with the background against which it is seen, without being highly reflective.

- e. Use a surface for the **handrail** that is slip-resistant and which, in locations subject to extremely cold or hot temperatures, does not become excessively cold or hot to touch. In areas where resistance to vandalism or low maintenance are key factors, use of metals with relatively low thermal conductivity may be appropriate.
- f. Finish the end of the **handrail** in a way that reduces the risk of clothing being caught.
- g. Use the **handrail** profile shown in Diagram 1.13.



### In dwellings

- 1.37** In exceptional circumstances where severely sloping plots are involved, a stepped change of level within the entrance storey may be unavoidable. In those instances, if a **flight** comprises three or more risers, provide a suitable continuous **handrail** in accordance with both of the following.
- a. On each side of the **flight**.
  - b. On each side of any intermediate landings.

See para 1.36

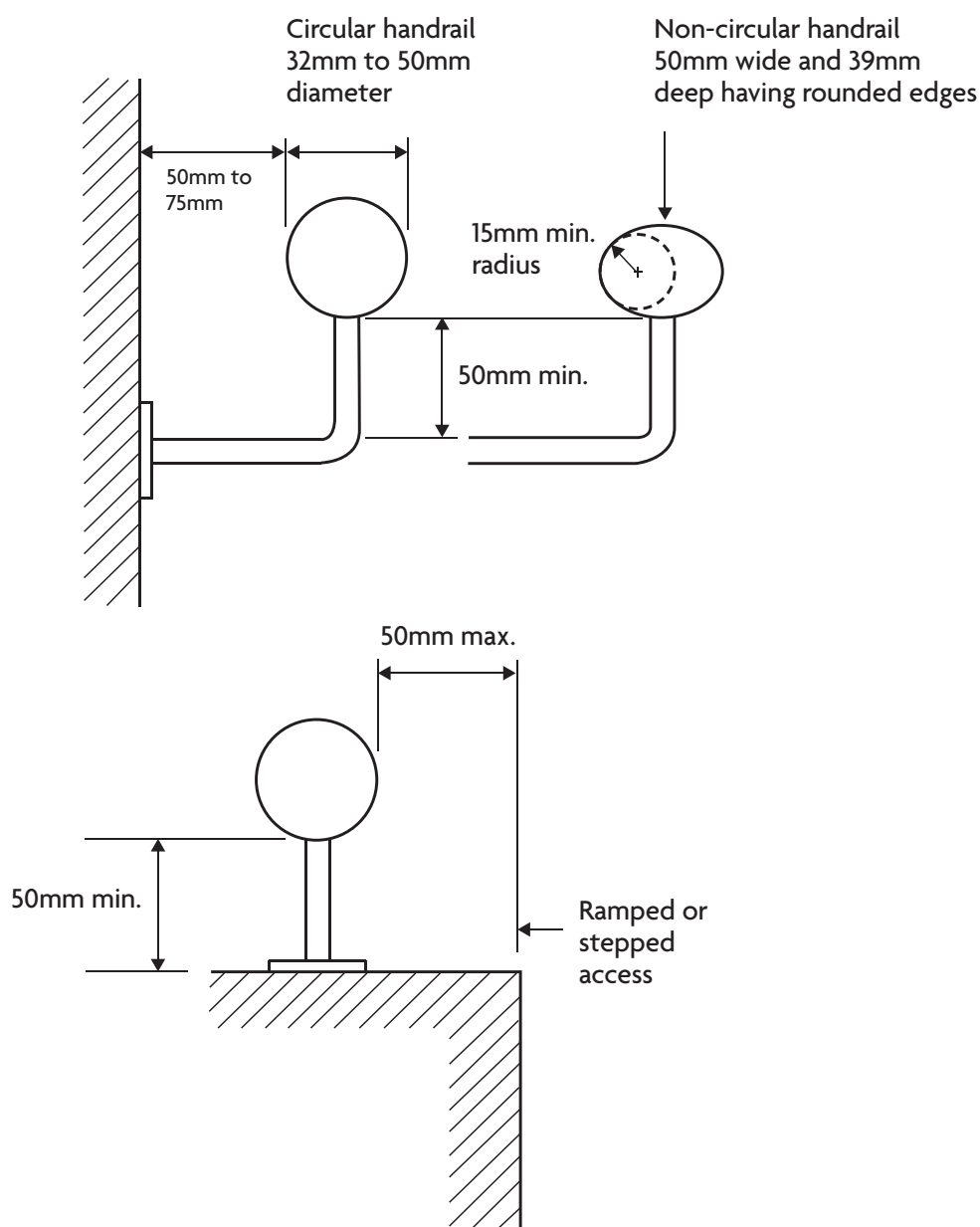


Diagram 1.13 Handrail design

## Guarding of stairs

### For all buildings

**1.38** Design the **guarding** to be the height shown in Diagram 3.1.

**1.39** In a building that may be used by children under five years of age, construct the **guarding** to a **flight** of stairs to do both of the following.

- Prevent children being held fast by the **guarding**: ensure that a 100mm sphere cannot pass through any openings in the **guarding**.
- Prevent children from readily being able to climb the **guarding**.

**For buildings other than dwellings and for common access areas for buildings that contain flats**

**1.40** Provide **guarding** at the sides of **flights** and landings when there are two or more risers.

**In dwellings**

**1.41** Provide **guarding** at the sides of **flights** and landings when there is a drop of more than 600mm.

**Access for maintenance****For buildings other than dwellings**

**1.42** Where the stairs or **ladders** will be used to access areas for maintenance they should comply with one of the following.

- a. If access will be required a minimum of once per month: follow provisions such as those for **private stairs** in dwellings or for industrial stairs and **ladders** in **BS 5395-3**.
- b. If access will be required less frequently than once a month: it may be appropriate, for example, to use portable **ladders**. The Construction (Design and Management) Regulations 2007 give provisions for safe use of temporary means of access.

## Section 2: Ramps

### Scope

- 2.1 The guidance provided in this document covers internal and external ramps when they are part of the building. Additional guidance is provided in Approved Document M when external ramped access also forms part of the principal entrances and alternative accessible entrances, and when they form part of the access route to the building from the boundary of the site and car parking. See Approved Document M Section 1 (for buildings other than dwellings) and Section 6 (for dwellings).

### Appearance of ramps

#### For buildings other than dwellings

- 2.2 Ensure that ramps are readily apparent or clearly signposted.

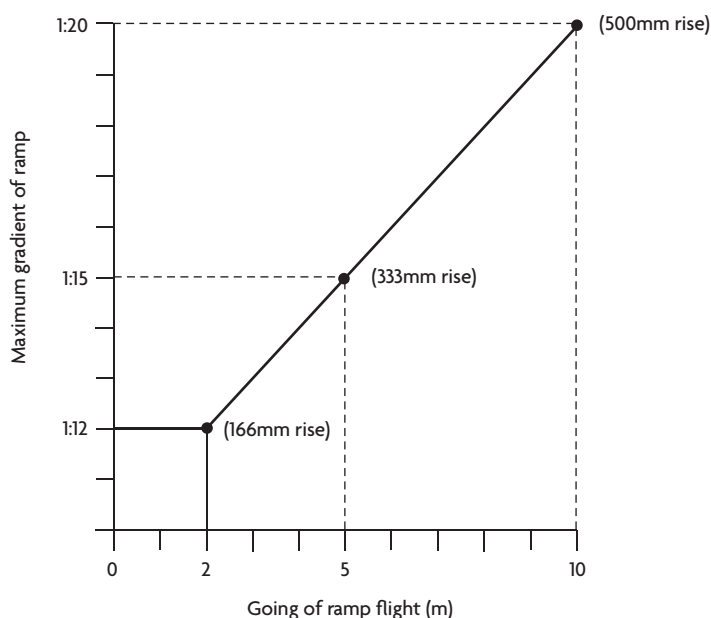
### Steepness of ramps

#### For all buildings

- 2.3 Ensure that the relationship between the gradient of a ramp and its going between landings is as shown in Diagram 2.1.

**NOTE:** A floor level with a gradient of 1:20 or steeper should be designed as a ramp.

See para 2.3



**NOTE:** For goings between 2m and 10m, it is acceptable to interpolate between the maximum gradients i.e. 1:14 for 4m going or 1:19 for 9m going

Diagram 2.1 Relationship of ramp gradient to the going of a flight

## Construction of ramps

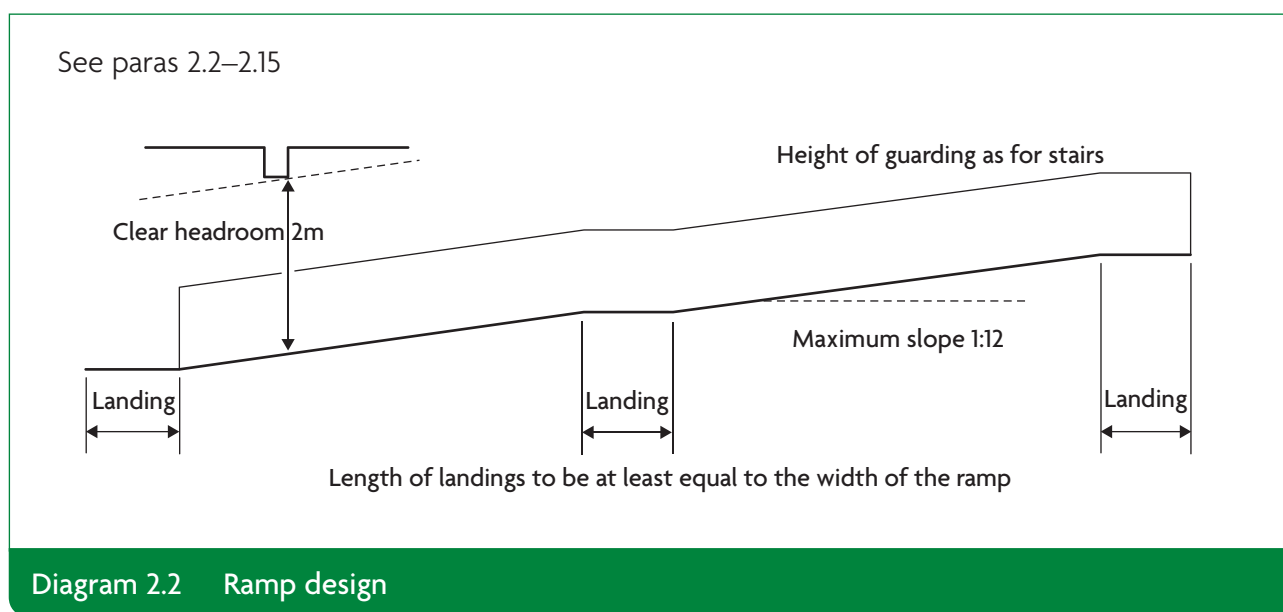
### For buildings other than dwellings

- 2.4** A ramps surface should be selected in accordance with both of the following.
- Use a ramps surface that is slip resistant, especially when wet, and a colour that will contrast visually with that of the landings.
  - Ensure that the frictional characteristics of the ramps and landing surfaces are similar.
- 2.5** On the open side of any ramps or landing, in addition to any guarding, provide a kerb that complies with both of the following.
- Is a minimum of 100mm high.
  - Will contrast visually with the ramps or landing.
- 2.6** Where the change of level is:
- 300mm or more: in addition to the ramps, provide two or more clearly signposted steps
  - less than 300mm: provide a ramps instead of a single step.
- 2.7** If the soffit beneath any ramps is less than 2m above floor level, protect the area beneath the ramps with one of the following.
- Guarding and low level cane detection.
  - A barrier giving the same degree of protection.

## Design of ramps

### For all buildings

- 2.8** Design all ramps and landings in accordance with Diagram 2.2.



## Width of ramps

### For buildings other than dwellings

2.9 Regarding the width of a **ramp**.

- For a **ramp** that provides access for people: ensure the **ramp** has a minimum width between walls, upstands or kerbs of 1500mm.
- For a **ramp** that forms a means of escape, refer also to Approved Document B: Volume 2 – Buildings other than dwellinghouses, B1, Section 5.

## Obstruction of ramps

### For all buildings

2.10 Keep **ramps** clear of permanent obstructions.

## Handrails for ramps

### For buildings other than dwellings

2.11 Provide a **handrail** on both sides of the **ramp** and design them to comply with paragraph 1.36.

### In dwellings and for common access areas in buildings that contain flats

2.12 Provide all of the following.

- For **ramps** that are less than 1000mm wide: provide a **handrail** on one or both sides.
- For **ramps** that are 1000mm or more wide: provide a **handrail** on both sides.
- For **ramps** that are 600mm or less in height: you do not need to provide **handrails**.
- Position the top of the **handrails** at a height of 900mm to 1000mm above the surface of the **ramp**.
- Choose **handrails** that give firm support and allow a firm grip.
- The **handrails** may form the top of the **guarding** if you can match the heights.

## Landings for ramps

### For buildings other than dwellings

2.13 Provide all of the following.

- At the foot and head of a **ramp**, provide landings which are a minimum of 1200mm long and are clear of any door swings or other obstructions.
- Ensure that any intermediate landings are a minimum of 1500mm long and are clear of any door swings or other obstructions.
- If either a wheelchair user cannot see from one end of the **ramp** to the other or the **ramp** has three **flights** or more then provide intermediate landings a minimum of 1800mm wide and a minimum of 1800mm long as passing places.
- Make all landings level or with a maximum gradient of 1:60 along their length.

**For dwellings and for common access areas in buildings that contain flats**

**2.14** Provide landings for **ramps**, as described for stairs in paragraphs 1.19–1.22 and 1.24.

**Guarding of ramps****For all buildings**

**2.15** Provide **guarding** for **ramps** and their landings at their sides in the same way as stairs (see paragraphs 1.38–1.41).

## Requirement K2: Protection from falling

This approved document deals with the following requirement from Part K of Schedule 1 to the Building Regulations 2010.

### Requirements

<i>Requirement</i>	<i>Limits on application</i>
<b>Protection from falling</b>	
<b>K2.</b> —(a) Any stairs, ramps, floors and balconies and any roof to which people have access, and (b) any light well, basement area or similar sunken area connected to a building, shall be provided with barriers where it is necessary to protect people in or about the building from falling.	Requirement K2 (a) applies only to stairs and ramps which form part of the building.

### Performance

In the Secretary of State's view, you can meet requirement K2 if, in order to reduce the risk to the safety of people in and around buildings, you use suitable **guarding** for the appropriate circumstance. Unless otherwise set out elsewhere in this document for particular situations, you can achieve this by the following:

- in *dwelling*s: provide pedestrian **guarding** that is capable of preventing people from being injured by falling from a height of more than 600mm
- in *buildings other than dwelling*s: provide pedestrian **guarding** that is capable of preventing people from falling more than the height of two risers (or 380mm, if not part of a stair).

The standard of provision for **guarding** needed to give an acceptable level of safety depends on the circumstances. For example, in a public building the standard of provision may need to be higher than in a dwelling, because people may be less familiar with the building and there may be more users.

For areas where access is required only for maintenance, greater care can be expected from people and therefore a lower standard of provision may be acceptable.

## Section 3: Protection from falling

### Siting of pedestrian guarding

#### For all buildings

**3.1** Provide **guarding** in all of the following locations:

- a. where it is reasonably necessary for safety to guard the edges of any part of a floor (including the edge below an opening window), gallery, balcony, roof (including roof lights and other openings), any other place to which people have access, and any light well, basement or similar sunken area next to a building
- b. in vehicle parks.

**NOTE:** You do *not* need to provide **guarding** in the following locations:

- a. on **ramps** used only for vehicle access
- b. in places such as loading bays where it would obstruct normal use.

### Design of guarding

#### For all buildings

**3.2** **Guarding** should be provided in accordance with all of the following.

- a. Ensure that **guarding** is, as a minimum, the height shown in Diagram 3.1.
- b. You can use any wall, parapet, balustrade or similar obstruction as **guarding**.
- c. Ensure that **guarding** can resist, as a minimum, the loads given in **BS EN 1991-1-1** with its UK National Annex and **PD 6688-1-1**.
- d. Where glazing is used in the **guarding**, refer also to Section 5 in this approved document.

**NOTE:** Typical locations for **guarding** are shown in Diagram 3.2.

For further guidance on the design of **barriers** and infill panels, refer to **BS 6180**.

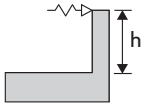
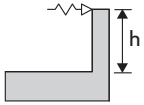
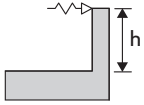
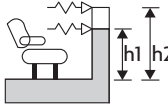
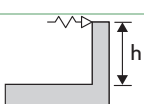
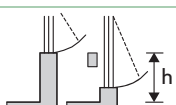
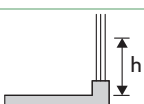
Building Category and location See paras 1.38, 3.2 and 3.4		Height (h)	
Single family dwellings	Stairs, landings, ramps, edges of internal floors	900mm for all elements	
	External balconies, including Juliette balconies and edges of roof	1100mm	
Factories and warehouses (light traffic)	Stairs, ramps	900mm	
	Landings and edges of floors	1100mm	
Residential, institutional, educational, office and public buildings	All locations	900mm for flights otherwise 1100mm	
Assembly	Within 530mm in front of fixed seating	800mm (h1)	
	All other locations	900mm for flights elsewhere 1100mm (h2)	
Retail	All locations	900mm for flights otherwise 1100mm	
Glazing in all buildings	At opening windows except roof windows in loft extensions, see Approved Document B1	800mm	
	At glazing to changes of levels to provide containment	Below 800mm	

Diagram 3.1 Guarding design

- 3.3** In a building that may be used by children under five years of age during normal use, **guarding** should be constructed in accordance with both of the following.
- To prevent children being held fast by the **guarding**: ensure that a 100mm sphere cannot pass through any openings in the **guarding**.
  - To prevent children from readily being able to climb the **guarding**: avoid horizontal rails.

See para 3.2 and Diagram 3.1 for location and dimensions

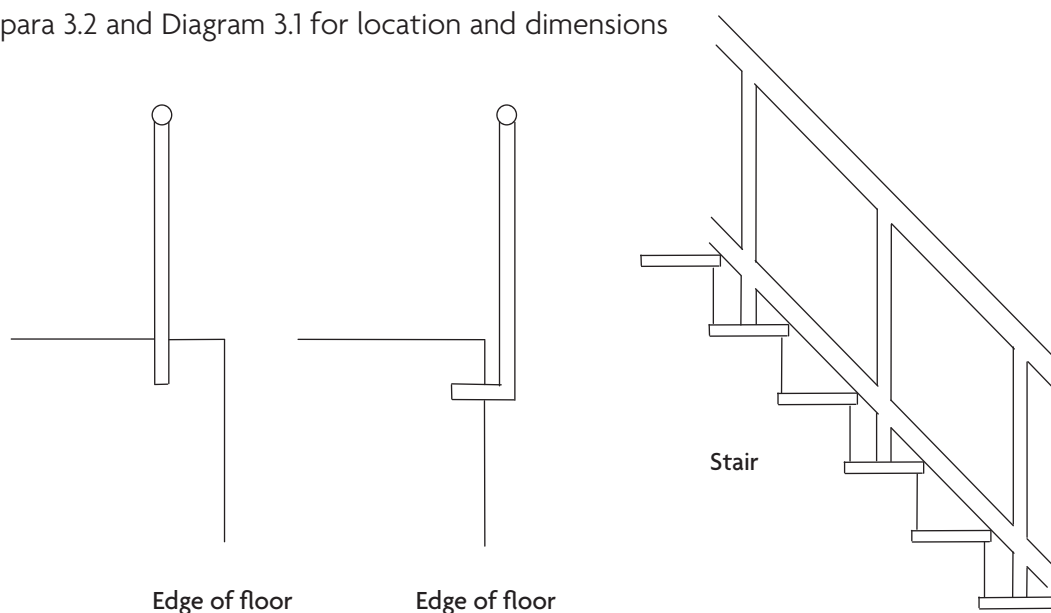


Diagram 3.2 Typical locations for guarding

## Guarding of areas used for maintenance

### For all buildings

- 3.4** Where people will use the stairs or ladders to access areas for maintenance they should comply with one of the following.
- If access will be required frequently (e.g. a minimum of once per month); follow provisions such as those suggested for dwellings in this Approved Document (see Diagram 3.1).
  - If access will be required less frequently than once a month: it may be appropriate to use temporary guarding or warning notices. The Construction (Design and Management) Regulations 2007 and the Work at Height Regulations 2005 give provisions for such measures.
- 3.5** Use signs as specified in the Health and Safety (Safety Signs and Signals) Regulations 1996.

## Requirement K3: Vehicle barriers and loading bays

This approved document deals with the following requirement from Part K of Schedule 1 to the Building Regulations 2010.

### Requirements

#### *Requirement*

#### **Vehicle barriers and loading bays**

**K3.**—(1) Vehicle ramps and any levels in a building to which vehicles have access, shall be provided with barriers where it is necessary to protect people in or about the building.

(2) Vehicle loading bays shall be constructed in such a way, or be provided with such features, as may be necessary to protect people in them from collision with vehicles.

#### *Limits on application*

### Performance

In the Secretary of State's view, you can meet requirement K3 if, in order to reduce the risk to the safety of people from collision with vehicles in and about buildings, you:

- provide vehicle **barriers** that are capable of resisting or deflecting the impact of vehicles
- provide loading bays that have an adequate number of exits or refuges which enable people to avoid being struck or crushed by vehicles.

The standard of provision for **guarding** needed to give an acceptable level of safety depends on the circumstances. For example, in a public building the standard of provision may need to be higher than in a dwelling, because people may be less familiar with the building and there may be more users.

For areas where access is required only for maintenance, greater care can be expected from people and therefore a lower standard of provision may be acceptable.

## Section 4: Vehicle barriers and loading bays

### Vehicle barriers

#### For all buildings

- 4.1** If vehicles have access to a floor, roof or ramp which forms part of a building, provide barriers at any edges which are level with or above the floor or ground or any other route for vehicles (see Diagram 4.1).

See para 4.1

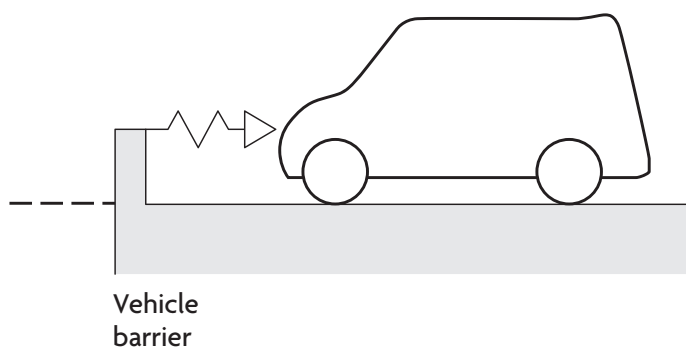
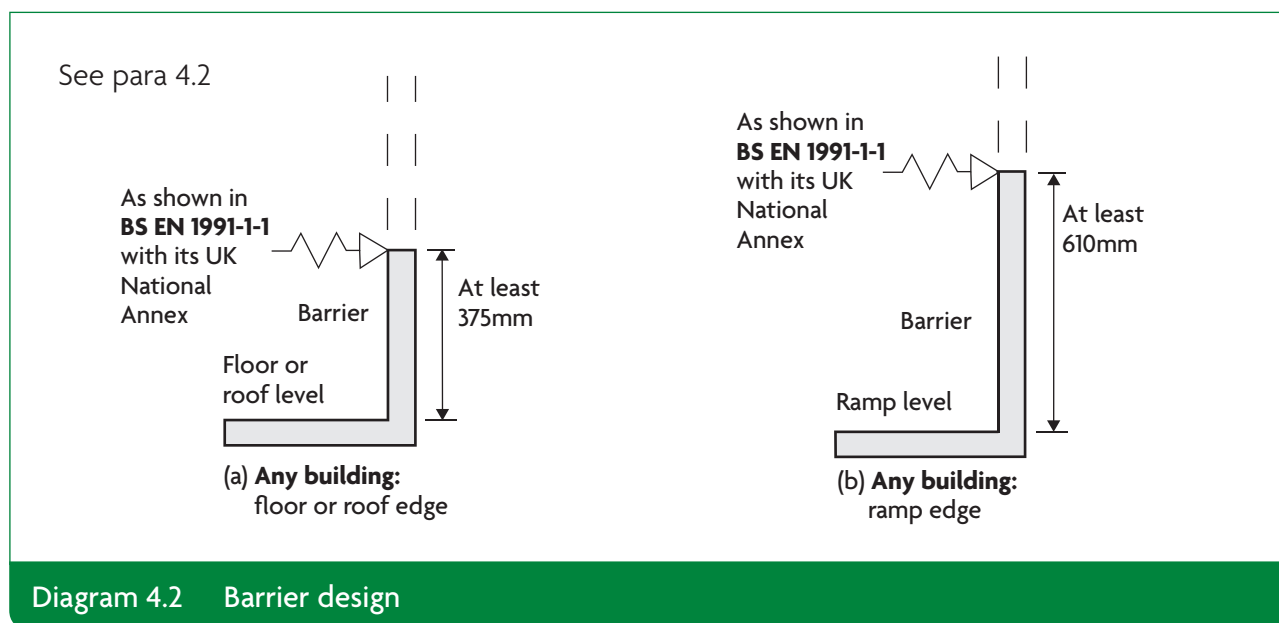


Diagram 4.1 Barrier siting

- 4.2** Barriers should be provided in accordance with all of the following.
- You can use any wall, parapet, balustrade or similar obstacle as a barrier.
  - Construct barriers to be, as a minimum, the height shown in Diagram 4.2.
  - Ensure that barriers can resist the loads given in **BS EN 1991-1-1** with its UK National Annex and **PD 6688-1-1**.



## Loading bays

### For all buildings

- 4.3** Loading bays should be constructed with exit points in accordance with both of the following.
- Provide loading bays with a minimum of one exit point from the lower level, as near the centre of the rear wall as possible.
  - For wide loading bays (for three or more vehicles), provide a minimum of two stepped exit points, one on each side, or provide a refuge where people can avoid the path of a vehicle in addition to one stepped exit point (see Diagram 4.3).

## Guarding for loading bays

### For all buildings

- 4.4** Where there is a danger of people falling, loading bays should be provided with **guarding** as per the guidance provided in this approved document. If **guarding** is not practical for the particular circumstances, alternative safeguards should be provided and agreed with the building control body.

See para 4.3

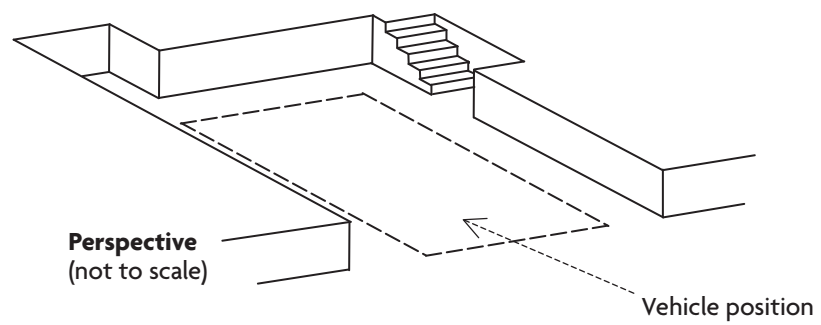
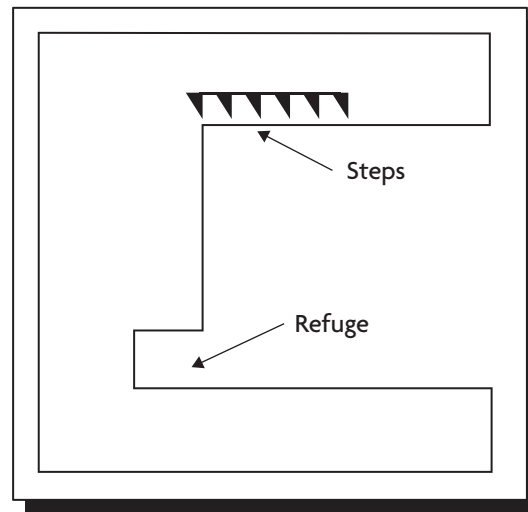


Diagram 4.3 Loading bay

# Requirement K4: Protection against impact with glazing

This approved document deals with the following requirement from Part K of Schedule 1 to the Building Regulations 2010.

## Requirements

### *Requirement*

### *Limits on application*

#### **Protection against impact with glazing**

**K4.**—Glazing, with which people are likely to come into contact whilst moving in or about the building shall:

- (a) if broken on impact, break in a way which is unlikely to cause injury; or
- (b) resist impact without breaking; or
- (c) be shielded or protected from impact.

## Performance

In the Secretary of State's view, you can meet requirement K4 if you adopt, in critical locations, one of the following approaches.

- a. Measures to limit the risk of cutting and piercing injuries by the use of glazing that is reasonably safe, such that, if breakage did occur, any particles would be relatively harmless.
- b. Use of glazing sufficiently robust to ensure that the risk of breakage is low.
- c. Steps are taken to limit the risk of contact with the glazing.

Impacts with glazing, particularly glazing in doors and door side panels, and at low level in walls and partitions, can result in cutting and piercing injuries. For doors and door side panels, the risk is greatest for glazing between floor and shoulder level when near to door handles and push plates, especially when normal building movement causes doors to stick.

Hands, wrists and arms are particularly vulnerable. An initial impact at between waist and shoulder levels can be followed by a fall through the glazing, resulting in additional injury to the face and body.

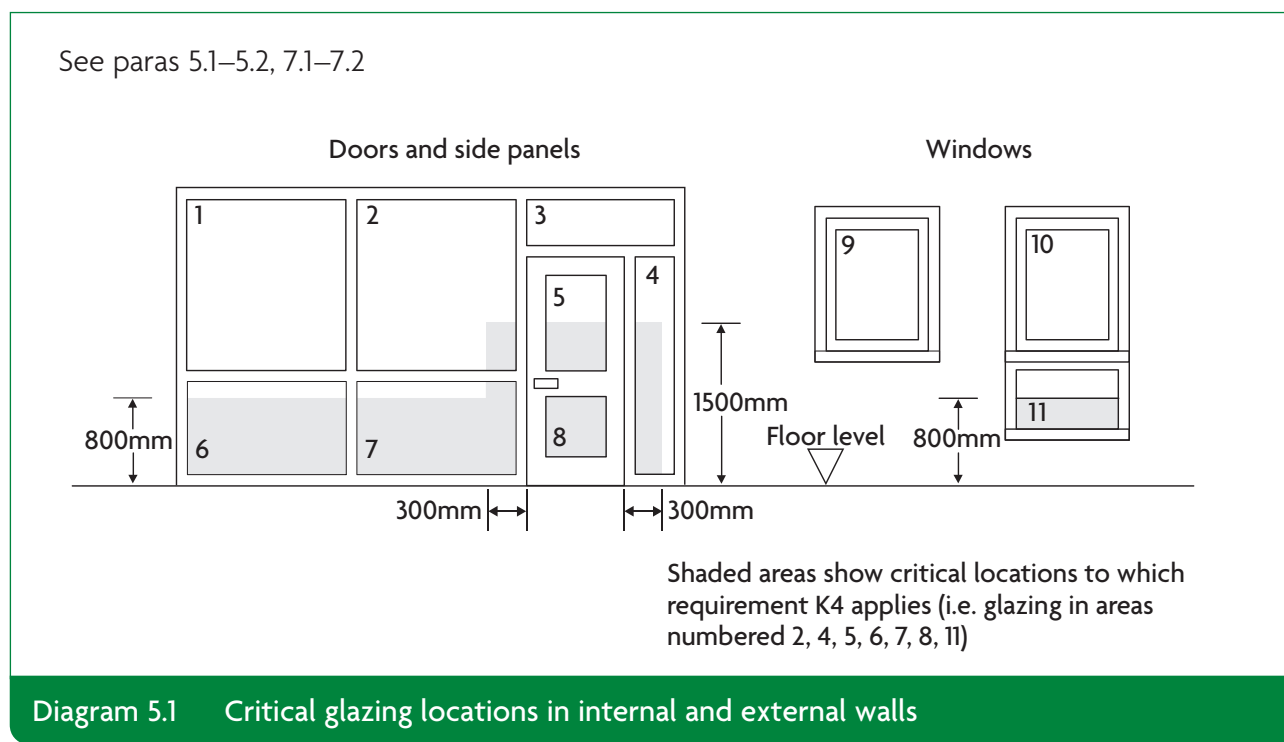
In walls and partitions, away from doors, the risks relate predominantly to glazing at low level. At that level, children are especially vulnerable.

# Section 5: Protection against impact with glazing

## Glazing in critical locations

### For all buildings

5.1 Diagram 5.1 shows critical locations in terms of safety.



5.2 In critical locations, comply with one of the following.

- a. Ensure that glazing, if it breaks, will break safely (see paragraphs 5.3 and 5.4).
- b. Choose glazing that is one of the following:
  - (i) robust (see paragraph 5.5)
  - (ii) in small panes (see paragraphs 5.6 and 5.7).
- c. Permanently protect glazing (see paragraph 5.8).

## Safe breakage

- 5.3** Safe breakage is defined in **BS EN 12600** section 4 and **BS 6206** clause 5.3. In an impact test, a breakage is safe if it creates one of the following.
- A small clear opening only, with detached particles no larger than the specified maximum size.
  - Disintegration, with small detached particles.
  - Broken glazing in separate pieces that are not sharp or pointed.
- 5.4** A glazing material would be suitable for a critical location if it complies with one of the following.
- It satisfies the requirements of Class 3 of **BS EN 12600** or Class C of **BS 6206**.
  - It is installed in a door or in a door side panel and has a pane width exceeding 900mm and it satisfies the requirements of Class 2 of **BS EN 12600** or Class B of **BS 6206**.

## Robustness

- 5.5** Some glazing materials such as annealed glass gain strength through thickness; others such as polycarbonates or glass blocks are inherently strong.

The maximum dimensions for annealed glass of different thicknesses for use in large areas forming fronts to shops, showrooms, offices, factories and public buildings with four edges supported are shown in Diagram 5.2 (see also paragraph 7.1).

See para 5.5

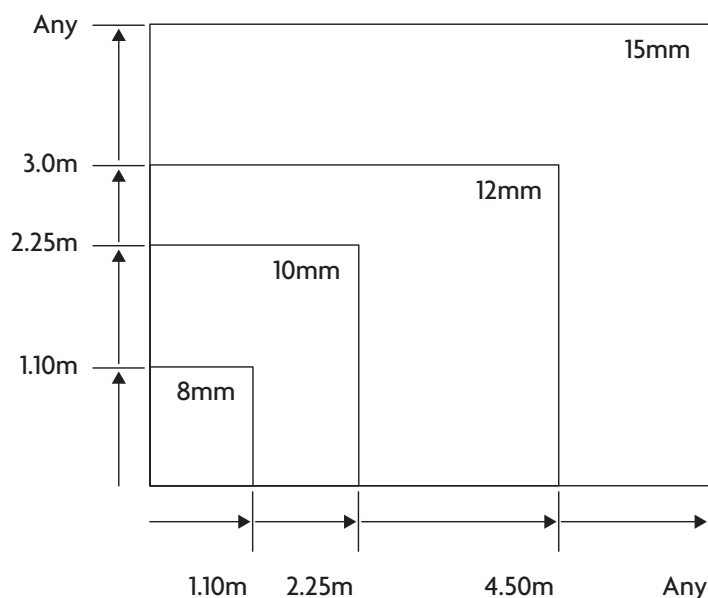
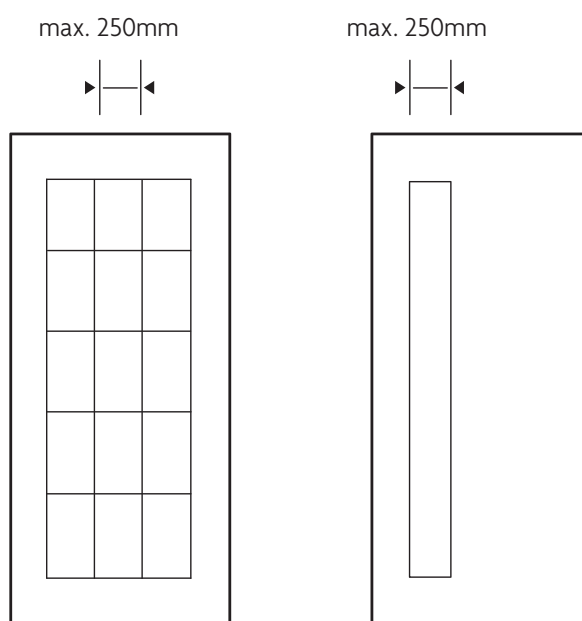


Diagram 5.2 Annealed glass thickness and dimension limits

## Glazing in small panes

- 5.6** In the context of this approved document, a 'small pane' is an isolated pane or one of a number of panes held in glazing bars, traditional leaded lights or copper lights (see Diagram 5.3).
- 5.7** Small panes should be provided in accordance with all of the following.
- In a small annealed glass pane, use glass with a minimum 6mm nominal thickness *except in the situation described in b.*
  - In traditional leaded or copper lights, when fire resistance is not important, you may use 4mm glass.
  - Use the dimensions and areas shown in Diagram 5.3.

See paras 5.6–5.7



Maximum area of single pane not to exceed 0.5m<sup>2</sup>,  
small panes of annealed glass should not be less  
than 6mm thick

Diagram 5.3 Dimensions and areas of small panes

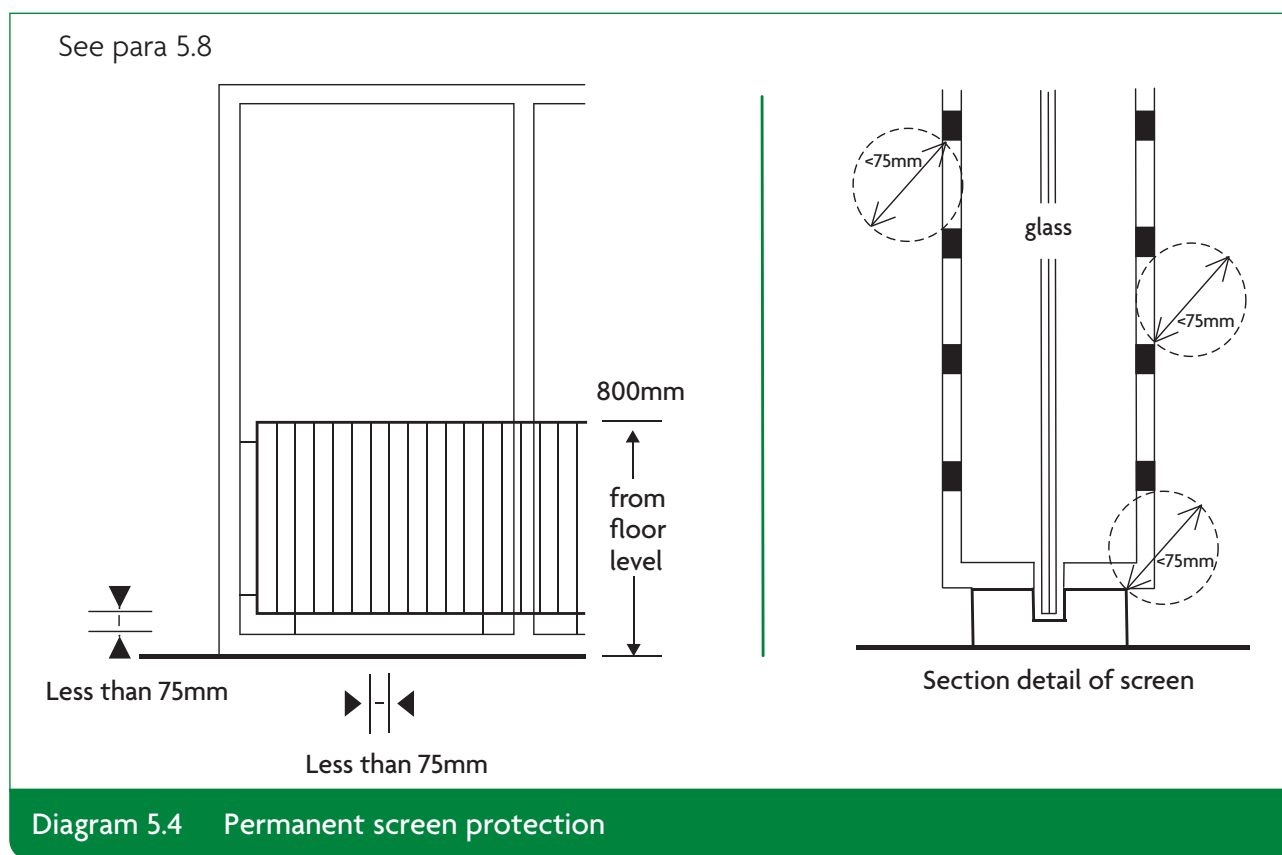
### Permanent screen protection

**5.8** If glazing in a critical location is protected by a permanent screen then the glazing itself does not need to comply with requirement K4.

The permanent screen should comply with all of the following.

- Prevent a sphere of 75mm from coming into contact with the glazing.
- Be robust.
- If it protects glazing installed to help prevent people from falling, be difficult to climb (e.g. no horizontal rails).

See Diagram 5.4.



## Requirement K5.1: Protection from collision with open windows etc.

This approved document deals with the following requirement from Part K of Schedule 1 to the Building Regulations 2010.

### Requirements

#### *Requirement*

#### **Protection from collision with open windows etc.**

**K5.1**—Provision shall be made to prevent people moving in or about the building from colliding with open windows, skylights or ventilators.

#### *Limits on application*

Requirement K5.1 does not apply to dwellings.

### Performance

In the Secretary of State's view, you can meet requirement K5.1 if windows, skylights and ventilators can be left open without danger of people colliding with them. You can achieve this by one of the following methods.

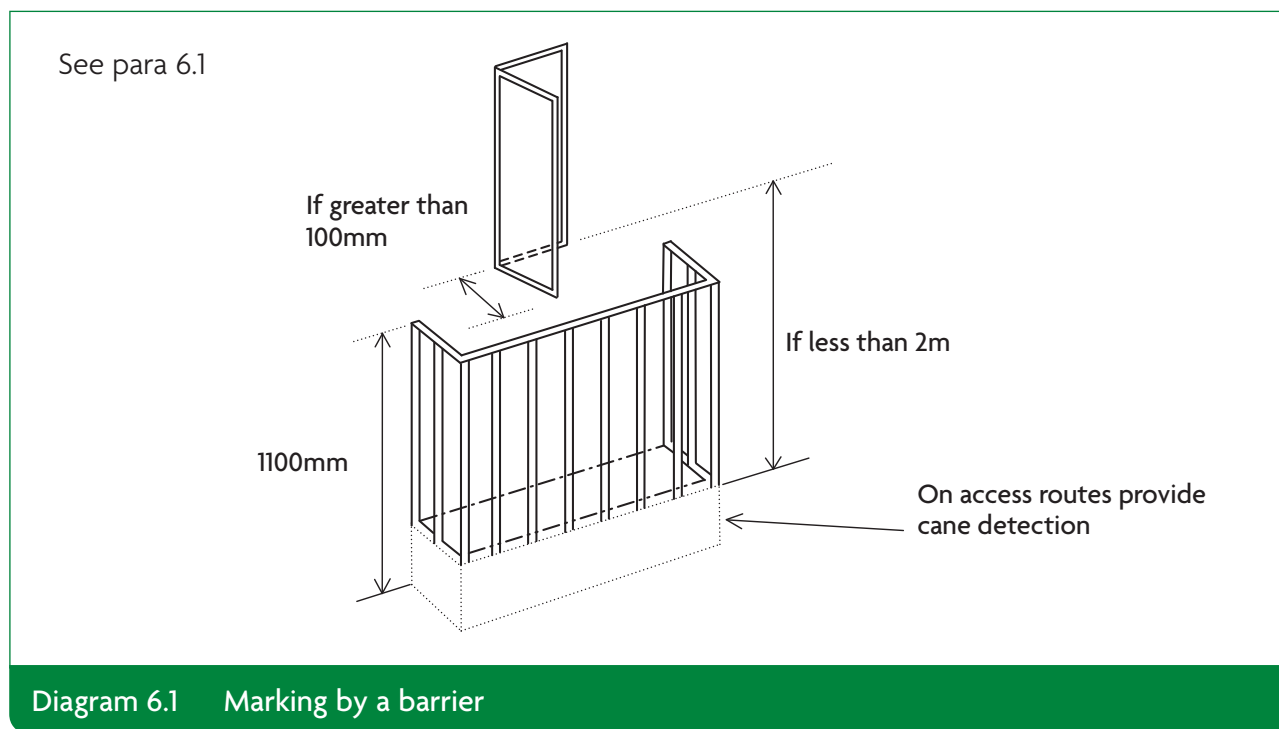
- a. Install windows, skylights and ventilators so that projecting parts cannot come into contact with people moving in and around the building.
- b. Install features which guide people moving in or around the building away from any open window, skylight or ventilator.

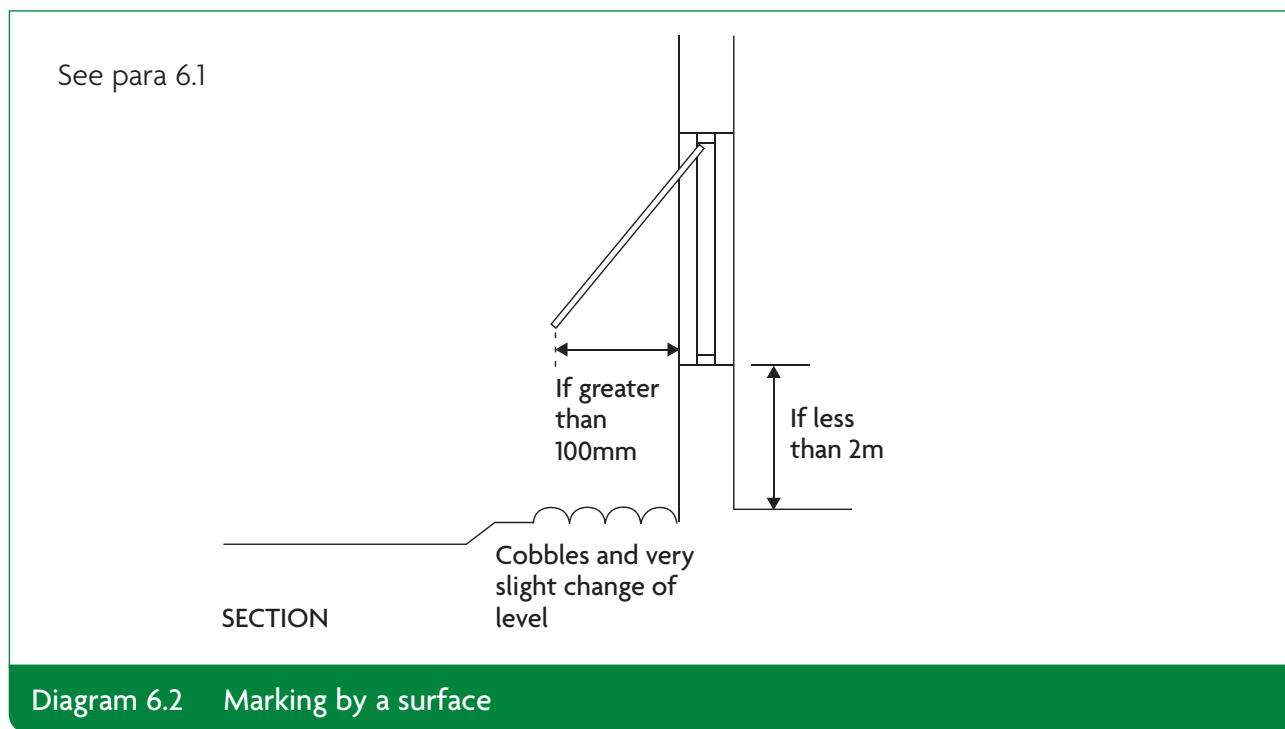
In special cases, such as in spaces where access is required only for maintenance, greater care can be expected from people and therefore a lower standard of provision may be acceptable.

## Section 6: Protection from collision with open windows etc.

### Projecting parts

- 6.1** Where parts of windows, skylights and ventilators project inside or outside a building, indicate this as shown in Diagram 6.1 or Diagram 6.2 (but see also paragraph 6.2).





### Spaces used only for maintenance

- 6.2** In spaces which are used infrequently and only for maintenance you can, for example, mark the projecting part clearly to make it easy to see.

## Requirement K5.2: Manifestation of glazing

This approved document deals with the following requirement from Part K of Schedule 1 to the Building Regulations 2010.

### Requirements

#### *Requirement*

#### **Manifestation of glazing**

**K5.2**—Transparent glazing, with which people are likely to come into contact while moving in or about the building, shall incorporate features which make it apparent.

#### *Limits on application*

Requirement K5.2 does not apply to dwellings.

### Performance

In the Secretary of State's view, you can meet requirement K5.2 by including, in critical locations, permanent means of indicating the presence of large uninterrupted areas of transparent glazing.

## Section 7: Manifestation of glazing

### Critical locations

- 7.1** Critical locations (see paragraph 5.1) include large uninterrupted areas of transparent glazing which form, or are part of, the internal or external walls and doors of shops, showrooms, offices, factories, public or other non-domestic buildings.
- 7.2** The risk of collision is greatest when two parts of the building, or the building and its immediate surroundings, are at the same level but separated by transparent glazing and people may think they can walk from one part to the other.

### Permanent methods to indicate glazing, and alternative methods

- 7.3** People moving in or around a building might not see glazing in critical locations and can collide with it. To avoid this one of the following should be adopted.
  - a. Use permanent manifestation to make glazing apparent (see paragraph 7.4).
  - b. Use alternative indications of glazing, such as mullions, transoms, door framing or large pull or push handles (see Diagram 7.1).
- 7.4** Provide glass doors and glazed screens (including glazed screens alongside a corridor) with all of the following.
  - a. Manifestation at two levels, as shown in Diagram 7.2.
  - b. Manifestation that will **contrast visually** with the background seen through the glass, both from inside and outside, in all lighting conditions.
  - c. Manifestation in the form of a logo or sign, a minimum of 150mm high (repeated if on a glazed screen), or a decorative feature such as broken lines or continuous bands, a minimum of 50mm high.
  - d. Where glazed doors are beside or part of a glazed screen, they are clearly marked with a high-contrast strip at the top and on both sides.
  - e. Where glass doors may be held open, they are protected with **guarding** to prevent people colliding with the leading edge.

See para 7.3

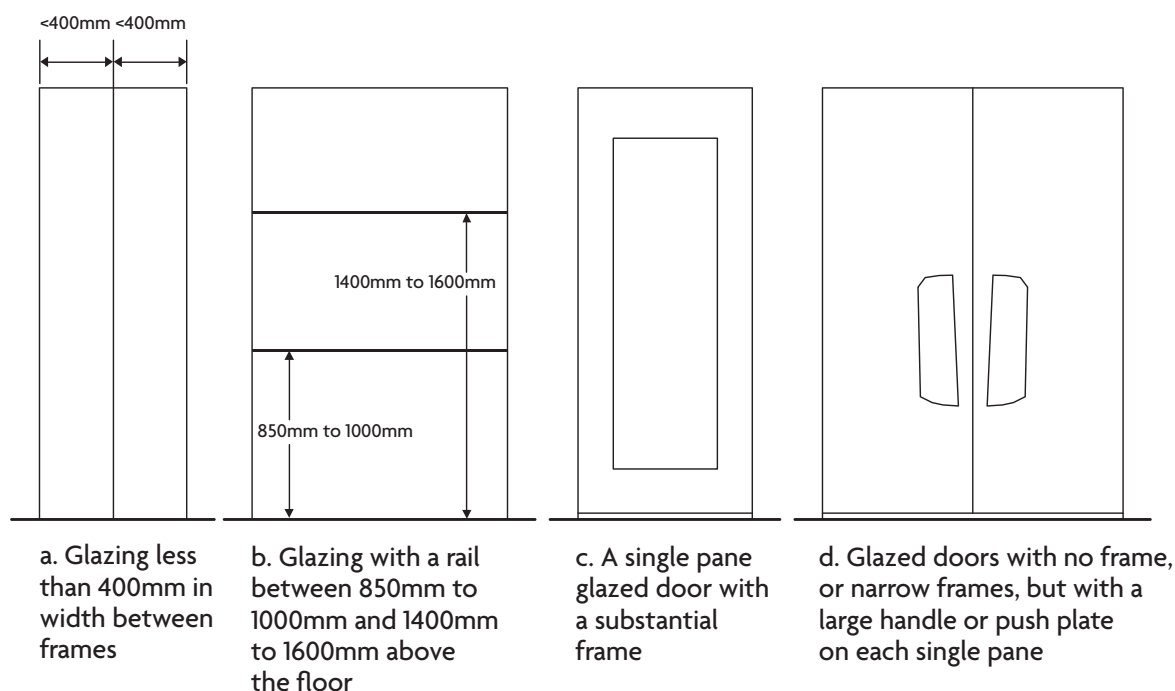


Diagram 7.1 Examples of door-height glazing not warranting manifestation

See para 7.4

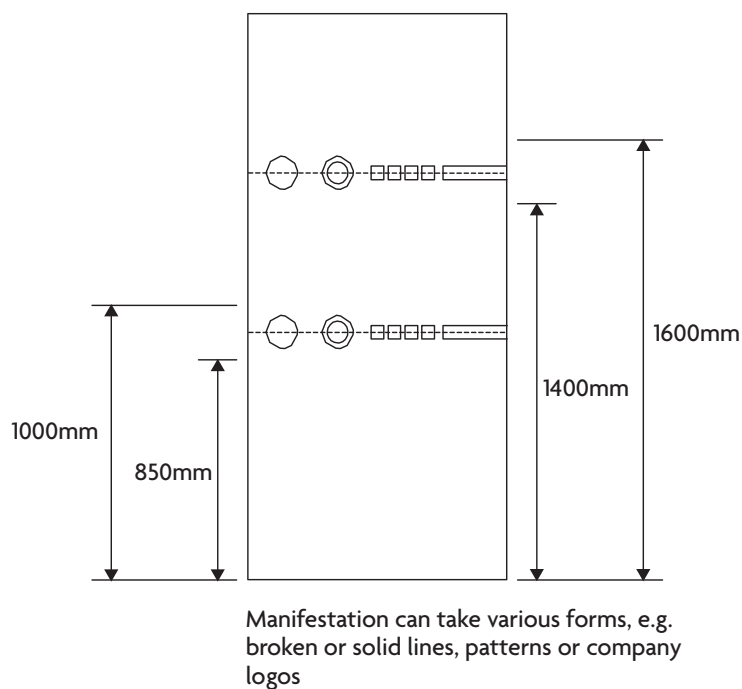


Diagram 7.2 Height of manifestation for glass doors and glazed screens

## Requirement K5.3: Safe opening and closing of windows etc.

This approved document deals with the following requirement from Part K of Schedule 1 to the Building Regulations 2010.

### Requirements

#### *Requirement*

#### **Safe opening and closing of windows etc.**

**K5.3**—Windows, skylights and ventilators which can be opened by people in or about the building shall be so constructed or equipped that they may be opened, closed or adjusted safely.

#### *Limits on application*

Requirement K5.3 does not apply to dwellings.

### Performance

In the Secretary of State's view, you can meet requirement K5.3 by ensuring that people can safely operate windows, skylights and ventilators that open.

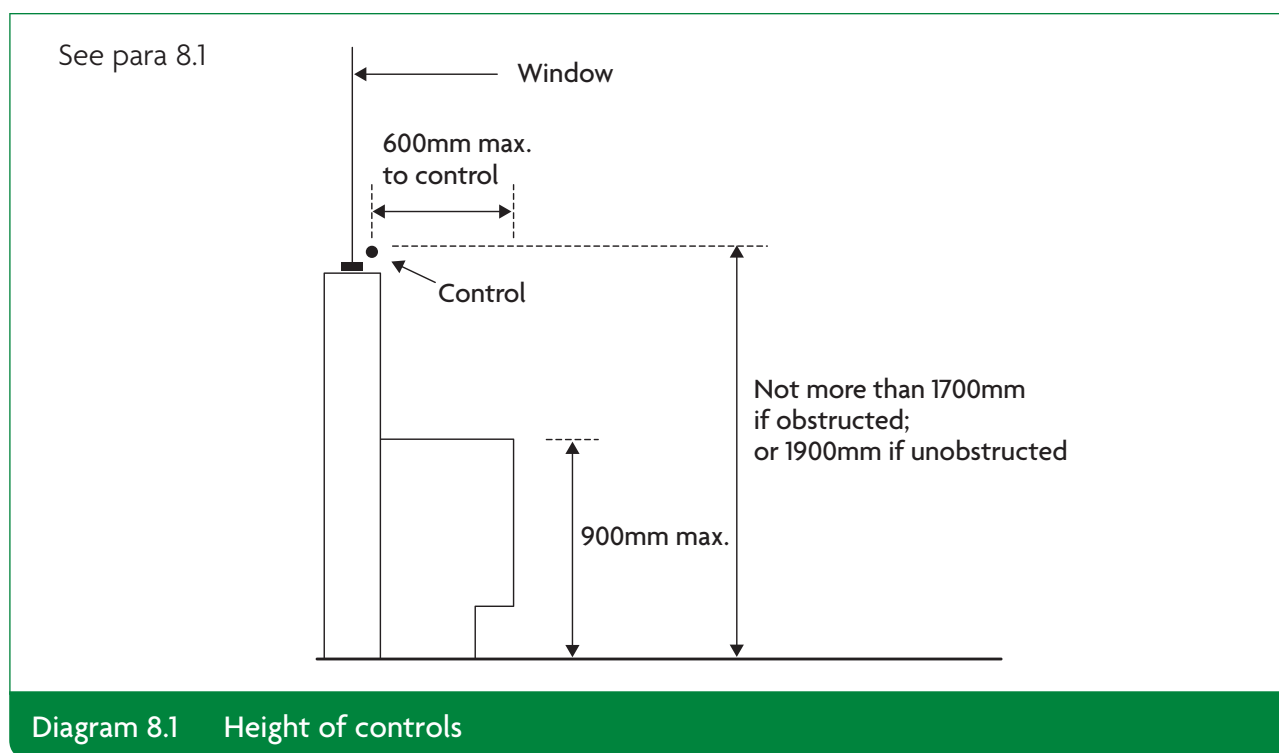
## Section 8: Safe opening and closing of windows etc.

### Location of controls

**8.1** Regarding the controls to operate windows, skylights and ventilators, one of the following should be provided.

- a. Controls positioned as shown in Diagram 8.1.
- b. If controls cannot be positioned as shown in Diagram 8.1 within safe reach of a permanent stable surface, provide a safe manual or electrical means of remote operation.

**NOTE:** Additional guidance is provided in Approved Document M for switches and controls and for window controls in sleeping accommodation.



### Prevention of falls

**8.2** Where a person may fall through a window above ground floor level, provide suitable opening limiters, to restrain the window sufficiently to prevent such falls, or **guarding** (see Section 3).

## Requirement K5.4: Safe access for cleaning windows etc.

This approved document deals with the following requirement from Part K of Schedule 1 to the Building Regulations 2010.

### Requirements

#### *Requirement*

#### **Safe access for cleaning windows etc.**

**K5.4**—Provision shall be made for any windows, skylights, or any transparent or translucent walls, ceilings or roofs to be safely accessible for cleaning.

#### *Limits on application*

Requirement K5.4 does not apply to:

- (a) dwellings, or
- (b) any transparent or translucent elements whose surfaces are not intended to be cleaned.

### Performance

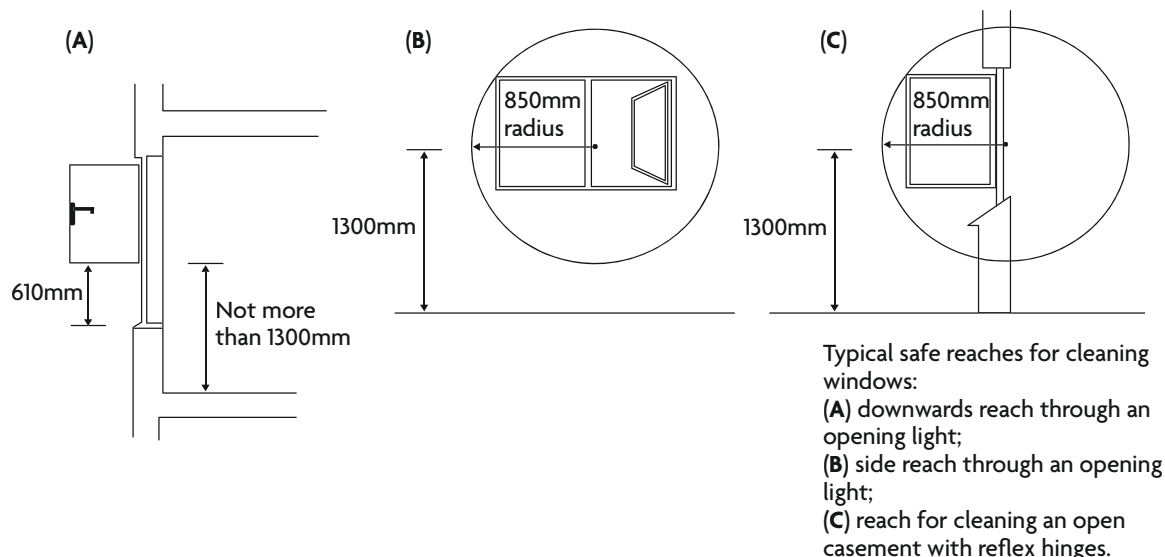
In the Secretary of State's view, you can meet requirement K5.4 if, where a person may fall from a window, you provide safe means of access for cleaning both sides of the glass.

## Section 9: Safe access for cleaning windows etc.

### Safe access methods

- 9.1** Where a person standing on the ground, a floor or other permanent stable surface cannot safely clean a glazed surface use one of the following methods.
- Provide windows of a size and design that allows people to clean the outside safely from inside the building (see Diagram 9.1). If windows reverse for cleaning, fit a mechanism to hold the window in the reversed position. For additional guidance, see **BS 8213-1**.

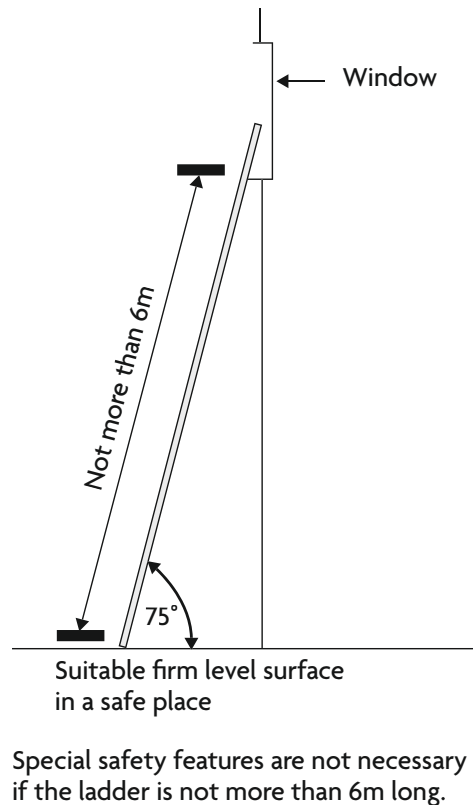
See para 9.1



**Diagram 9.1** Safe reaches for cleaning

- Provide access ladders as follows:
  - for ladders up to 6m long: as shown in Diagram 9.2
  - for ladders between 6m and 9m long: with safety features, as shown in Diagram 9.3.

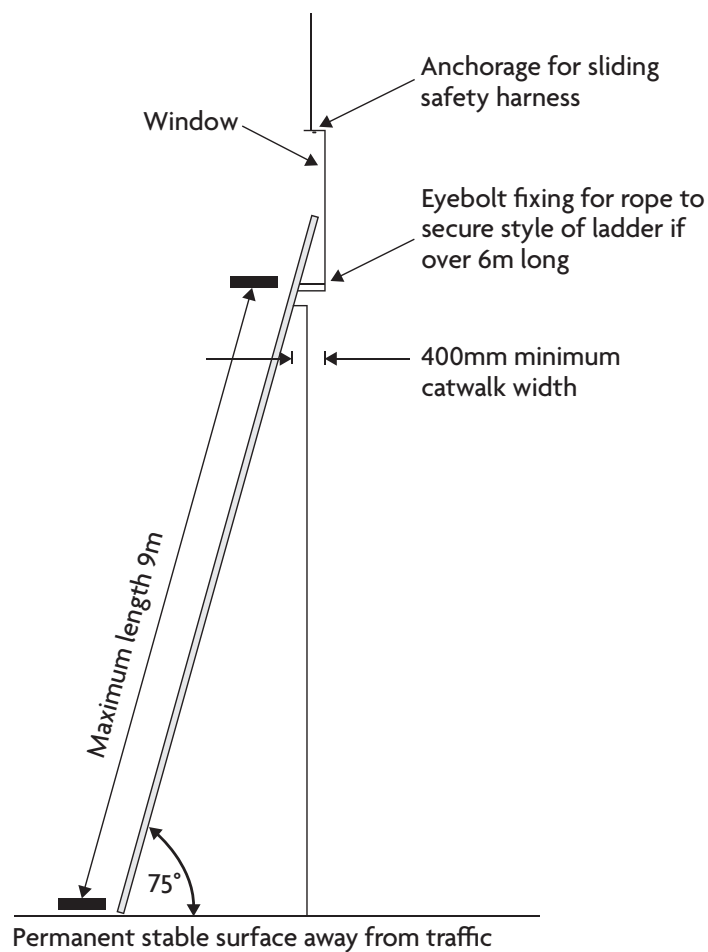
See para 9.1b(i)



**Diagram 9.2** Ladders a maximum of 6m long

- c. Provide access equipment such as suspended cradles or travelling ladders, with attachments for safety harnesses (see Diagram 9.3).
- d. Provide suitable anchorage points for safety harnesses (see Diagram 9.3) or abseiling hooks.
- e. Provide walkways at least 400mm wide, either with guarding at least 1100mm high, or with anchorages for sliding safety harnesses (see Diagram 9.3).
- f. If the methods described in (a) to (e) are not possible, provide space for scaffold towers from which glazed surfaces can be cleaned.

See para 9.1b(ii)



Access to windows from a catwalk. Diagram shows:

- fixing for ladder required if it is over 6m long
- anchorage for sliding safety harness (see 9.1e) for working on a catwalk

Diagram 9.3 Ladders a maximum of 9m long

## Requirement K6: Protection against impact from and trapping by doors

This approved document deals with the following requirement from Part K of Schedule 1 to the Building Regulations 2010.

### Requirements

#### *Requirement*

#### **Protection against impact from and trapping by doors**

**K6.**—(1) Provision shall be made to prevent any door or gate:

- (a) which slides or opens upwards, from falling onto any person; and
- (b) which is powered, from trapping any person.

(2) Provision shall be made for powered doors and gates to be opened in the event of a power failure.

(3) Provision shall be made to ensure a clear view of the space on either side of a swing door or gate.

#### *Limits on application*

Requirement K6 does not apply to:

- (a) dwellings, or
- (b) any door or gate which is part of a lift.

### Performance

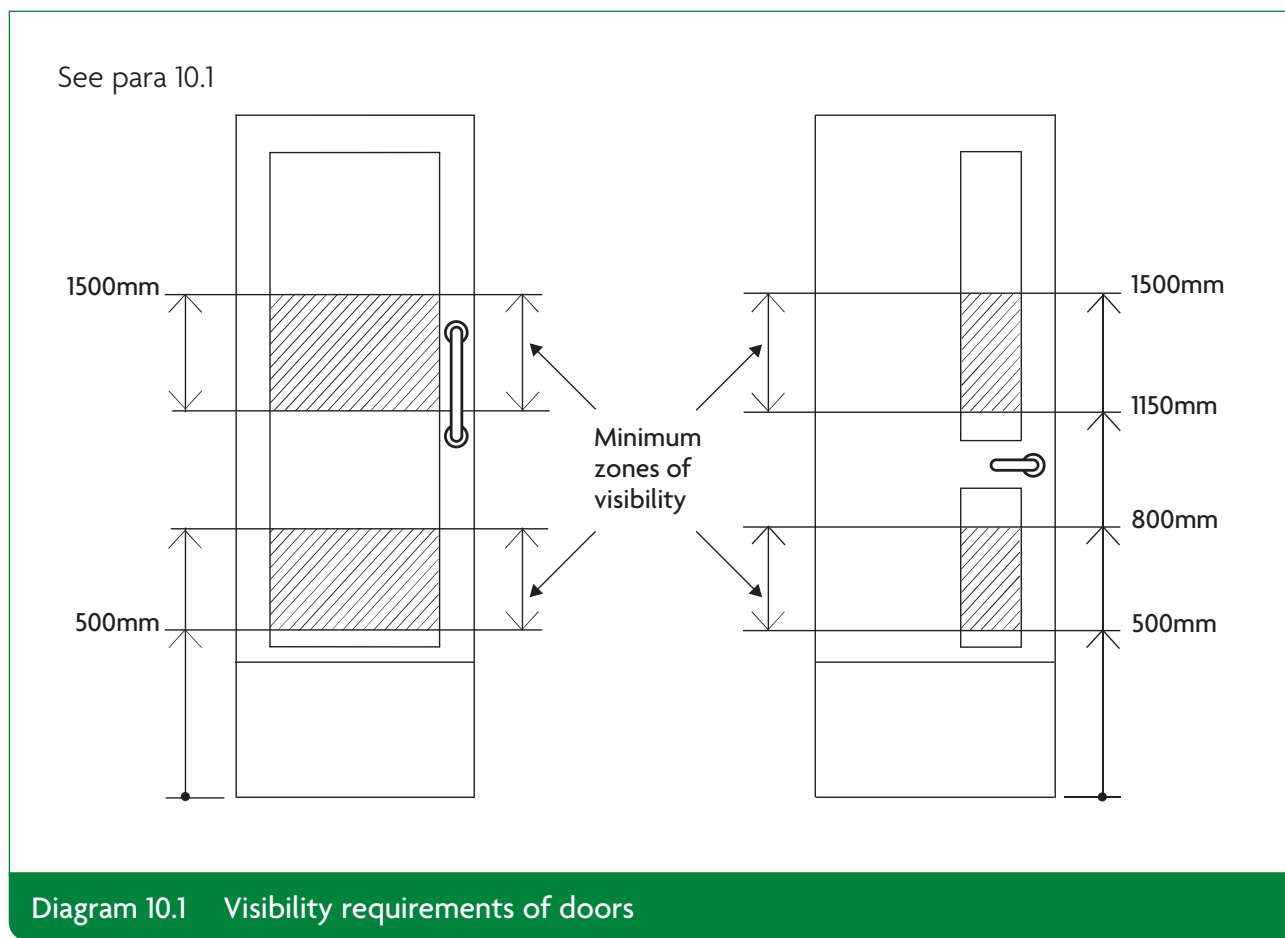
In the Secretary of State's view, you can meet requirement K6 if you take measures to prevent the opening and closing of doors and gates presenting a safety hazard.

## Section 10: Protection against impact from and trapping by doors

### Safety features

**10.1** Doors and gates should be constructed in accordance with all of the following.

- a. In door leaves and side panels wider than 450mm, include vision panels towards the leading edge of the door to provide, as a minimum, the zone or zones of visibility shown in Diagram 10.1.
- b. For sliding doors and gates, provide both of the following:
  - (i) a stop or other effective means to prevent them coming off the end of the track
  - (ii) a retaining rail to prevent doors and gates falling if the suspension system fails or the rollers leave the track.
- c. On upward-opening doors and gates, fit a device to stop them falling in a way that may cause injury.
- d. For power-operated doors and gates, provide all of the following:
  - (i) safety features (such as a pressure-sensitive door edge which operates the power switch) to prevent injury to people who are struck or trapped
  - (ii) a readily identifiable and accessible stop switch
  - (iii) the ability for manual or automatic opening if there is a power failure, when necessary for health or safety.



## Hazards on access routes

**10.2** If, during normal use, doors (excluding fire escape doors) swing out by more than 100mm towards an access route, protect them as shown in Diagram 10.2.

See para 10.2

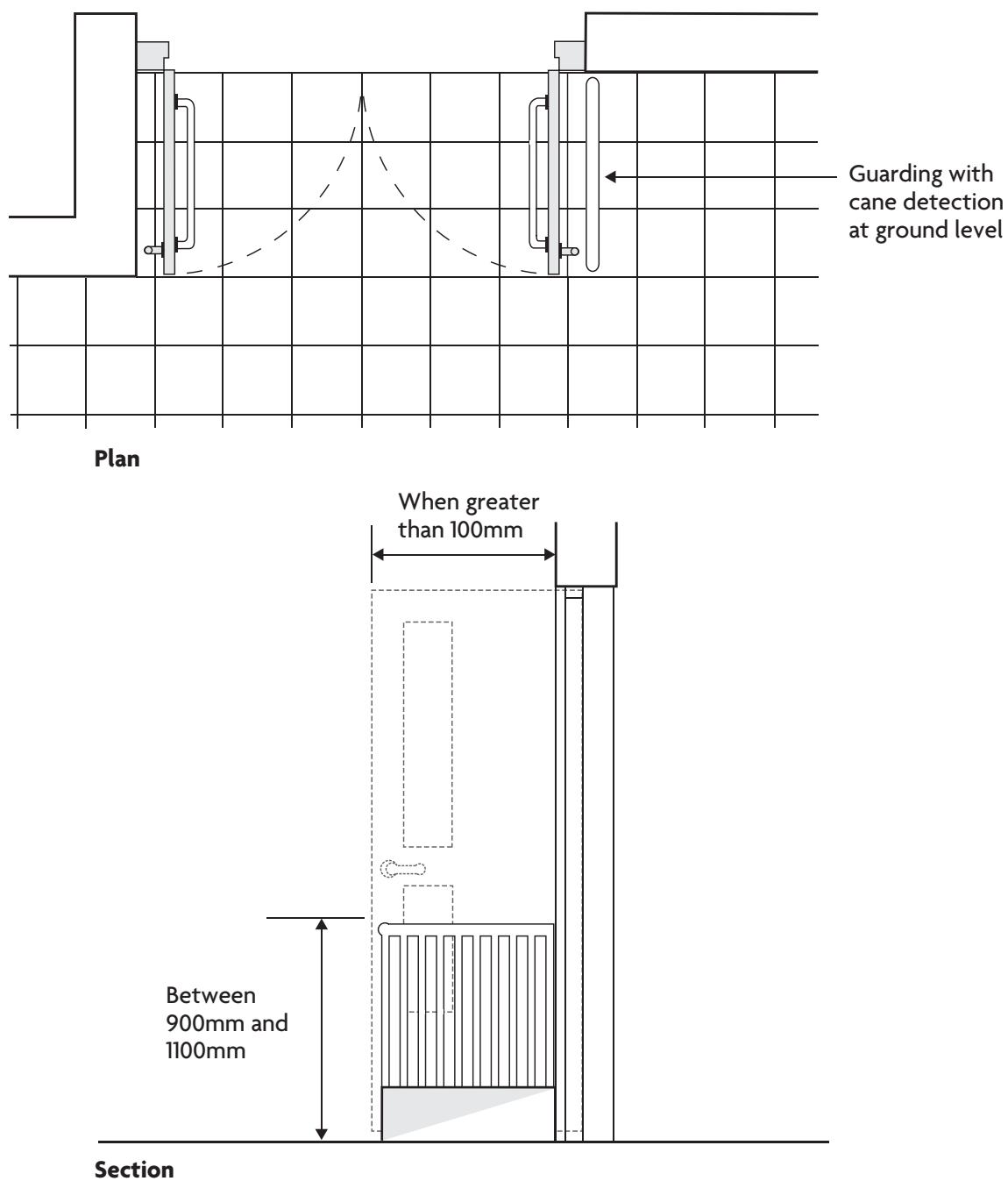


Diagram 10.2 Avoiding doors on access routes

# Appendix A: Key terms

The following are key terms used in this document:

## Accessible entrance

An entrance which is accessible to people regardless of disability, age or gender.

## Alternating tread stair

A stair with paddle-shaped treads where the wide portion is on alternate sides on consecutive treads (see paragraphs 1.29 and 1.30).

## Barrier

A structure – either a raised rail or a solid wall – that denies access to another area.

## Common stair

Serving more than one dwelling.

## Contrast visually

The perception of a visual difference between two elements of the building, or fittings within the building, so that the difference in **light reflectance value** is of sufficient points to distinguish between the two elements.

## Flight

A continuous series of steps or a continuous slope (**ramp**) between landings. (For the widths and lengths of flights see paragraphs 1.14–1.24.)

## General access stair

A stair intended for all users of a building on a day-to-day basis, as a normal route between levels.

## Going

For stairs: the depth from front to back of a tread, less any overlap with the next tread above (see paragraphs 1.2 and 1.3). (For the measurement of the going on **tapered treads** see paragraphs 1.25–1.27.)

For **ramps**: the length of the **ramp** between landings.

## Guarding

A **barrier** that denies pedestrians or vehicles access to another area, for example the floor below (see Diagrams 3.1 and 3.2).

## Handrail

A rail, at hand height or a little higher, for people to hold for support. (For handrails for stairs, see paragraphs 1.34–1.37; for handrails for **ramps**, see paragraphs 2.11–2.12.)

## Helical stair

A stair in a helix around a central void (see paragraph 1.28).

## Ladder

A means of access to another level, formed by a series of rungs or narrow treads. People normally ascend or descend facing the ladder. (See paragraphs 1.31–1.33.)

## Light reflectance value (LRV)

The total quantity of visible light reflected by a surface at all wavelengths and directions when illuminated by a light source.

## Nosing

The leading edge of a stair tread.

## Pitch

The angle of inclination (slope) between the horizontal and a line connecting the **nosings** of a stair.

## Private stair

A stair intended to be used for only one dwelling.

## Principal entrance

An entrance which a visitor not familiar with the building would normally expect to approach.

## Radial gangway

A gangway at an angle to the rows of seats/ wheelchair spaces or a stepped gangway in tiered seating.

**Ramp**

A slope steeper than 1:20, on which a pedestrian or wheelchair user can move from one level to another (see Section 2).

**Rise**

The height between consecutive treads (see paragraphs 1.2 and 1.3).

For **ramps**: the vertical distance between each end of the **ramp flight**.

**Spiral stair**

A stair in a helix around a central column (see paragraph 1.28).

**Stair width**

The clear width between the walls or balustrades.

**Tapered tread**

A step in which the **going** reduces from one side to the other (see paragraphs 1.25–1.27).

**Transverse gangway**

A flat gangway parallel to the rows of seating/wheelchair spaces.

**Utility stair**

A stair used for escape, access for maintenance, or purposes other than as the usual route for moving between levels on a day-to-day basis.

**Vomitory exits**

Storey exits provided within the body of a seating layout.

## Appendix B: Standards referred to

### **BS EN 1991-1-1**

Eurocode 1. Actions on structures. General actions. Densities, self-weight, imposed loads for buildings [2002]

### National Annex to **BS EN 1991-1-1**

UK National Annex to Eurocode 1. Actions on structures. General actions. Densities, self-weight, imposed loads for buildings [2002]

### **BS 4211**

Specification for permanently fixed ladders [2005 + AMD A1, Corrigenda C1, C2]

### **BS 5395-2**

Code of practice for the design of helical and spiral stairs [1984 + AMD 6076, Corrigenda July 2008, C2, C3]

### **BS 5395-3**

Code of practice for the design of industrial type stairs, permanent ladders and walkways [1985 + AMD 14247]

### **BS 6180**

Barriers in and about buildings. Code of practice [2011]

### **BS 6206**

Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings [1981 + AMDs 4580, 5189, 7589, 8156, 8693]

### **PD 6688-1-1**

Recommendations for the design of structures to BS EN 1991-1-1 [2011]

### **BS 8213-1**

Windows doors and rooflights. Design for safety in use and during cleaning of windows, including door-height windows and roof windows. Code of practice [2004]

### **BS EN 12600**

Glass in building – Pendulum test – Impact test method and classification for flat glass [2002 + incorporating corrigendum April 2010]

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HM Government

# The Building Regulations 2010

**Conservation of  
fuel and power**

**APPROVED DOCUMENT**

**L1A**

**L1A Conservation of fuel and power  
in new dwellings**

# Main changes in the 2010 edition

This 2010 edition, incorporating further 2010 amendments, reflects the changes made as a result of the Building Regulations 2010 and Building (Approved Inspectors etc) Regulations 2010. The changes mainly reflect regulation number changes as a result of re-ordering. There have been no amendments to the substantive requirements in Schedule 1 (i.e. Parts A to P) of the Building Regulations. Please note the simplification of the definition of 'room for residential purposes' in regulation 2 of the Building Regulations 2010. Please also note that L1(c) has now become regulation 40.

## **Main changes made by the 2016 amendments**

Changes reflect alterations to the regulations, principally withdrawal of Regulations 29 to 33 of the Building Regulations 2010 and their replacement by Regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012 and changes in wording of Regulations 24, 25, 26, 26A, 27 and 27A of the Building Regulations 2010. There are no technical changes.

\* This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No.2) Order 2009. This approved document also gives guidance applying to buildings of statutory undertakers and of the Crown or carried out by Crown authorities in both England and Wales in respect of regulations 25, 25A, 25B and 26.

# The approved documents

## What is an approved document?

The Secretary of State has approved a series of documents that give practical guidance about how to meet the requirements of the Building Regulations 2010 for England. Approved documents give guidance on each of the technical parts of the regulations and on regulation 7 (see the back of this document).

Approved documents set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirements of the Building Regulations to which they refer. If you follow the guidance in an approved document, there will be a presumption of compliance with the requirements covered by the guidance. However, compliance is not guaranteed; for example, 'normal' guidance may not apply if the particular case is unusual in some way.

Note that there may be other ways to comply with the requirements – *there is no obligation to adopt any particular solution contained in an approved document*. If you prefer to meet a relevant requirement in some other way than described in an approved document, you should discuss this with the relevant building control body.

In addition to guidance, some approved documents include provisions that must be followed exactly, as required by regulations or where methods of test or calculation have been prescribed by the Secretary of State.

Each approved document relates only to the particular requirements of the Building Regulations that the document addresses. However, building work must also comply with any other applicable requirements of the Building Regulations.

## How to use this approved document

This document uses the following conventions.

- a. **Text against a green background** is an extract from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations.
- b. **Key terms, printed in green**, are defined in Appendix A.
- c. When this approved document refers to a named standard or other document, the relevant version are listed in Appendix D (documents referred to) and Appendix E (standards referred to) respectively. However, if the issuing body has revised or updated the listed version of the standard, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations.
- d. Additional *commentary in italic* text appears after some numbered paragraphs. This commentary is intended to assist understanding of the immediately preceding paragraph or sub-paragraph, or to direct readers to sources of additional information, but is not part of the technical guidance itself.

**NOTE:** *Standards and technical approvals may also address aspects of performance or matters that are not covered by the Building Regulations, or they may recommend higher standards than required by the Building Regulations.*

## Where you can get further help

If you do not understand the technical guidance or other information in this approved document or the additional detailed technical references to which it directs you, you can seek further help through a number of routes, some of which are listed below:

- a. The Government website: [www.gov.uk](http://www.gov.uk).
- b. *If you are the person undertaking the building work*: either from your local authority building control service or from an approved inspector.
- c. *If you are registered with a competent person scheme*: from the scheme operator.
- d. *If your query is highly technical*: from a specialist or an industry technical body for the relevant subject.

# The Building Regulations

The following is a high level summary of the Building Regulations relevant to most types of building work. Where there is any doubt you should consult the full text of the regulations, available at [www.legislation.gov.uk](http://www.legislation.gov.uk).

## Building work

Regulation 3 of the Building Regulations defines ‘building work’. Building work includes:

- a. the erection or extension of a building
- b. the provision or extension of a controlled service or fitting
- c. the material alteration of a building or a controlled service or fitting.

Regulation 4 states that building work should be carried out in such a way that, when work is complete:

- a. for new buildings or work on a building that complied with the applicable requirements of the Building Regulations: the work and the building comply with the applicable requirements of the Building Regulations.
- b. for work on an existing building that did not comply with the applicable requirements of the Building Regulations:
  - (i) the work itself must comply with the applicable requirements of the Building Regulations
  - (ii) the building must be no more unsatisfactory in relation to the requirements than before the work was carried out.

## Material change of use

Regulation 5 defines a ‘material change of use’ in which a building or part of a building that was previously used for one purpose will be used for another.

The Building Regulations set out requirements that must be met before a building can be used for a new purpose. To meet the requirements, the building may need to be upgraded in some way.

## Materials and workmanship

In accordance with regulation 7, building work must be carried out in a workmanlike manner using adequate and proper materials. Guidance on materials and workmanship is given in Approved Document 7.

## Energy efficiency requirements

Part 6 of the Building Regulations imposes additional specific requirements for energy efficiency.

If a building is extended or renovated, the energy efficiency of the existing building or part of it may need to be upgraded.

## Notification of work

Most building work and material changes of use must be notified to a building control body unless one of the following applies.

- a. It is work that will be self-certified by a registered competent person or certified by a registered third party.
- b. It is work exempted from the need to notify by regulation 12(6A) of, or schedule 4 to, the Building Regulations.

## Responsibility for compliance

People who are responsible for building work (for example the agent, designer, builder or installer) must ensure that the work complies with all applicable requirements of the Building Regulations. The building owner may also be responsible for ensuring that work complies with the Building Regulations. If building work does not comply with the Building Regulations, the building owner may be served with an enforcement notice.

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# Approved Document L1A: Conservation of fuel and power in new dwellings

## Summary

**0.1** This approved document is one of four approved documents that give guidance on how to comply with the **energy efficiency requirements** of the Building Regulations:

**Approved Document L1A:** Conservation of fuel and power in new dwellings

**Approved Document L1B:** Conservation of fuel and power in existing dwellings

**Approved Document L2A:** Conservation of fuel and power in new buildings other than dwellings

**Approved Document L2B:** Conservation of fuel and power in existing buildings other than dwellings

The approved documents are supported by the:

*Domestic Building Services Compliance Guide*

*Non-Domestic Building Services Compliance Guide*

**0.2** This approved document contains the following sections:

**Section 1** sets out the relevant legal requirements and provides an overview of the steps to demonstrate compliance.

**Section 2** sets out the considerations that apply to demonstrating that the design of the building will meet the **energy efficiency requirements**.

**Section 3** sets out the considerations that apply when demonstrating that the design has been appropriately translated into actual construction performance.

**Section 4** describes the information that should be provided to occupiers to help them achieve reasonable standards of energy efficiency in practice.

**Section 5** provides a pointer to some useful information on different design approaches to meeting the **energy efficiency requirements**

**Appendix A:** Key terms and abbreviations

**Appendix B:** Guidance on the types of building work covered by this approved document

**Appendix C:** Reporting evidence of compliance

**Appendix D:** Documents referred to

**Appendix E:** Standards referred to

## Energy performance certificates

- 0.3** Regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012 requires that when a **dwelling** is erected the person carrying out the work must give an **energy performance certificate** to the owner of the building and a notice to the building control body (BCB) that a certificate has been given including the reference number under which the certificate has been registered. See also the Energy Performance of Buildings (England and Wales) Regulations 2012 (SI 2012/3118) at [www.legislation.gov.uk](http://www.legislation.gov.uk) and detailed guidance on **energy performance certificates** at [www.gov.uk](http://www.gov.uk)

## Section 1: The requirements

- 1.1** This approved document, which takes effect on 6 April 2014, deals with the **energy efficiency requirements** in the Building Regulations 2010. Regulation 2(1) of the Building Regulations defines the **energy efficiency requirements** as the requirements of regulations 23, 25A, 25B, 26, 26A, 28 and 40 and Part L of Schedule 1. The **energy efficiency requirements** relevant to this approved document, which deals with new **dwellings**, are those in regulations 25A, 26, 26A and 40 and Part L of Schedule 1, and are set out below.

**NOTE:** Regulation 25B ‘Nearly zero-energy requirements for new buildings’ will not come into force until 2019 at the earliest. Statutory guidance on how to comply with regulation 25B is not included within this approved document and will be provided nearer to the time that regulation 25B comes into force.

- 1.2** Relevant extracts from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended) are set out using **text against a green background** in this approved document. Where there is any doubt you should consult the full text of the regulations, available at [www.legislation.gov.uk](http://www.legislation.gov.uk)

### Part L of Schedule 1: Conservation of fuel and power

<i>Requirement</i>	<i>Limits on application</i>
<b>Schedule 1 – Part L Conservation of fuel and power</b>	
<b>L1.</b> Reasonable provision shall be made for the conservation of fuel and power in buildings by:	
(a) limiting heat gains and losses–	
(i) through thermal elements and other parts of the building fabric; and	
(ii) from pipes, ducts and vessels used for space heating, space cooling and hot water services;	
(b) providing fixed building services which–	
(i) are energy efficient;	
(ii) have effective controls; and	
(iii) are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances.	

## Demonstrating compliance

- 1.3** In the Secretary of State's view, compliance with the **energy efficiency requirements** could be demonstrated by meeting the five separate criteria set out in the following paragraphs. Compliance software should produce an output report to assist **BCBs** check that compliance has been achieved.

**NOTE:** *The output report can benefit both developers and **BCBs** during the design and construction stages as well as at completion.*

- 1.4** Criterion 1: in accordance with regulation 26, the calculated rate of CO<sub>2</sub> emissions from the **dwelling** (the Dwelling CO<sub>2</sub> Emission Rate, **DER**) must not be greater than the Target CO<sub>2</sub> Emission Rate (**TER**). Additionally, and in accordance with regulation 26A, the calculated Dwelling Fabric Energy Efficiency (**DFEE**) rate must not be greater than the Target Fabric Energy Efficiency (**TFEE**) rate. The **TER/DER** and **TFEE/DFEE** rate calculations are determined using the procedures set out in paragraphs 2.8 to 2.30.

**NOTE:** *Criterion 1 is a regulation and is therefore mandatory, whereas the limits for design flexibility for Criteria 2 are statutory guidance. The calculations required as part of the procedure to show compliance with this criterion can also provide information for the **energy performance certificate** required by the Energy Performance of Buildings (England and Wales) Regulations 2012 (SI 2012/3118).*

- 1.5** Criterion 2: the performance of the individual fabric elements and the **fixed building services** of the building should achieve reasonable overall standards of energy efficiency, following the procedure set out in paragraphs 2.31 to 2.37.

**NOTE:** *Criterion 2 is intended to limit design flexibility, to discourage excessive and inappropriate trade-offs. For example, individual building fabric elements with poor insulation standards being offset by renewable energy systems with uncertain service lives.*

- 1.6** Criterion 3: the **dwelling** should have appropriate passive control measures to limit the effect of heat gains on indoor temperatures in summer, irrespective of whether the **dwelling** has mechanical cooling. The guidance given in paragraphs 2.38 to 2.42 of this approved document provides a way of demonstrating reasonable provision.

**NOTE:** *The purpose is to limit solar gains and heat gains from circulation pipes to reasonable levels during the summer period, in order to reduce the need for, or the installed capacity of, air-conditioning systems. Criterion 3 should be satisfied even if the **dwelling** is air-conditioned.*

- 1.7** Criterion 4: the performance of the **dwelling**, as built, should be consistent with the **DER** and **DFEE** rate. Use the guidance in Section 3 to demonstrate that this criterion has been met.

- 1.8** Criterion 5: the necessary provisions for enabling energy-efficient operation of the **dwelling** should be put in place. One way to achieve this is to follow the guidance in Section 4.

## Section 2: Design standards

### Regulations 35, 24 and 25

2.1 Regulations 35, 24 and 25 state that:

#### Interpretation

**35(1).** 'Energy performance of a building' means the calculated or measured amount of energy needed to meet the energy demand associated with a typical use of the building, which includes, inter alia, energy used for heating, cooling, ventilation, hot water and lighting.

#### Methodology of calculation of the energy performance of buildings

**24.** (1) The Secretary of State shall approve—

- (a) a methodology of calculation of the energy performance of buildings, including methods for calculating asset ratings and operational ratings of buildings; and
- (b) ways in which the energy performance of buildings, as calculated in accordance with the methodology, shall be expressed.

(2) In this regulation—

'asset rating' means an energy performance indicator determined from the amount of energy estimated to meet the different needs associated with a standardised use of the building; and

'operational rating' means an energy performance indicator determined from the amount of energy consumed during the occupation of a building over a period of time and the energy demand associated with a typical use of the building over that period.

#### Minimum energy performance requirements for buildings

**25.** Minimum energy performance requirements shall be set by the Secretary of State calculated and expressed in accordance with the methodology approved pursuant to regulation 24, for—

- (a) new buildings (which shall include new dwellings), in the form of target CO<sub>2</sub> emission rates; and
- (b) new dwellings, in the form of target fabric efficiency rates.

### Target CO<sub>2</sub> Emission Rate (TER) and Target Fabric Energy Efficiency (TFEE) rate

**2.2** The Target CO<sub>2</sub> Emission Rate (TER) and Target Fabric Energy Efficiency (TFEE) rate are the minimum energy performance requirements for a new dwelling approved by the Secretary of State in accordance with regulation 25. The TER is expressed as the mass of CO<sub>2</sub> emitted in kilograms per square metre of floor area per year. The TFEE rate is expressed as the amount of energy demand in units of kilowatt-hours per square metre of floor area per year. The results are based on the provision and standardised use of specified fixed building services when assessed using approved calculation tools.

**2.3** In line with the methodology approved by the Secretary of State in the *Notice of Approval*, the TER and TFEE rate for individual dwellings must be calculated using SAP 2012.

**NOTE:** A summary of the Part L 2013 notional dwelling is published at Table 4 in this approved document with the full detail in SAP 2012 Appendix R. If the actual dwelling is constructed entirely to the notional dwelling specifications it will meet the CO<sub>2</sub> and fabric energy efficiency targets and the limiting values for individual fabric elements and buildings services. Developers are, however, free to vary the specification, provided the same overall level of CO<sub>2</sub> emissions and fabric energy efficiency performance is achieved or bettered.

## 2.4 The TER is calculated in two stages:

- a. First calculate the CO<sub>2</sub> emissions from a notional dwelling of the same size and shape as the actual dwelling and which is constructed according to the reference values set out in Appendix R of SAP 2012 (and summarised at Table 4). No values may be varied from these reference values when establishing the TER. The calculation tool will report the CO<sub>2</sub> emissions (based on SAP 2012 CO<sub>2</sub> emission factors) arising from:
  - i. The provision of space heating and hot water,  $C_H$
  - ii. The use of pumps and fans,  $C_{PF}$
  - iii. The use of internal lighting,  $C_L$
- b. Second, calculate the TER using the following formula:

$$TER_{2013} = C_H \times FF + C_{PF} + C_L$$

Where  $FF$  is the fuel factor taken from Table 1 in accordance with the guidance in paragraph 2.5.

## 2.5 The fuel to be used when determining the fuel factor from Table 1 is one of the fuels used to provide heating and hot water to the actual dwelling, as follows:

- a. If all the space heating and domestic hot water heating appliances are served by the same fuel, select that fuel.
- b. If the dwelling has more than one appliance for space heating and/or domestic hot water and these are served by different fuels, select:
  - i. mains gas if used to fire any of the appliances; or
  - ii. otherwise the fuel used for the main space heating system.
- c. Where the dwelling is served by a community heating scheme, select:
  - i. mains gas if used for any purpose in the community scheme; or
  - ii. otherwise the fuel that provides the most heat for the community scheme.

**Table 1 Fuel factor**

	Fuel factor <sup>1</sup>
Mains gas	1.00
LPG	1.06
Oil	1.17
B30K	1.00
Grid electricity for direct acting and storage systems	1.55
Grid electricity for heat pumps	1.55
Solid mineral fuel <sup>2</sup>	1.35
Any fuel with a CO <sub>2</sub> emission factor less than that of mains gas	1.00
Solid multi-fuel <sup>2</sup>	1.00

Notes:

1. The fuel factors in this table will be reviewed as progress is made towards the zero carbon target.
2. For those appliances that can only burn one particular fuel, use the specific fuel factor. For an appliance that is classed as multi-fuel and that is not in a dwelling in a smoke control area, use the multi-fuel factor. For a multi-fuel appliance in a dwelling within a smoke control area, use the solid mineral fuel figure unless the specific appliance type is approved for use within smoke control areas, in which case use the multi-fuel factor.

- 2.6 The **TFEE** rate is calculated by determining the fabric energy efficiency from a notional **dwelling** of the same size and shape as the actual **dwelling** and which is constructed according to the reference values as summarised in Table 4. This fabric energy efficiency is then multiplied by **1.15** to give the **TFEE** rate.

### Buildings containing multiple dwellings

- 2.7 For a building that contains more than one **dwelling** (such as a terrace of houses or an apartment block), an average **TER** and/or **TFEE** rate can be calculated. The average **TER** and/or **TFEE** rate is the floor-area-weighted average of the **TERs** and/or **TFEE** rates for all the **dwellings** in the building, calculated according to the following formula:

$$\frac{\{(TER_1 \times \text{Floor area}_1) + (TER_2 \times \text{Floor area}_2) + (TER_3 \times \text{Floor area}_3) + \dots\}}{(\text{Floor area}_1 + \text{Floor area}_2 + \text{Floor area}_3 + \dots)}$$

The average **TFEE** rate is calculated according to an identical formula, replacing **TER** with **TFEE** rate.

An average **TER** and/or **TFEE** rate can be calculated across multiple **dwellings** in the same building but **cannot** be calculated across separate multiple buildings on the same site.

## Criterion 1 – Achieving the TER and TFEE rate

- 2.8 Regulations 26 and 26A state that:

#### CO<sub>2</sub> emission rates for new buildings

**26.** Where a building is erected, it shall not exceed the target CO<sub>2</sub> emission rate for the building that has been approved pursuant to regulation 25 applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.

#### Fabric energy efficiency rates

**26A.** Where a dwelling is erected, it shall not exceed the target fabric energy efficiency rate for the dwelling that has been approved pursuant to regulation 25, applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.

### Calculating the CO<sub>2</sub> emissions from and fabric energy efficiency performance of the actual dwelling

- 2.9 To comply with regulations 26 and 26A, the Dwelling CO<sub>2</sub> Emission Rate (**DER**) and the Dwelling Fabric Energy Efficiency (**DFEE**) rate must be no worse than the **TER** and **TFEE** rate calculated as set out in paragraphs 2.2 to 2.7. The final **DER** and **DFEE** rate calculation produced in accordance with regulations 27 and 27A (see paragraph 2.13 below) must be based on the building as constructed, incorporating:
- any changes to the list of specifications that have been made during construction; and
  - the **assessed air permeability**. The **assessed air permeability** is determined as follows:
    - where the **dwelling** has been pressure tested, the **assessed air permeability** is the measured **air permeability**;
    - where the **dwelling** has not been pressure tested, the **assessed air permeability** is the average test result obtained from other **dwellings** of the same **dwelling type** on the development, increased by +2.0 m<sup>3</sup>/(h·m<sup>2</sup>) at 50 Pa;

- iii. on small developments (see paragraph 3.22) where the builder has opted to avoid testing, the **assessed air permeability** is  $15 \text{ m}^3/(\text{h}\cdot\text{m}^2)$  at 50 Pa.

**NOTE:** The safety margin in sub-paragraph ii is approximately one standard deviation, derived from analysing a large sample of data from post-2006 **dwelling**s. For **dwelling**s that will not be pressure tested, the **design air permeability** should be a maximum of  $8.0 \text{ m}^3/(\text{h}\cdot\text{m}^2)$  at 50 Pa, so that the **assessed air permeability** (the average of other test results, plus  $2.0 \text{ m}^3/(\text{h}\cdot\text{m}^2)$  at 50 Pa) is less than the limiting value of  $10 \text{ m}^3/(\text{h}\cdot\text{m}^2)$  at 50 Pa.

If the design of a **dwelling** aims to achieve a low **design air permeability** but the **dwelling** is not pressure tested, the margin added under sub-paragraph ii will have a significant impact on the calculated **DER** and **DFEE** rate. In such cases, the builder should consider testing the **dwelling** so that the measured permeability can be included in the calculation.

## CO<sub>2</sub> emission rate and fabric energy efficiency rate calculations

**2.10** Regulation 27 states that:

### CO<sub>2</sub> emission rate calculations

- 27.** (1) This regulation applies where a building is erected and regulation 26 applies.
- (2) Not later than the day before the work starts, the person carrying out the work shall give the local authority a notice which specifies—
- (a) the target CO<sub>2</sub> emission rate for the building calculated and expressed in accordance with the methodology approved pursuant to regulation 24,
  - (b) the CO<sub>2</sub> emission rate for the building as designed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24, and
  - (c) a list of specifications to which the building is to be constructed.
- (3) Not later than five days after the work has been completed, the person carrying out the work shall give the local authority—
- (a) a notice which specifies—
    - (i) the target CO<sub>2</sub> emission rate for the building calculated and expressed in accordance with the methodology approved pursuant to regulation 24,
    - (ii) the CO<sub>2</sub> emission rate for the building as constructed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24, and
    - (iii) whether the building has been constructed in accordance with the list of specifications referred to in paragraph (2)(c), and if not a list of any changes to those specifications; or
  - (b) a certificate of the sort referred to in paragraph (4) accompanied by the information referred to in sub-paragraph (a).
- (4) A local authority is authorised to accept, as evidence that the requirements of regulation 26 have been satisfied, a certificate to that effect by an energy assessor who is accredited to produce energy performance certificates for that category of building.
- (5) In this regulation, ‘specifications’ means specifications used for the calculation of the CO<sub>2</sub> emission rate.

**NOTE:** Where the **BCB** is an approved inspector see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

## 2.11 Regulation 27A of the Building Regulations states that:

### Fabric energy efficiency rate calculations

**27A.** (1) This regulation applies where a dwelling is erected and regulation 26A applies.

(2) Not later than the day before the work starts, the person carrying out the work shall give the local authority a notice which specifies—

- (a) the target fabric energy efficiency rate for the dwelling calculated and expressed in accordance with the methodology approved pursuant to regulation 24;
- (b) the fabric energy efficiency rate for the dwelling as designed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; and
- (c) a list of specifications to which the dwelling is to be constructed.

(3) Not later than five days after the work has been completed, the person carrying out the work shall give the local authority—

- (a) a notice which specifies—
  - (i) the target fabric energy efficiency rate for the dwelling calculated and expressed in accordance with the methodology approved pursuant to regulation 24;
  - (ii) the fabric energy efficiency rate for the dwelling as constructed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; and
  - (iii) whether the dwelling has been constructed in accordance with the list of specifications referred to in paragraph (2)(c), and if not a list of any changes to those specifications; or
- (b) a certificate of the sort referred to in paragraph (4) accompanied by the information referred to in sub-paragraph (a).

(4) A local authority is authorised to accept, as evidence that the requirements of regulation 26A have been satisfied, a certificate to that effect by an energy assessor who is accredited to produce energy performance certificates for that category of building.

(5) In this Regulation, ‘specifications’ means specifications used for the calculation of the fabric energy efficiency rate.

**NOTE:** Where the BCB is an approved inspector see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

### CO<sub>2</sub> emission and fabric energy efficiency rate calculations before work commences

**2.12** Regulations 26 and 26A and 27 and 27A require that, before work starts, the builder must calculate the DER and the DFEE rate of the dwelling as designed, to demonstrate that the DER and the DFEE rate are not greater than the TER and the TFEE rate. The builder must give this design-based calculation to the BCB, along with a list of specifications used in calculating the DER and DFEE rate.

**NOTE:** This design-stage calculation and list of specifications will help the BCB to confirm that the dwelling as designed aligns with the claimed performance. As set out at Appendix C, it is expected that the builder will use software implementations of SAP 2012 to produce the list of specifications and highlight those features of the design that are critical to achieving compliance. These ‘key features’ can be used to prioritise the risk-based inspection of the dwelling as part of confirming compliance with regulations 26 and 26A. If a provisional energy rating is calculated and an interim recommendations report is therefore available, the developer should review the recommendations to see whether further measures may be incorporated in a cost-effective manner.

### CO<sub>2</sub> emission and fabric energy efficiency rate calculation when work is complete

**2.13** When work is complete, the builder must notify the BCB of the TER and DER, the DFEE rate and TFEE rate, and whether the building was constructed in accordance with the list of specifications

submitted to the BCB before work started. A list of any changes to the design-stage list of specifications must be given to the BCB. BCBs are authorised to accept a certificate of compliance to this effect signed by a suitably accredited energy assessor.

**NOTE:** *It is useful to provide additional information to support the values used in the DER and DFEE rate calculation and the list of specifications. For example, U-values may have been determined from a specific calculation, in which case the details should be provided, or from an accredited source, in which case a reference to that source is sufficient. For example, for a boiler, details of the model reference and fuel type is sufficient evidence to allow the claimed performance to be checked against the Products Characteristics Database. Evidence that demonstrates that the dwelling as designed satisfies the requirements of criteria 2 and 3 is also useful.*

## Secondary heating

**2.14** A secondary heating appliance may meet part of the demand for space heating. When calculating the DER, the fraction provided by the secondary heating system must be as defined by SAP 2012 for the particular combination of main heating system and secondary heating appliance. Refer to the following when calculating the DER:

- a. Where a secondary heating appliance is fitted, the efficiency of the actual appliance with its appropriate fuel must be used in the calculation of the DER.
- b. Where a chimney or flue is provided but no appliance is installed, the presence of the following appliances must be assumed when calculating the DER:
  - i. if a gas point is located adjacent to the hearth, a decorative fuel-effect gas fire open to the chimney or flue with an efficiency of 20 per cent;
  - ii. if there is no gas point, an open fire in grate for burning multi-fuel with an efficiency of 37 per cent, unless the dwelling is in a smoke control area, when the fuel should be taken as smokeless solid mineral fuel.
- c. Otherwise it must be assumed that the secondary heating system has the same efficiency as the main heating system and is served by the same fuel – i.e. the equivalent of having no secondary heating system.

## Internal lighting

**2.15** In all cases, when calculating the DER, allow for the proportion of low-energy lamps installed in the fixed lighting locations.

**NOTE:** *Low-energy lighting provision is therefore tradable. The minimum amount that would be reasonable provision in the actual dwelling is given in the Domestic Building Services Compliance Guide.*

## Buildings containing multiple dwellings

**2.16** A building that contains more than one dwelling (such as a terrace of houses or an apartment block) complies with regulation 26 if:

- a. **either** every individual dwelling has a DER that is no greater than the individual dwelling's corresponding TER;
- b. **or** the average DER for the whole building is no greater than the average TER.

The average DER is the floor-area-weighted average of the individual DERs for all the dwellings in the building, and is calculated in the same way as the average TER (see paragraph 2.7).

An average DER **cannot** be calculated across separate multiple buildings on a site.

**NOTE:** When an average DER is calculated, it is still necessary to provide information for each individual dwelling, as required by regulation 27.

- 2.17** A building that contains more than one dwelling (such as a terrace of houses or an apartment block) complies with regulation 26A if:
- either** every individual dwelling has a DFEE rate that is no greater than the individual dwelling's corresponding TFEE rate;
  - or** the average DFEE rate for the whole building is no greater than the average TFEE rate;

The average DFEE rate is the floor-area-weighted average of the individual DFEE rates for all the dwellings in the building, and is calculated in the same way as the average TFEE rate (see paragraph 2.7).

An average DFEE rate **cannot** be calculated across separate multiple buildings on a site.

**NOTE:** When an average DFEE rate is calculated, it is still necessary to provide information for each individual dwelling, as required by regulation 27A.

## Achieving the TER and TFEE rate

- 2.18** Provided the dwelling satisfies the limits on design flexibility set out in Criterion 2, the designer can achieve the TER by using fabric energy efficiency, system measures and integrating low and zero carbon technologies in whatever mix is appropriate.
- 2.19** Similarly, provided the dwelling satisfies the limits on design flexibility set out in Criterion 2, the designer can achieve the TFEE rate by using fabric energy efficiency measures in whatever mix is appropriate.
- 2.20** The approved compliance tools include algorithms that enable the designer to assess the role that low and zero carbon technologies (including local renewable and low carbon energy sources driven by the *National Planning Policy Framework*) can play in achieving the TER.
- 2.21** Where a dwelling is connected to a community energy system, the annual percentage heat supplied from each heat source should be the same for each newly connected dwelling. The submission should demonstrate that the capacity of the community scheme is sufficient to provide the percentage that is assumed. The predicted effect of all dwellings proposed to be newly connected to the system in the first 12 months of operation of the system can be considered in the calculation of the percentage of heat supplied so that the increased operation of any marginal plant (e.g. gas boilers) is properly accounted for.
- 2.22** In order to facilitate incorporation of improvements in system efficiencies and the integration with low and zero carbon technologies, the designer should:
- consider heating system designs that use low distribution temperatures; and
  - where multiple systems serve the same end use, organise the control strategies such that priority is given to the least carbon-intensive option; and

**NOTE:** For example, where a solar hot water system is available, use controls that make best use of the available solar energy.

- consider making the dwelling easily adaptable by facilitating the integration of additional low and zero carbon technologies at a later date. Providing appropriate facilities at the construction stage can make subsequent enhancements much easier and cheaper, e.g. providing capped off connections that can link into a planned community heating scheme.

## Consideration of high-efficiency alternative systems

2.23 Regulation 25A states that:

### Consideration of high-efficiency alternative systems for new buildings

**25A.** (1) Before construction of a new building starts, the person who is to carry out the work must analyse and take into account the technical, environmental and economic feasibility of using high-efficiency alternative systems (such as the following systems) in the construction, if available—

- (a) decentralised energy supply systems based on energy from renewable sources;
- (b) cogeneration;
- (c) district or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources; and
- (d) heat pumps.

(2) The person carrying out the work must—

- (a) not later than the beginning of the day before the day on which the work starts, give the local authority a notice which states that the analysis referred to in paragraph (1)—
  - (i) has been undertaken;
  - (ii) is documented; and
  - (iii) the documentation is available to the authority for verification purposes; and
- (b) ensure that a copy of the analysis is available for inspection at all reasonable times upon request by an officer of the local authority.

(3) An authorised officer of the local authority may require production of the documentation in order to verify that this regulation has been complied with.

(4) The analysis referred to in paragraph (1)—

- (a) may be carried out for individual buildings or for groups of similar buildings or for common typologies of buildings in the same area; and
- (b) in so far as it relates to collective heating and cooling systems, may be carried out for all buildings connected to the system in the same area.

(5) In this regulation—

- (a) ‘cogeneration’ means simultaneous generation in one process of thermal energy and one or both of the following—
  - (i) electrical energy;
  - (ii) mechanical energy;
- (b) ‘district or block heating or cooling’ means the distribution of thermal energy in the form of steam, hot water or chilled liquids, from a central source of production through a network of multiple buildings or sites, for the use of space or process heating or cooling;
- (c) ‘energy from renewable sources’ means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases; and
- (d) ‘heat pump’ means a machine, a device or installation that transfers heat from natural surroundings such as air, water or ground to buildings or industrial applications by reversing the natural flow of heat such that it flows from a lower to a higher temperature. (For reversible heat pumps, it may also move heat from the building to the natural surroundings.)

**NOTE:** Where the BCB is an approved inspector see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

**2.24** Regulation 25A requires that, before work starts, the person undertaking the work must carry out an analysis that considers and takes into account the technical, environmental and economic feasibility of using high-efficiency alternative systems in the dwelling design. The following high-efficiency alternative systems may be considered if available, but other low and zero carbon systems may also be considered if available:

- a. decentralised energy supply systems based on energy from renewable sources;
- b. cogeneration;
- c. district or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources;
- d. heat pumps.

The analysis should state whether high-efficiency alternative systems have or have not been included in the building design. The requirement relates to considering, taking into account, documenting and making available for verification purposes the analysis of high-efficiency alternative systems.

**NOTE:** *The Building Regulations are technology neutral and do not require that high-efficiency alternative systems or other low and zero carbon systems are installed.*

**2.25** The analysis of the feasibility of using high-efficiency alternative systems may be carried out for individual dwellings, groups of similar dwellings or for common types of dwelling in the same area. Where a number of dwellings are connected to a community energy system, a single analysis may be carried out for all the dwellings connected to the system in the same area as the building to be constructed.

**2.26** Before work starts, the person undertaking the work must give the BCB a notice which states that the analysis of the feasibility of using high-efficiency alternative systems has been undertaken and documented and is available for verification purposes. The documented results of the analysis must be retained for inspection by the BCB upon request.

Although the analysis of high-efficiency alternative systems is not an explicit requirement of the CO<sub>2</sub> emission rate calculation, a facility within calculation software output reporting (the design-stage BRUKL report) may be available to the builder to declare that the analysis has been carried out and documented, and where it is available for verification purposes.

## Special considerations

**2.27** The following paragraphs describe some 'special areas' that fall outside the normal five criteria, and give guidance on how to demonstrate reasonable provision for the conservation of fuel and power.

### Common areas in buildings with multiple dwellings

**2.28** The common areas of buildings containing more than one dwelling are not classified as dwellings and therefore fall outside the scope of the five criteria outlined above. For such areas, reasonable provision is:

- a. if they are heated, to follow the guidance in Approved Document L2A; or
- b. if they are unheated, to provide individual fabric elements that meet the fabric standards set out in paragraphs 2.33 to 2.35.

## Conservatories and porches

**2.29** Where conservatories and porches are installed at the same time as the construction of a new **dwelling**, and adequate thermal separation (see Tables 2 and 4) is provided between the **dwelling** and the conservatory or porch, and the **dwelling's** heating system is not extended into the conservatory or porch, follow the guidance in Approved Document L1B. Where conservatories and porches are installed at the same time as the construction of a new **dwelling**, and no, or inadequate, thermal separation is included between the **dwelling** and the conservatory or porch, or the **dwelling's** heating system is extended into the conservatory or porch, follow the guidance in this approved document including **TER/DER** and **TFFEE/DFEE** rate calculations.

## Swimming pool basins

**2.30** In terms of Criterion 1, the **dwelling** should be assessed as if the pool basin were not there, although the pool hall should be included. The area covered by the pool should be replaced with the equivalent area of floor with the same U-value as the pool surround.

## Criterion 2 – Limits on design flexibility

**2.31** While the approach to complying with Criterion 1 allows design flexibility, paragraph L1(a)(i) of Schedule 1 to the Building Regulations requires that reasonable provision be made to limit heat gains and losses through the fabric of the building, and paragraphs L1(b)(i) and (ii) require that energy-efficient **fixed building services** with effective controls be provided.

**2.32** One way of showing that the Part L requirement is satisfied is to demonstrate that the fabric elements and the **fixed building services** all meet the minimum energy efficiency standards specified in the following paragraphs.

**NOTE:** Note that, in order to satisfy the **TER** and the **TFFEE** rate, the building specification needs to be considerably better than the stated limiting values in many aspects of the design.

**NOTE:** Achieving the **TFFEE** rate could be dependent on very good performance of one specific feature of the fabric design with poorer fabric performance elsewhere. If this key element of fabric design was to fail, or perform less well than expected, this would have a significant impact on performance. Continuing to have limiting fabric standards in Criterion 2 reduces such an impact.

## Limiting fabric standards

**2.33** Table 2 sets out the limiting standards for the properties of the fabric elements of the building. Each stated value represents the area-weighted average for all elements of that type. In general, to achieve the **TER** and the **TFFEE** rate, a significantly better fabric performance than that set out in Table 2 is likely to be required.

**2.34** U-values shall be calculated using the methods and conventions set out in BR 443 *Conventions for U-value calculations*, and should be based on the whole element or unit (e.g. in the case of a window, the combined performance of the glazing and the frame).

In the case of windows, the U-value can be taken as that for:

- the smaller of the two standard windows defined in BS EN 14351-1; or
- the standard configuration set out in BR 443; or
- the specific size and configuration of the actual window.

The U-value of the door can be calculated for:

- the standard size as laid out in BS EN 14351-1; or
- the specific size and configuration of the actual door.

**NOTE:** For domestic-type construction, SAP 2012 Table 6e gives values for different window configurations, which can be used if there are no test data or calculated values.

- 2.35** The U-values for roof windows and roof-lights given in this approved document are based on the U-value having been assessed with the roof window or roof-light in the vertical position. If a particular unit has been assessed in a plane other than the vertical, the standards given in this approved document, should be modified by making an adjustment that is dependent on the slope of the unit, following the guidance given in BR 443.

**Table 2 Limiting fabric parameters**

Roof	0.20 W/(m <sup>2</sup> ·K)
Wall	0.30 W/(m <sup>2</sup> ·K)
Floor	0.25 W/(m <sup>2</sup> ·K)
Party wall	0.20 W/(m <sup>2</sup> ·K)
Swimming pool basin <sup>1</sup>	0.25 W/(m <sup>2</sup> ·K)
Windows, roof windows, glazed roof-lights <sup>2</sup> , curtain walling and pedestrian doors	2.00 W/(m <sup>2</sup> ·K)
Air permeability	10.0 m <sup>3</sup> /(h·m <sup>2</sup> ) at 50 Pa

Notes:

- Where a swimming pool is constructed as part of a new building, reasonable provision should be made to limit heat loss from the pool basin by achieving a U-value no worse than 0.25 W/(m<sup>2</sup>·K) as calculated according to BS EN ISO 13370.
- For the purposes of checking compliance with the limiting fabric values for roof-lights, the true U-value based on aperture area can be converted to the U-value based on the developed area of the roof-light. Further guidance on evaluating the U-value of out-of-plane roof-lights is given in *Assessment of thermal performance of out-of-plane rooflights*, NARM Technical Document NTD 2 (2010).

**Note:** Approved Document C gives limiting values for individual elements to minimise the risk of condensation.

## Limiting system efficiencies

- 2.36** Each **fixed building service** should be at least as efficient as the minimum acceptable value for the particular type of service, as set out in the *Domestic Building Services Compliance Guide*. If a type of service is not covered by the Guide, then reasonable provision is to demonstrate that the proposed service is not less efficient than a comparable service that is covered by the Guide.

**NOTE:** To not inhibit innovation.

- 2.37** The efficiency claimed for the **fixed building service** should be based on the appropriate test standard set out in the *Domestic Building Services Compliance Guide*, and the test data should be certified by a notified body. It is reasonable for **BCBs** to accept such data at face value. In the absence of quality-assured data, the **BCB** should satisfy itself that the claimed performance is justified.

## Criterion 3 – Limiting the effects of heat gains in summer

**2.38** This section sets out the approach to limiting heat gains as required by paragraph L1(a)(i) and L1(a)(ii) of Schedule 1 to the Building Regulations.

### Limiting the effects of solar gains in summer

**2.39** Solar gains are beneficial in winter to offset demand for heating, but can contribute to overheating in the summer. The effects of solar gain in summer can be limited by an appropriate combination of window size and orientation, solar protection through shading and other solar control measures, ventilation (day and night) and high thermal capacity. If ventilation is provided using a balanced mechanical system, consider providing a summer bypass function to use during warm weather (or allow the dwelling to operate via natural ventilation) so that the ventilation is more effective in reducing overheating.

**2.40** SAP 2012 Appendix P contains a procedure enabling designers to check whether solar gains are excessive. Reasonable provision is achieved if the SAP assessment indicates that the dwelling does not have a high risk of high internal temperatures. This assessment should be done regardless of whether or not the dwelling has mechanical cooling. If the dwelling has mechanical cooling, the assessment should be based on the design without the cooling system operating, but with an appropriate assumption about effective air-change rate through openable windows.

**NOTE:** *Designers may want to exceed the requirements in the current Building Regulations to consider the impacts of future global warming on the risks of higher internal temperatures occurring more often. CIBSE TM 36 Climate change and the indoor environment gives guidance on this issue.*

**2.41** When seeking to limit solar gains, consideration should be given to the provision of adequate levels of daylight. BS 8206-2 *Code of practice for daylighting* gives guidance on maintaining adequate levels of daylight.

**NOTE:** *The Building Regulations do not specify minimum daylight requirements. Reducing the window area has conflicting impacts on the predicted CO<sub>2</sub> emissions: reduced solar gain but increased use of electric lighting. As a general guide, if the area of glazing is much less than 20 per cent of the total floor area, some parts of the dwelling may experience poor levels of daylight, resulting in increased use of electric lighting.*

### Heat losses and gains from circulation pipes

**2.42** Reasonable provision should be made to limit heat losses from pipes as set out in the *Domestic Building Services Compliance Guide*. This includes insulating primary circulation pipes for domestic hot water services throughout their length.

**NOTE:** *In the case of apartment blocks, insulating primary circulation pipes for space heating as well as for domestic hot water services within communal spaces can help to limit potentially unwanted heat gains and overheating of the space.*

## Section 3: Quality of construction and commissioning

### Criterion 4 – Building performance consistent with DER and DFEE rate

- 3.1** Dwellings should be constructed and equipped so that performance is consistent with the calculated DER and DFEE rate. As indicated in paragraph 2.13, a final calculation of the DER and DFEE rate is required to take account of any changes in performance between design and construction, and to demonstrate that the building, as constructed, meets the TER and TFEE rate as required by regulations 26 and 26A. The following paragraphs in this section set out what in normal circumstances is reasonable provision to ensure that the performance of the building is consistent with the DER and DFEE rate.

**NOTE:** *The information referred to in paragraph 2.12 will help BCBs check that the key features of the design are included during the construction process.*

- 3.2** In accordance with Part L and regulation 7, the building fabric should be constructed to a reasonable standard so that:
- the insulation is reasonably continuous over the whole building envelope; and
  - the air permeability is within reasonable limits.

#### Party walls and other thermal bypasses

- 3.3** Contrary to previous assumptions, party cavity walls may not be zero heat loss walls; this is because air flow in the cavity provides a heat-loss mechanism.

**NOTE:** *Where outside air flows into the party wall cavity, a cold zone is created which causes heat loss through the wall sections on either side. The extent of air flow and heat changes depends on external conditions such as wind and temperature, and also on the effect caused by the warmed air rising in the cavity to be replaced by cooler air drawn in from outside. The air movements involved can be significant and, if no steps are taken to restrict flows, the resulting heat losses can be large.*

- 3.4** Heat loss can be reduced by restricting air movement through the cavity, which can be achieved by fully filling the cavity and/or by effective sealing around the perimeter. Further guidance is available at [www.buildingcontrolalliance.org](http://www.buildingcontrolalliance.org)

The extent to which heat loss can be reduced depends on the detailed design and the quality of construction. In the absence of any specific independent scientific field evidence, reasonable provision is to adopt the guidance on U-values in paragraph 3.5.

**NOTE:** *Fully filling the cavity may affect sound transmission through party walls. Developers who plan to fill a party wall cavity must satisfy the BCB that the requirements of Part E (Sound) of Schedule 1 to the Building Regulations will be satisfied, either by adopting a full-fill detail accredited under the Robust Details scheme or through specific site testing.*

- 3.5** When calculating the DER and DFE rate for a dwelling, a party wall U-value for the type of construction adopted, as set out in Table 3, should be applied.
- 3.6** When applying the U-values in Table 3, it is important that if edge sealing is adopted, either on its own or in conjunction with a fully filled cavity, the seal is effective in restricting air flow and is aligned with the thermal envelope. Although effective sealing may be part of a cavity barrier provided in order to comply with Part B (Fire) of Schedule 1 to the Building Regulations, a cavity barrier on its own may not be effective in restricting air flow. In order to claim a reduced U-value (0.2 or 0.0), it is necessary to demonstrate that the design adopted is likely to be robust under normal site conditions.

It is also important that the sealing system is applied in such a way as to be in line with the thermal envelope. Any solution to reducing party wall heat loss must take into account all the requirements in Schedule 1 to the Building Regulations, but particular attention should be given to the requirements of Part E.

**NOTE:** For example, in a room-in-roof design, the insulation layer may follow the sloping roof sections to a horizontal ceiling then continue at ceiling level. In such a case it is important that the party wall cavity seal follows the line of the insulation in the slope and horizontal ceiling sections (although for the purposes of Part B (Fire), it may be necessary to ensure that the fire cavity barrier follows the slope to the ridge). In the case of flats, the sealing system should follow the line of party floors and other party structures as well as the main thermal envelope.

- 3.7** In considering heat losses via party walls, it is important to remember that wherever the wall penetrates an insulation layer, such as when the blockwork of a masonry party wall penetrates insulation at ceiling level, a thermal bridge is likely to exist – even when the party wall U-value is zero. Any bridging at the party wall should be evaluated and then taken into account, along with other thermal bridges. It is important also to be satisfied that any solution to the party wall bypass does not contravene other parts of the regulations, in particular Part E (Sound).

**Table 3 U-values for party walls**

Party wall construction	U-value W/(m <sup>2</sup> K)
Solid	0.0
Unfilled cavity with no effective edge sealing	0.5
Unfilled cavity with effective sealing around all exposed edges and in line with insulation layers in abutting elements	0.2
A fully filled cavity with effective sealing at all exposed edges and in line with insulation layers in abutting elements	0.0

- 3.8** The party wall is a particular case of the more general thermal bypass problem that occurs if the air barrier and the insulation layer are not contiguous and the cavity between them is subject to air movement. To avoid the consequent reduction in thermal performance, either the insulation layer should be contiguous with the air barrier at all points in the building envelope, or the space between the air barrier and insulation layer should be filled with solid material, such as in a masonry wall.

## Thermal bridges

**3.9** The building fabric should be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements, at the joints between elements, and at the edges of elements, such as those around window and door openings.

**3.10** Reasonable provision would be to:

- a. Adopt approved design details as set out in DCLG Approved Construction Details or those that are formally recognised by DCLG. The calculated linear thermal transmittance values can be used directly in the DER and DFEE rate calculations; or
- b. Use construction joint details that have been calculated by a person with suitable expertise and experience following the guidance set out in BRE Report BR 497 *Conventions for calculating linear thermal transmittance and temperature factors*. The linear thermal transmittance values can be used directly in the DER and DFEE rate calculations. Reasonable provision for the temperature factors is that they should achieve a performance no worse than that set out in BRE Information Paper IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings*; or

**NOTE:** *Evidence of suitable expertise and experience for calculating linear thermal transmittance would be to demonstrate that the person has been trained in the software used to carry out the calculation, has applied that model to the example calculations set out in BR 497 and has achieved results that are within the stated tolerances.*

- c. Use the linear thermal transmittance values in the 'default' column of Table K1 in SAP 2012 directly in the DER and DFEE rate calculations; or
- d. Use a conservative default  $\psi$ -value of  $0.15 \text{ W}/(\text{m}^2\text{K})$ , rather than linear transmittance values for each construction joint, in the DER and DFEE rate calculation.

**3.11** The alternative approaches for using linear transmittance values in paragraphs 3.10 (a), (b) and (c) are not mutually exclusive. For example, a builder could use approved design details for the majority of the junctions, but use a calculated bespoke detail for the window head. Furthermore, where design details via paragraph 3.10 (a) or (b) are adopted for some junctions but not for all junctions, the linear thermal transmittance values in the 'default' column of Table K1 in SAP 2012 should be used for the other junctions.

**NOTE:** *The effect of using linear transmittance values that are poorer than those in the notional dwelling specification at SAP 2012 Appendix R should be compensated for by improved standards elsewhere in the dwelling design. When default linear transmittance values from Table K1 in SAP 2012 are used for the majority of the construction joints in a dwelling, or when the conservative default  $\psi$ -value of  $0.15 \text{ W}/(\text{m}^2\text{K})$  is used, the builder would need to significantly improve upon the notional dwelling values elsewhere in the design to meet the TER and TFEE rate.*

**3.12** When adopting the approaches in paragraphs 3.10 (a) and (b), the builder should demonstrate to the BCB that an appropriate system of site inspection is in place to give confidence that the construction procedures achieve the required standard of consistency.

## Air permeability and pressure testing

**3.13** In order to demonstrate that an acceptable **air permeability** has been achieved, Regulation 43 states:

### Pressure testing

- 43.** (1) This regulation applies to the erection of a building in relation to which paragraph L1(a)(i) of Schedule 1 imposes a requirement.
- (2) Where this regulation applies, the person carrying out the work shall, for the purpose of ensuring compliance with regulation 26 and paragraph L1(a)(i) of Schedule 1:
- (a) ensure that:
    - (i) pressure testing is carried out in such circumstances as are approved by the Secretary of State; and
    - (ii) the testing is carried out in accordance with a procedure approved by the Secretary of State; and
  - (b) subject to paragraph (5), give notice of the results of the testing to the local authority.
- (3) The notice referred to in paragraph (2)(b) shall:
- (a) record the results and the data upon which they are based in a manner approved by the Secretary of State; and
  - (b) be given to the local authority not later than seven days after the final test is carried out.
- (4) A local authority is authorised to accept, as evidence that the requirements of paragraph (2)(a)(ii) have been satisfied, a certificate to that effect by a person who is registered by the Independent Air Tightness Testing Scheme Limited or the Air Tightness and Testing and Measuring Association in respect of pressure testing for the air tightness of buildings.
- (5) Where such a certificate contains the information required by paragraph (3)(a), paragraph (2)(b) does not apply.

**NOTE:** Where the **BCB** is an approved inspector see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

**3.14** The approved procedure for pressure testing is given in the Air Tightness Testing and Measurement Association (ATTMA) publication *Measuring air permeability of building envelopes (dwellings)* and, specifically, the method that tests the envelope area. The preferred test method is that trickle ventilators should be temporarily sealed rather than just closed. **BCBs** should be provided with evidence that test equipment has been calibrated within the previous 12 months using a UKAS-accredited facility. The manner approved for recording the results and the data on which they are based is given in Section 4 of that document.

**3.15** **BCBs** are authorised to accept, as evidence of compliance, a certificate offered under regulation 43(4). It should be confirmed to the **BCB** that the person who completed the testing has received appropriate training and is registered to test the specific class of building concerned. See <http://www.iats-uk.org/iats-member-list/> and [https://attma.org/join-attma/registered\\_members/](https://attma.org/join-attma/registered_members/)

**3.16** The approved circumstances under which the Secretary of State requires pressure testing to be carried out are set out in paragraphs 3.17 to 3.22.

**3.17** On each development, an air pressure test should be carried out on three units of each **dwelling type** or 50 per cent of all instances of that **dwelling type**, whichever is the less. For the purposes of this approved document, a block of flats should be treated as a separate development, irrespective of the number of blocks on the site. The **dwelling(s)** to be tested should be taken from the first completed batch of units of each **dwelling type**.

**NOTE:** Most larger developments include many **dwelling types**. Multiple units of each type should be tested to confirm the robustness of the designs and the construction procedures.

**3.18** The specific dwellings making up the test sample should be selected by the BCB in consultation with the pressure tester. Dwellings should be selected so that about half of the scheduled tests for each dwelling type are carried out during construction of the first 25 per cent of each dwelling type. The results of all tests on dwellings in the sample should be reported to the BCB, including any test failures (see paragraphs 3.19 to 3.21).

**NOTE:** *The aim is to enable lessons to be learned and adjustments to the design and/or site procedures to be made before the majority of the dwellings are built.*

### Showing compliance with regulation 43, and the consequences of failing a pressure test

**3.19** The dwelling is shown to comply with the requirements if:

- a. the measured air permeability is not worse than the limit value of  $10 \text{ m}^3/(\text{h}\cdot\text{m}^2)$  at 50 Pa; and
- b. the DER and the DFEE rate calculated using the measured air permeability are not worse than the TER and the TFEE rate.

**NOTE:** *If a low (i.e. better) design air permeability is used in order to achieve a performance that is better than the TER and the TFEE rate, the design will not fail to comply with the energy efficiency requirements if the pressure test achieves the limit value and the TER and the TFEE rate are achieved.*

**3.20** If satisfactory performance is not achieved, then remedial measures should be carried out on the dwelling and new tests carried out until the dwelling achieves the criteria set out in paragraph 3.19. In addition, a further dwelling of the same dwelling type should be tested, thereby increasing the overall sample size.

**3.21** When a dwelling fails the initial pressure test, other dwellings of the same dwelling type that have not been tested should be examined and, where appropriate, remedial measures applied.

### Alternative to pressure testing on small developments

**3.22** On development sites where no more than two dwellings are to be erected, reasonable provision is to:

- a. demonstrate that during the preceding 12-month period, a dwelling of the same dwelling type constructed by the same builder was pressure tested according to the procedures given in paragraphs 3.13 to 3.18 and achieved the design air permeability; or
- b. use a value of  $15 \text{ m}^3/(\text{h}\cdot\text{m}^2)$  at 50 Pa for the air permeability when calculating the DER and the DFEE rate, which then avoids the need for pressure testing.

**NOTE:** *The effect of using this cautious value in option b should be compensated for by improved standards elsewhere in the dwelling design.*

### Commissioning of heating and hot water systems

**3.23** Paragraph L1(b)(iii) of Schedule 1 to the Building Regulations requires fixed building services to be commissioned by testing and adjustment as necessary to ensure that they use no more fuel and power than is reasonable in the circumstances. In order to demonstrate that the heating and hot water systems have been adequately commissioned, regulation 44 states:

## Commissioning

44. (1) This regulation applies to building work in relation to which paragraph F1(2) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed system for mechanical ventilation or any associated controls where testing and adjustment is not possible.
- (2) This regulation applies to building work in relation to which paragraph L1(b) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed building service where testing and adjustment is not possible or would not affect the energy efficiency of that fixed building service.
- (3) Where this regulation applies the person carrying out the work shall, for the purpose of ensuring compliance with paragraph F1(2) or L1(b) of Schedule 1, give to the local authority a notice confirming that the fixed building services have been commissioned in accordance with a procedure approved by the Secretary of State.
- (4) The notice shall be given to the local authority—
- (a) not later than the date on which the notice required by regulation 16(4) is required to be given; or
  - (b) where that regulation does not apply, not more than 30 days after completion of the work.

**NOTE:** Where the BCB is an approved inspector see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

- 3.24 It would be useful to prepare a commissioning plan, identifying the systems that need to be tested and the tests that will be carried out and provide this with the design stage TER/DER and TFEE/DFEE rate calculations so that the BCB can check that the commissioning is being done as the work proceeds.

**NOTE:** The use of the templates in the Model Commissioning Plan (BSRIA BG 8/2009) is a way of documenting the process in an appropriate way.

- 3.25 Not all fixed building services will need to be commissioned. With some systems it is not possible as the only controls are 'on' and 'off' switches. Examples of this would be some mechanical extraction systems or single fixed electrical heaters. In other cases commissioning would be possible but in the specific circumstances would have no effect on energy use.

Fixed building services which do not require commissioning should be identified in the commissioning plan, along with the reason for not requiring commissioning.

- 3.26 Where commissioning is carried out, it should be done in accordance with procedures approved by the Secretary of State:
- a. For heating and hot water systems, the approved procedures are set out in the *Domestic Building Services Compliance Guide*.
  - b. For ventilation systems, the approved procedure is set out in the *Domestic Ventilation Compliance Guide*.
- 3.27 Commissioning is often carried out by the person who installs the system. In other cases, it may be carried out by a subcontractor or by a specialist firm. It is important that whoever carries it out follows the relevant approved procedure in doing so.
- 3.28 Where a building notice or full plans have been given to a local authority BCB the notice of completion of commissioning should be given to that BCB within five days of the completion of the commissioning work. In other cases, for example where work is carried out by a person registered with a competent person scheme, it must be given within 30 days.

- 3.29** Where an approved inspector is the BCB the notice of completion of commissioning should generally be given to the approved inspector within five days of the completion of work. However, where the work is carried out by a person registered with a competent person scheme the notice must be given within 30 days. Where the installation of fixed building services which require commissioning is carried out by a person registered with a competent person scheme, the notice of commissioning will be given by that person.
- 3.30** Until the BCB receives the commissioning notice, it may not consider it appropriate to give a completion/final certificate.

## Section 4: Providing information

### Criterion 5 – Provisions for energy-efficient operation of the dwelling

- 4.1** In accordance with regulation 40, the owner of the **dwelling** should be provided with sufficient information about the building, the **fixed building services** and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

#### Information about use of fuel and power

- 40.** (1) This regulation applies where paragraph L1 of Schedule 1 imposes a requirement relating to building work.  
(2) The person carrying out the building work shall not later than five days after the work has been completed provide to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

- 4.2** A way of complying with the requirement is to provide a suitable set of operating and maintenance instructions aimed at assisting the occupiers of the **dwelling** achieve the expected level of energy efficiency. The documentation should be specific to the **dwelling**, and be in a durable format that can be kept and referred to over the service life of the various systems and components. The documentation should include relevant information in an easily understood format.
- 4.3** Without prejudice to the need to comply with health and safety requirements, this should:
- a. Explain the essential design principles (insulation, materials etc.) and the key features, with floor plans showing the location of the main heating and ventilation components in the **dwelling**.
  - b. Explain how to operate, control and maintain the following systems:
    - i. space heating system;
    - ii. hot water heating system;
    - iii. ventilation system;
    - iv. any other technology which has been included in the **dwelling**, e.g. solar panels or other low and zero carbon technology, or a technology for which SAP Appendix Q has been utilised.
  - c. Signpost other important documentation which should include:
    - i. appliance manuals;
    - ii. the data used in the **TER/DER** and **TFEE/DFEE** rate calculations;
    - iii. the Recommendations Report generated with the 'on-construction' **energy performance certificate**, which will inform the occupier as to how the energy performance of the dwelling might be further improved.

**NOTE:** *It would also be sensible to retain an electronic copy of the input file for the energy calculation to facilitate any future analysis that may be required by the owner when altering or improving the **dwelling**.*

## Section 5: Model designs

- 5.1** The TER and TFE rate are based on a dwelling of the same size and shape as the actual dwelling, constructed to a concurrent specification. If the actual dwelling is constructed entirely to this specification it will meet the TER and better the TFE rate and therefore pass Criterion 1. Table 4 provides a summary of the concurrent notional building specification. More detailed information can be found in SAP 2012 Appendix R.
- 5.2** It should be noted, however, that the concurrent notional building specifications are not prescriptive and may not be the most economic specification in every case. Designers are free to explore the most economic specification to meeting the TER and TFE rate in each case, provided that this specification meets all other provisions within this approved document, in particular the limiting fabric parameters in Table 2.
- 5.3** Some builders may prefer to adopt model design packages rather than to engage in design for themselves. Such model packages of fabric U-values, boiler seasonal efficiencies, window opening allowances etc should, if suitably robust, help the builder achieve compliance. The construction industry may develop model designs for this purpose and make them available on the Internet at: [www.modeldesigns.info](http://www.modeldesigns.info)
- 5.4** It will still be necessary to demonstrate compliance in the particular case by going through the procedures described in paragraphs 2.8 to 2.17.

**Table 4 Summary of concurrent notional dwelling specification**

Element or system	Values
Opening areas (windows and doors)	Same as actual dwelling up to a maximum proportion of 25% of total floor area <sup>1</sup>
External walls (including opaque elements of curtain walls)	0.18 W/(m <sup>2</sup> ·K)
Party walls	0.0 W/(m <sup>2</sup> ·K)
Floor	0.13 W/(m <sup>2</sup> ·K)
Roof	0.13 W/(m <sup>2</sup> ·K)
Windows, roof windows, glazed roof-lights and glazed doors	1.4 W/(m <sup>2</sup> ·K) (whole window U-value) <sup>2</sup> g-value = 0.63 <sup>3</sup>
Opaque doors	1.0 W/(m <sup>2</sup> ·K)
Semi-glazed doors	1.2 W/(m <sup>2</sup> ·K)
Airtightness	5.0 m <sup>3</sup> /(h·m <sup>2</sup> )
Linear thermal transmittance	Standardised psi values – see SAP 2012 Appendix R, except use of $y = 0.05$ W/(m <sup>2</sup> ·K) if the default value of $y = 0.15$ W/(m <sup>2</sup> ·K) is used in the actual dwelling
Ventilation type	Natural (with extract fans) <sup>4</sup>
Air-conditioning	None

**Table 4 Summary of concurrent notional dwelling specification (*continued*)**

Element or system	Values
Heating system	Mains gas If combi boiler in actual dwelling, combi boiler; otherwise regular boiler Radiators Room sealed Fan flue SEDBUK 2009 89.5% efficient
Controls	Time and temperature zone control <sup>5</sup> Weather compensation Modulating boiler with interlock
Hot water storage system	Heated by boiler (regular or combi as above) If cylinder specified in actual dwelling, volume of cylinder in actual dwelling If combi boiler, no cylinder. Otherwise 150 litres Located in heated space Thermostat controlled Separate time control for space and water heating
Primary pipework	Fully insulated
Hot water cylinder loss factor (if specified)	Declared loss factor equal or better than $0.85 \times (0.2 + 0.051 V^{2/3})$ kWh/day
Secondary space heating	None
Low-energy lighting	100% low-energy lighting
Thermal mass parameter (TMP)	Medium (TMP = 250)

**Notes:**

1. The Building Regulations do not specify minimum daylight requirements. However, reducing window area produces conflicting impacts on the predicted CO<sub>2</sub> emissions: reduced solar gain but increased use of electric lighting. As a general guide, if the area of glazing is much less than 20% of the total floor area (TFA), some parts of the dwelling may experience poor levels of daylight, resulting in increased use of electric lighting.
2. The orientation of the elemental building is the same as the actual building. In plotting buildings onto a site designers should consider the benefits of orientating buildings to the south (with large windows orientated south and smaller windows orientated north) to benefit from passive solar gains through having lower space heating demands. Designers should be aware of the risk of overheating through excessive solar gain in the summer and design shading to avoid excessive summer heat gain.
3. Higher g-values would also comply with the recipe as increasing solar gains reduces the space heat load. However, designers should be aware of the impact of g-value on the risk of overheating and optimise their choice accordingly. The U-value is set to 1.5 W/(m<sup>2</sup>K) for curtain walling glazed areas, as an allowance for thermal bridging.
4. See SAP 2012 Section 11: 2 fans for TFA up to 70 m<sup>2</sup>; 3 fans for TFA > 70–100 m<sup>2</sup>; 4 fans for TFA > 100 m<sup>2</sup>. A recipe approach can be followed if extract fans are replaced with the same number of passive vents.
5. In order for a system to be specified with time and temperature zone control, it must be possible to programme the heating times of at least two heating zones independently, as well as having independent temperature controls. These two heating zones must be space heating zones. For single-storey open-plan dwellings in which the living area is greater than 70% of TFA, sub-zoning of temperature control is not appropriate and the recipe will default to programmer and room stat.

# Appendix A: Key terms and abbreviations

## Key terms

The following are key terms used in this document:

**Air permeability** is the physical property used to measure airtightness of the building fabric. It is defined as air leakage rate per hour per square metre of envelope area at the test reference pressure differential of 50 pascals (50 N/m<sup>2</sup>). The envelope area, or measured part of the building, is the total area of all floors, walls and ceilings bordering the internal volume that is the subject of the pressure test. This includes walls and floors below external ground level. Overall internal dimensions are used to calculate this envelope area and no subtractions are made for the area of the junctions of internal walls, floors and ceilings with exterior walls, floors and ceilings.

The **limiting air permeability** is the worst allowable **air permeability**.

The **design air permeability** is the target value set at the design stage, and must always be no worse than the limiting value.

The **assessed air permeability** is the value used in establishing the **DER** and the **DFEE** rate, and is based on a specific measurement of the **dwelling** concerned or on measurements of other **dwellings** of the same **dwelling type**.

**NOTE:** *The envelope area of a terraced house includes the party wall(s). The envelope area of a flat in a multiple-storey building includes the floors, walls and ceilings which are shared with adjacent flats.*

**BCB** means building control body – a local authority or an approved inspector.

**Commissioning** is the advancement of a **fixed building service** after all or part of the system has been installed, replaced or altered. The system is taken from a state of static completion to working order. Testing and adjusting, as necessary, ensure that the whole system uses no more fuel and power than is reasonable in the circumstances, without compromising the need to comply with health and safety requirements. For each system, **commissioning** includes the following: setting-to-work; regulation (that is, testing and adjusting repetitively) to achieve the specified performance; calibration, setting up and testing of the associated automatic control systems; and recording of the system settings and the performance test results that have been accepted as satisfactory.

**Controlled service or fitting** means a service or fitting in relation to which Part G (sanitation, hot water safety and water efficiency), H (drainage and waste disposal), J (combustion appliances and fuel storage systems), L (conservation of fuel and power) or P (electrical safety) of Schedule 1 to the Building Regulations imposes a requirement.

**DER** is the Dwelling CO<sub>2</sub> Emission Rate expressed as kgCO<sub>2</sub>/(m<sup>2</sup>·year).

**DFEE** rate is the **dwelling** fabric energy efficiency rate expressed as kWh/(m<sup>2</sup>·year).

**Dwelling** means a self-contained unit designed to accommodate a single household.

**NOTE:** *Buildings exclusively containing rooms for residential purposes, such as nursing homes, student accommodation and similar, are not dwellings, and in such cases, Approved Document L2A applies.*

**Dwelling type** is the particular group allocated to each **dwelling** on a development to provide the basis for assessing the pressure testing regime.

The allocation of each **dwelling** to a **dwelling type** should be the responsibility of the person carrying out the pressure testing. To be classed as of the same type, **dwellings** should:

- i. be of the same generic form (i.e. detached, semi-detached, end terrace, mid-terrace, ground-floor flat (including ground-floor maisonette), mid-floor flat, top-floor flat (including top-floor maisonette);
- ii. include the same number of storeys;
- iii. have the same **design air permeability**;
- iv. have similar adjacency to unheated spaces such as stairwells, integral garages etc.
- v. have the same principal construction details;
- vi. have a similar (i.e.  $\pm 1$ ) number of significant penetrations, i.e. for windows, doors, flues/chimneys, supply/exhaust terminals, waste water pipes;
- vii. have envelope areas that do not differ by more than 10 per cent (see **air permeability** for a definition of envelope area).

**Energy efficiency requirements** means the requirements of regulations 23, 25A, 25B, 26, 26A, 28 and 40 of, and Part L of Schedule 1 to, the Building Regulations.

**Energy performance certificate** means a certificate which complies with regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012.

**Fixed building services** means any part of, or any controls associated with—

- (a) fixed internal or external lighting systems (but not including emergency escape lighting or specialist process lighting);
- (b) fixed systems for heating, hot water, air conditioning or mechanical ventilation; or
- (c) any combination of systems of the kinds referred to in paragraph (a) or (b).

**Room for residential purposes** means a room, or a suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep and includes a room in a hostel, an hotel, a boarding house, a hall of residence or a residential home, but does not include a room in a hospital, or other similar establishment, used for patient accommodation.

**TER** is the Target CO<sub>2</sub> Emission Rate expressed as kgCO<sub>2</sub>/(m<sup>2</sup>·year).

**TFEE** is the Target Fabric Energy Efficiency rate expressed as kWh/(m<sup>2</sup>·year).

## Abbreviations

CO <sub>2</sub> :	carbon dioxide
BRUKL:	Building Regulations UK Part L
UKAS:	The United Kingdom Accreditation Service
SEDBUK:	Seasonal Efficiency of Domestic Boilers in the UK
TFA:	total floor area
TMP:	thermal mass parameter

## Appendix B: Types of work covered by this approved document

1. This approved document gives guidance on what, in ordinary circumstances, may be considered reasonable provision to comply with the requirements of regulations 26, 26A and 40 of, and Part L of Schedule 1 to, the Building Regulations for those creating new **dwelling**s. In addition, this approved document gives guidance on how to comply with regulations 25A, 27, 27A, 43 and 44 of the Building Regulations and regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 where an approved inspector is the **BCB**.

### Live-work units

2. If a unit contains both living accommodation and space to be used for commercial purposes (e.g. as a workshop or office), the whole unit should be treated as a **dwelling**, as long as the commercial part can revert to domestic use. This can be the case if, for example:
  - a. there is direct access between the commercial space and the living accommodation; and
  - b. both are contained within the same thermal envelope; and
  - c. the living accommodation occupies a substantial proportion of the total area of the unit.

**Note:** Sub-paragraph c means that, for example, the presence of a small flat for a manager in a large non-domestic building does not result in the whole building being treated as a **dwelling**. Similarly, if a room is used as an office or utility space within a **dwelling**, that does not mean that the building should not be treated as a **dwelling**.

### Mixed-use developments

3. When constructing a **dwelling** as part of a larger building that contains other types of accommodation, sometimes called a mixed-use development, use this Approved Document L1A for guidance in relation to each individual **dwelling**. Approved Document L2A gives guidance relating to the non-dwelling parts of such buildings, such as heated common areas, and in the case of mixed-use developments, the commercial or retail space.

### Material changes of use

4. The act of erecting a new **dwelling** is not a material change of use. Approved Document L1B applies where a **dwelling** is being created in an existing building as the result of a material change of use of all or part of the building.

## Appendix C: Reporting evidence of compliance

1. To facilitate effective communication between the builder and BCB, it would be beneficial to adopt a standardised format for presenting the evidence that demonstrates compliance with the energy efficiency requirements. (Other than the CO<sub>2</sub> and fabric energy efficiency targets, which are mandatory, the limiting values for individual fabric elements and building services represent reasonable provision in normal circumstances. In unusual circumstances, alternative limits may represent reasonable provision, but this would have to be demonstrated in the particular case.)
2. Since the data in SAP 2012 and the results it calculates can provide a substantial proportion of the evidence in support of the compliance demonstration, compliance software should produce this report as a standard output option.
3. Two versions of the standardised report may be produced by the compliance software: the first before commencement of works to include the TER/DER and TFEF/DFEF calculation plus supporting list of specifications, and the second after completion to include the as-built TER/DER and TFEF/DFEF calculation plus any changes to the list of specifications. The first design-stage report and accompanying list of specifications can then be used by the BCB to assist checking that what has been designed is actually built. A standardised report should enable the source of the evidence to be indicated, and allow the credentials of those submitting the evidence to be declared.
4. An important part of demonstrating compliance is to make a clear connection between the product specifications and the data inputs required by the compliance software (e.g. what is the wall construction that delivers the claimed U-value?). Examples as to how compliance software might provide this link are:
  - a. By giving each data input a reference code that can be mapped against a separate submission by the builder/developer that details the specification corresponding to each unique reference code in the data input.
  - b. By providing a free-text entry facility along with each input parameter that has a unique reference code, thereby allowing the software to capture the specification of each item and so include the full details in an integrated output report.
  - c. By including one or more utility programs that derive the data input from the specification, e.g. a U-value calculator that conforms to BR 443 and that calculates the U-value based on the layer thicknesses and conductivities, repeating thermal bridge effects etc. Outputs from such a utility program could then automatically generate the type of integrated report described at sub-paragraph b.

It would also help the BCB if the software included a facility to compare the 'as designed' and 'as constructed' data input files and automatically produce a schedule of changes.

5. The report should highlight any items whose specification is better than typically expected values. The BCB can then give particular attention to such 'key features', as their appropriate installation will be critical in achieving the TER and TFE rate. The BCB is advised to give particular attention to those aspects where the claimed specification delivers an energy efficiency standard in advance of that defined in the following schedule.

Parameter	
Wall U-value	0.15 W/(m <sup>2</sup> ·K)
Roof U-value	0.13 W/(m <sup>2</sup> ·K)
Floor U-value	0.13 W/(m <sup>2</sup> ·K)
Window/door U-value	1.20 W/(m <sup>2</sup> ·K)
Party wall U-value	0.20 W/(m <sup>2</sup> ·K)
Thermal bridging value	0.04 W/(m <sup>2</sup> ·K)
Design air permeability	4.0 m <sup>3</sup> /(h·m <sup>2</sup> ) at 50 Pa
Any secondary heating appliance	
Any item involving SAP 2012 Appendix Q	
Use of any low-carbon or renewable energy technology	
Note: Solutions using electric resistance heating may have to better several of these fabric parameters if the design does not include an element of renewable energy provision.	

## Appendix D: Documents referred to

### **Air Tightness Testing and Measurement Association (ATTMA)**

[www.attma.org](http://www.attma.org)

Technical Standard L1 Measuring air permeability of building envelopes (dwellings) [2010].

### **BRE**

[www.bre.co.uk](http://www.bre.co.uk)

BR 443 Conventions for U-value calculations [2006]. ([www.bre.co.uk/uvalues](http://www.bre.co.uk/uvalues))

BRE Report BR 497 Conventions for calculating linear thermal transmittance and temperature factors [2007 and 2010 amendment and conventions].

ISBN 978 1 86081 986 5

Information Paper IP 1/06 Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings [2006].

ISBN 978 1 86081 904 9

### **BSRIA**

[www.bsria.co.uk](http://www.bsria.co.uk)

BSRIA BG 8/2009 Model Commissioning Plan.

### **Chartered Institution of Building Services Engineers (CIBSE)**

[www.cibse.org](http://www.cibse.org)

TM 36 Climate change and the indoor environment: impacts and adaptation [2005].

ISBN 978 1 90328 750 7

### **Department for Energy and Climate Change (DECC)**

[www.decc.gov.uk](http://www.decc.gov.uk)

The Government's Standard Assessment Procedure for energy rating of dwellings, SAP 2012. (Available at [www.bre.co.uk/sap2012](http://www.bre.co.uk/sap2012))

### **Department for Communities and Local Government**

[www.communities.gov.uk](http://www.communities.gov.uk)

National Planning Policy Framework [2012].

Domestic Building Services Compliance Guide [2013].

Domestic Ventilation Compliance Guide [2010].

Notice of Approval of the methodology of calculation of the energy performance of buildings in England.

### **National Association of Rooflight Manufacturers (NARM)**

[www.narm.org.uk](http://www.narm.org.uk)

Technical Document NTD 2 Assessment of thermal performance of out-of-plane rooflights [2010].

## Appendix E: Standards referred to

**BS EN ISO 13370** Thermal performance of buildings. Heat transfer via the ground. Calculation methods [2007 incorporating corrigendum March 2009].

**BS 8206-2** Lighting for buildings. Code of practice for daylighting [2008].

**BS EN 14351-1** Windows and doors. Product standard, performance characteristics. Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics [2006 (+AMD 1:2010)].

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## Conservation of fuel and power

**APPROVED  
DOCUMENT**

# L1B

**L1B Conservation of fuel and power  
in existing dwellings**

In effect from 1 October 2010

For use in England\*

**2010 edition**  
incorporating 2010, 2011,  
2013, 2016 and 2018  
amendments

## MAIN CHANGES IN THE 2010 EDITION

1. This Approved Document L1B came into force on 1 October 2010 in support of the Building and Approved Inspectors (Amendment) Regulations 2010, SI 2010 No. 719. The main changes to the legal requirements and the supporting guidance in this edition of Approved Document L1B are as follows:

### Changes in the legal requirements

2. The exemption from the energy efficiency provisions for extensions consisting of a conservatory or porch is amended to grant the exemption only where any existing walls, windows or doors are retained, or replaced if removed, and where the heating system of the building is not extended into the conservatory or porch.
3. The list of work in Schedule 4 (work that need not be notified to building control) is amended to include the installation of thermal insulation in a roof space or loft space where this is the only work carried out and the work is not carried out to comply with any requirement in the Building Regulations.

### Changes in the technical guidance

4. In this Approved Document the guidance is generally based upon an elemental approach to demonstrating compliance, with additional guidance that provides greater flexibility. The main technical changes comprise a general strengthening of energy efficiency standards that are considered reasonable for work on thermal elements, controlled fittings and controlled services in existing dwellings.
5. Amended guidance is given for historic and traditional buildings which may have an exemption from the energy efficiency requirements or where special considerations apply.
6. Amended guidance is given where an extension is a conservatory or porch that is not exempt from the energy efficiency requirements.
7. The guidance for the renovation of a thermal element through the provision of a new layer or through the replacement of an existing layer has been expanded.
8. Guidance is provided for swimming pool basins (walls and floor) in existing dwellings.

## Main changes made by the 2010 and 2011 amendments

This 2010 edition, incorporating the further 2010 amendments reflects the changes made as a result of the Building Regulations 2010; Building Approved inspector etc Regulations and the Building (Amendment) Regulations 2011. The changes mainly reflect regulation number changes as a result of re-ordering. There have been no amendments to the substantive requirements in Schedule 1(i.e. Parts A to P) of the Building Regulations.

Please note the simplification of the definition of 'room for residential purposes' in regulation 2 of the Building Regulations 2010 and the amendment of the definition of "renovation" in regulation 2(1) of the Building (Amendment) Regulations 2011. Please also note that L1(c) has now become regulation 40.

## Main changes made by the 2013 amendments

The main changes, which apply only to England\*, are:

- To take account of a recast of the European Energy Performance of Buildings Directive
- Materials and workmanship guidance updated
- Updated references to third party guidance
- Introduction of doorset energy ratings

## Main changes made by the 2016 amendments

Changes reflect alterations to the regulations, principally withdrawal of Regulations 29 to 33 of the Building Regulations 2010 and their replacement by Regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012 and changes in wording of Regulations 24, 25, 26, 26A, 27 and 27A of the Building Regulations 2010. There are no technical changes.

## Main changes made by the 2018 amendments

Changes all references to the Domestic Building Services Compliance Guide 2013 edition to the Domestic Building Services Compliance Guide 2013 edition with 2018 amendments.

\*This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No 2) Order 2009.

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# Section 1: Introduction

## What is an Approved Document?

**1.1** This Approved Document, which takes effect on 1 October 2010 has been approved and issued by the Secretary of State to provide practical guidance on ways of complying with the **energy efficiency requirements** (see Section 2) and regulation 7 of the Building Regulations 2010 (SI 2010/2214) for England and Wales. Regulation 2(1) of the Building Regulations defines the **energy efficiency requirements** as the requirements of regulations 23, 25A, 25B, 26, 28 and 40 and Part L of Schedule 1. The Building Regulations 2010 are referred to throughout the remainder of this Document as ‘the Building Regulations’.

**1.2** The intention of issuing Approved Documents is to provide guidance about compliance with specific aspects of building regulations in some of the more common building situations. They set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirement(s) of building regulations to which they refer.

**1.3** If guidance in an Approved Document is followed there will be a presumption of compliance with the requirement(s) covered by the guidance. However, this presumption can be overturned, so simply following guidance does not guarantee compliance; for example, if the particular case is unusual in some way, then ‘normal’ guidance may not be applicable. It is also important to note that there may well be other ways of achieving compliance with the requirements. **There is therefore no obligation to adopt any particular solution contained in this Approved Document if you would prefer to meet the relevant requirement in some other way. Persons intending to carry out building work should always check with their building control body, either the local authority or an approved inspector, that their proposals comply with building regulations.**

**1.4** It is important to note that this Approved Document, as well as containing guidance, also contains extracts from the Regulations. Such regulatory text must be complied with as stated. For example, the requirement that **fixed building services** must be commissioned (regulation 44) is a regulatory requirement. There is therefore no flexibility to ignore this requirement; neither can compliance with this particular regulation be demonstrated via any route other than that set out in regulation 44.

**1.5** The guidance contained in this Approved Document relates only to the particular requirements of the Building Regulations that the document addresses (set out in Section 2). However, building work may be subject to more than one requirement of building regulations. In such cases the work will also have to comply

with any other applicable requirements of building regulations.

**1.6** There are Approved Documents that give guidance on each of the Parts of Schedule 1 and on regulation 7. A full list of these is provided at the back of this document.

## Consideration of technical risk

**1.7** Building work to existing **dwelling**s must satisfy all the technical requirements set out in regulations 23, 22 and 28 of, and Schedule 1 to, the Building Regulations. When considering the incorporation of energy efficiency measures in **dwelling**s, attention should also be paid in particular to the need to comply with Part B (fire safety), Part C (site preparation and resistance to contaminants and moisture), Part E (resistance to the passage of sound), Part F (ventilation), paragraph G3 (hot water supply and systems), Part J (combustion appliances and fuel storage systems) and Part P (electrical safety) of Schedule 1 to the Building Regulations, as well as Part L. The adoption of any particular energy efficiency measure should not involve unacceptable technical risk of, for instance, excessive condensation. Designers and builders should refer to the relevant Approved Documents and to other generally available good practice guidance to help minimise these risks.

## How to use this Approved Document

**1.8** This Approved Document is subdivided into seven sections as detailed below. These sections are followed by supporting appendices.

This **introductory** section sets out the general context in which the guidance in this Approved Document must be considered.

**Section 2** sets out the relevant legal requirements contained in the Building Regulations.

**Section 3** contains general guidance, including the definition of key terms, the types of building work covered by this Approved Document, the types of building work that are exempt, procedures for notifying work, materials and workmanship and health and safety issues.

**Section 4** gives guidance on reasonable provision for various types of building work.

**Section 5** deals with the particular case of work to **thermal elements**.

**Section 6** gives guidance in support of the requirement for **consequential improvements** for buildings over 1,000 m<sup>2</sup>.

**Section 7** describes the information that should be provided to occupiers to help them achieve reasonable standards of energy efficiency in practice.

**1.9** In this document the following conventions have been adopted to assist understanding and interpretation:

- a. Texts shown against a green background are extracts from the Building Regulations 2010 (SI 2010/2214) or Building (Approved Inspectors etc.) Regulations 2010 (SI 2010/2215) and set out the legal requirements that relate to compliance with the **energy efficiency requirements** of building regulations. As stated previously, there is no flexibility in respect of such text; it defines a legal requirement, not guidance for typical situations. It should also be remembered that, as noted above, building works must comply with all the other applicable requirements of building regulations.
- b. Key terms are defined in paragraph 3.1 and are printed in **bold italic text**.
- c. Details of technical publications referred to in the text of this Approved Document will be given in footnotes and repeated as references at the end of the document. A reference to a publication is likely to be made for one of two main reasons. The publication may contain additional or more comprehensive technical detail, which it would be impractical to include in full in the Approved Document but which is needed to fully explain ways of meeting the requirements; or it is a source of more general information. The reason for the reference will be indicated in each case. The reference will be to a specified edition of the document. The Approved Document may be amended from time to time to include new references or to refer to revised editions where this aids compliance.
- d. Additional *commentary in italic text* appears after some numbered paragraphs. This commentary is intended to assist understanding of the immediately preceding paragraph or sub-paragraph, or to direct readers to sources of additional information, but is not part of the technical guidance itself.

- if your query is of a highly technical nature, you may wish to seek the advice of a specialist, or industry technical body, for the relevant subject.

## Responsibility for compliance

**1.11** It is important to remember that if you are the person (e.g. designer, builder, installer) carrying out building work to which any requirement of building regulations applies you have a responsibility to ensure that the work complies with any such requirement. The building owner may also have a responsibility for ensuring compliance with building regulation requirements and could be served with an enforcement notice in cases of non-compliance.

## Where you can get further help

**1.10** If you do not understand the technical guidance or other information set out in this Approved Document and the additional detailed technical references to which it directs you, there are a number of routes through which you can seek further assistance:

- the Government website:  
[www.gov.uk](http://www.gov.uk);
- if you are the person undertaking the building work, you can seek assistance either from your local authority building control service or from your approved inspector (depending on which building control service you are using;
- persons registered with a competent person self-certification scheme may be able to get technical advice from their scheme operator;

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## Section 2: The requirements

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**2.1** This Approved Document, which takes effect on 1 October 2010, deals with the **energy efficiency requirements** in the Building Regulations. Regulation 2(1) of the Building Regulations defines the **energy efficiency requirements** as the requirements of regulations 23, 25A, 25B, 26, 28 and 40 and Part L of Schedule 1. The **energy efficiency requirements** relevant to this Approved Document, which deals with existing  **dwellings**, are those in regulations 23, 28 and 40 of, and Part L of Schedule 1 to, those Regulations and are set out below.

### Requirements for the renovation or replacement of thermal elements – Regulation 23

- (1) Where the renovation of an individual thermal element—
- (a) constitutes a major renovation; or
  - (b) amounts to the renovation of more than 50% of the element's surface area;
- the renovation must be carried out so as to ensure that the whole of the element complies with paragraph L1(a)(i) of Schedule 1, in so far as that is technically, functionally and economically feasible.
- (2) Where the whole or any part of an individual element is proposed to be replaced and the replacement—
- (a) constitutes a major renovation; or
  - (b) (in the case of part replacement) amounts to the replacement of more than 50% of the thermal element's surface area;
- the whole of the thermal element must be replaced so as to ensure that it complies with paragraph L1(a)(i) of Schedule 1, in so far as that is technically, functionally and economically feasible.

### Consequential improvements to energy performance Regulation 28

- (1) Paragraph (2) applies to an existing building with a total useful floor area over 1000 m<sup>2</sup> where the proposed building work consists of or includes—
- (a) an extension;
  - (b) the initial provision of any fixed building services; or
  - (c) an increase to the installed capacity of any fixed building services.
- (2) Subject to paragraph (3), where this paragraph applies, such work, if any, shall be carried out as is necessary to ensure that the building complies with the requirements of Part L of Schedule 1.
- (3) Nothing in paragraph (2) requires work to be carried out if it is not technically, functionally or economically feasible.

<i>Requirement</i>	<i>Limits on application</i>
<p><b>Schedule 1 – Part L Conservation of fuel and power</b></p> <p>L1. Reasonable provision shall be made for the conservation of fuel and power in buildings by:</p> <ul style="list-style-type: none"> <li>(a) limiting heat gains and losses— <ul style="list-style-type: none"> <li>(i) through thermal elements and other parts of the building fabric; and</li> <li>(ii) from pipes, ducts and vessels used for space heating, space cooling and hot water services;</li> </ul> </li> <li>(b) providing fixed building services which— <ul style="list-style-type: none"> <li>(i) are energy efficient;</li> <li>(ii) have effective controls; and</li> <li>(iii) are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances; and</li> </ul> </li> </ul> <p>Regulation 40 providing to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.</p>	

## LIMITATION ON REQUIREMENTS

**2.2** In accordance with regulation 8 of the Building Regulations, the requirements in Parts A to D and F to K (except for paragraphs G2, H2 and J7) of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings).

**2.3** Paragraph G2 is excluded as it deals with water efficiency and paragraphs H2 and J7 are excluded from regulation 8 because they deal directly with prevention of the contamination of water. Parts E and M (which deal, respectively, with resistance to the passage of sound, and access to and use of buildings) are excluded from regulation 8 because they address the welfare and convenience of building users. Part L is excluded from regulation 8 because it addresses the conservation of fuel and power.

**2.4** In addition, regulation 4(2) of the Building Regulations states that where the work is being carried out in order to comply with regulation 23 (requirements relating to **renovation** or replacement of a **thermal element**), regulation 22 (requirements relating to a change of a building's energy status) or regulation 28 (**consequential improvements** to energy performance), and is not a material alteration, it need comply only with the requirements of Part L.

## Section 3: General guidance

### Key terms

**3.1** The following are key terms used in this document:

**BCB** means Building Control Body: a local authority or an approved inspector.

**Building envelope** in relation to a building means the walls, floor, roof, windows, doors, roof windows and roof-lights.

**Commissioning** means the advancement of a **fixed building service** following installation, replacement or alteration of the whole or part of the system, from the state of static completion to working order by testing and adjusting as necessary to ensure that the system as a whole uses no more fuel and power than is reasonable in the circumstances, without prejudice to the need to comply with health and safety requirements. For each system **commissioning** includes setting-to-work, regulation (that is testing and adjusting repetitively) to achieve the specified performance, the calibration, setting up and testing of the associated automatic control systems, and recording of the system settings and the performance test results that have been accepted as satisfactory.

**Consequential improvements** means those energy efficiency improvements required by regulation 28.

**Controlled service or fitting** means a service or fitting in relation to which Part G (sanitation, hot water safety and water efficiency), H (drainage and waste disposal), J (combustion appliances and fuel storage systems), L (conservation of fuel and power) or P (electrical safety) of Schedule 1 to the Building Regulations imposes a requirement.

**Dwelling** means a self-contained unit, including a house or a flat, designed to be used separately to accommodate a single household. (**Rooms for residential purposes** are not **dwellings** so Approved Document L2B applies to work in such buildings.)

**Energy efficiency requirements** means the requirements of regulations 23, 25A, 25B, 26, 28 and 40 of, and Part L of Schedule 1 to, the Building Regulations.

**energy performance certificate** means a certificate which complies with regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012.

*In respect of existing dwellings the applicable requirements consist of Part L and regulations 23, 38 and 40.*

**Fixed building services** means any part of, or any controls associated with—

- (a) fixed internal or external lighting systems (but not including emergency escape lighting or specialist process lighting);
- (b) fixed systems for heating, hot water, air conditioning or mechanical ventilation; or
- (c) any combination of systems of the kinds referred to in paragraph (a) or (b);

**Major renovation** means the renovation of a building where more than 25% of the surface area of the building envelope undergoes renovation.

**Room for residential purposes** means a room, or a suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep and includes a room in a hostel, an hotel, a boarding house, a hall of residence or a residential home, but does not include a room in a hospital, or other similar establishment, used for patient accommodation.

**'Renovation'** in relation to a thermal element means the provision of a new layer in the thermal element (other than where that new layer is provided solely as a means of repair to a flat roof) or the replacement of an existing layer, but excludes decorative finishes, and 'renovate' shall be construed accordingly.

**Simple payback** means the amount of time it will take to recover the initial investment through energy savings, and is calculated by dividing the marginal additional cost of implementing an energy efficiency measure by the value of the annual energy savings achieved by that measure taking no account of VAT. When making this calculation the following guidance should be used:

- a. the marginal additional cost is the additional cost (materials and labour) of incorporating (e.g.) additional insulation, not the whole cost of the work;
- b. the cost of implementing the measure should be based on prices current at the date the proposals are made known to the **BCB** and be confirmed in a report signed by a suitably qualified person;
- c. the annual energy savings should be estimated using SAP 2012<sup>1</sup>;
- d. for the purposes of this Approved Document, the energy prices that are current at the time of the application to building control should be used when evaluating the annual energy savings. Current energy prices can be obtained from the DECC website<sup>2</sup>.

<sup>1</sup> [www.bre.co.uk/sap2012](http://www.bre.co.uk/sap2012).

<sup>2</sup> [www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics#energy-price-statistics](http://www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics#energy-price-statistics).

**Thermal element** is defined in regulation 2(3) of the Building Regulations as follows:

2(3) In these Regulations ‘thermal element’ means a wall, floor or roof (but does not include windows, doors, roof windows or roof-lights) which separates a thermally conditioned part of the building (‘the conditioned space’) from:

- a. the external environment (including the ground); or
- b. in the case of floors and walls, another part of the building which is:
  - i. unconditioned;
  - ii. an extension falling within class VII in Schedule 2; or
  - iii. where this paragraph applies, conditioned to a different temperature,

and includes all parts of the element between the surface bounding the conditioned space and the external environment or other part of the building as the case may be.

2(4) Paragraph 2(3)(b)(iii) only applies to a building which is not a dwelling, where the other part of the building is used for a purpose which is not similar or identical to the purpose for which the conditioned space is used.

*Note that this definition encompasses the walls and floor of a swimming pool basin where this is part of an existing **dwelling**.*

## Types of work covered by this Approved Document

**3.2** This Approved Document is intended to give guidance on what, in ordinary circumstances, may be considered reasonable provision for compliance with the requirements of regulation 23 and 28 of, and Part L of Schedule 1 to, the Building Regulations for those carrying out building work to existing **dwellings**. In addition it gives guidance on compliance with regulations 25A, 27, 43 and 44 of the Building Regulations and 20(1), 20(2) and 20(6) of the Approved Inspectors Regulations 2010.

*Buildings exclusively containing **rooms for residential purposes** such as nursing homes, student accommodation and similar are not **dwellings**, and in such cases Approved Document L2B applies.*

**3.3** In particular, this Approved Document gives guidance on compliance with the **energy efficiency requirements** where the following occurs:

- a. the construction of an extension (see paragraphs 4.1 to 4.9);
- b. a material change of use, or a change to the building’s energy status, including such work as loft and garage conversions (paragraphs 4.11 to 4.16);
- c. the provision or extension of a **controlled service** or **controlled fitting** (paragraphs 4.17 to 4.37);

- d. the replacement or **renovation** of a **thermal element** (Section 5);
- e. the **major renovation** of a building.

**3.4** Where the activities include building work in a **dwelling** that is part of a mixed-use building, account should also be taken of the guidance in Approved Document L2B in relation to those parts of the building that are not **dwellings**, including any common areas.

*It should be noted that **dwellings** are defined as self-contained units. **Rooms for residential purposes** are not **dwellings**, and so Approved Document L2B applies to them.*

## Dwellings within the scope of the energy efficiency requirements

**3.5** The **energy efficiency requirements** of the Building Regulations apply only to buildings which are roofed constructions having walls and which use energy to condition the indoor climate. For **dwellings** the requirements will apply to:

- the erection of a **dwelling** (guidance on this is given in Approved Document L1A);
- the extension of a **dwelling** other than some extensions falling within Class VII in Schedule 2 to the Building Regulations; or
- the carrying out of any building work to or in connection with an existing **dwelling** or an extension to an existing **dwelling**.

## Dwellings exempt from the energy efficiency requirements

**3.6** There are two exemptions from the **energy efficiency requirements** that may apply to building work to existing **dwellings** or extensions to existing **dwellings**:

- a. Buildings which are:
  - listed in accordance with section 1 of the Planning (Listed Buildings and Conservation Areas) Act 1990;
  - in a conservation area designated in accordance with section 69 of that Act; or
  - included in the schedule of monuments maintained under section 1 of the Ancient Monuments and Archaeological Areas Act 1979.

For these buildings the exemption applies only to the extent that compliance with the **energy efficiency requirements** would unacceptably alter the character or appearance of such existing **dwellings**. Guidance on these buildings is given in paragraphs 3.7 to 3.14 below.

- b. Carports, covered yards, covered ways and some conservatories or porches attached to existing **dwellings**. Guidance on these is given at paragraphs 3.15 and 3.16 below.

## Historic and traditional buildings which may have an exemption

**3.7** As mentioned above in paragraph 3.6a, the following classes of buildings have an exemption from the **energy efficiency requirements** where compliance would unacceptably alter the character or appearance of the buildings.

- listed buildings;
- buildings in conservation areas; and
- scheduled ancient monuments.

## Historic and traditional buildings where special considerations may apply

**3.8** There are three further classes of buildings where special considerations in making reasonable provision for the conservation of fuel or power may apply:

- buildings which are of architectural and historical interest and which are referred to as a material consideration in a local authority's development plan or local development framework;
- buildings which are of architectural and historical interest within national parks, areas of outstanding natural beauty, registered historic parks and gardens, registered battlefields, the curtilages of scheduled ancient monuments, and world heritage sites;
- buildings of traditional construction with permeable fabric that both absorbs and readily allows the evaporation of moisture.

**3.9** When undertaking work on or in connection with a building that falls within one of the classes listed above, the aim should be to improve energy efficiency as far as is reasonably practicable. The work should not prejudice the character of the host building or increase the risk of long-term deterioration of the building fabric or fittings.

**3.10** The guidance given by English Heritage<sup>3</sup> should be taken into account in determining appropriate energy performance standards for building work in historic buildings.

*In addition English Heritage has produced detailed technical guidance on how to implement specific energy efficiency measures. (See list of available guidance documents at <http://www.english-heritage.org.uk/professional/advice/advice-by-topic/climate-change/energy-efficiency/>.)*

**3.11** In general, new extensions to historic or traditional **dwelling**s should comply with the standards of energy efficiency as set out in this Approved Document. The only exception would be where there is a particular need to match the external appearance or character of the extension to that of the host building (see paragraph 4.2).

**3.12** Particular issues relating to work in historic buildings that warrant sympathetic treatment and where advice from others could therefore be beneficial include:

- restoring the historic character of a building that has been subject to previous inappropriate alteration, e.g. replacement windows, doors and rooflights;
- rebuilding a former historic building (e.g. following a fire or filling a gap site in a terrace);
- making provisions enabling the fabric of historic buildings to 'breathe' to control moisture and potential long-term decay problems.

**3.13** In assessing reasonable provision for energy efficiency improvements for historic buildings of the sort described in paragraphs 3.7 and 3.8, it is important that the **BCB** takes into account the advice of the local authority's conservation officer. The views of the conservation officer are particularly important where building work requires planning permission and/or listed building consent.

**3.14** Other classes of buildings to which special considerations apply are usually non-domestic in character, and so are covered in ADL2A and ADL2B.

## Conservatories and porches

**3.15** Regulation 21 of the Building Regulations exempts some conservatory and porch extensions from the **energy efficiency requirements**. The exemption applies only for conservatories or porches:

- which are at ground level;
- where the floor area is less than 30 m<sup>2</sup>;
- where the glazing complies with Part K 4 of Schedule 1;
- where the existing walls, doors and windows in the part of the **dwelling** which separates the conservatory are retained or, if removed, replaced by walls, windows and doors which meet the **energy efficiency requirements**; and
- where the heating system of the **dwelling** is not extended into the conservatory or porch.

**3.16** Where any conservatory or porch does not meet all the requirements in the preceding paragraph, it is not exempt and must comply with the relevant **energy efficiency requirements** (see paragraphs 4.8 and 4.9 below).

## Notification of work covered by the Energy Efficiency requirements

**3.17** In most instances in order to comply with the Building Regulations it will be necessary to notify a **BCB** before the work starts. Where you choose to use the local authority and any work relates to the common parts of a block of flats, this must be by deposit of full plans. For other existing **dwelling**s this could be either in the form of a deposit of full plans or by a building notice. There is no set procedure where the **BCB** is an Approved Inspector provided they have been notified at least 5 days before work starting.

<sup>3</sup> Energy Efficiency and Historic Buildings, English Heritage, 2011  
<http://www.english-heritage.org.uk/publications/energy-efficiency-historic-buildings-pt1/>.

**3.18** In certain situations, however, you do not need to notify a **BCB**:

- a. Where the work is being carried out by a person registered with a relevant competent person self-certification scheme listed in Schedule 3 to the Building Regulations, no advance notification to the **BCB** is needed (see paragraphs 3.19 to 3.22).
- b. Where the work involves an emergency repair, e.g. to a failed boiler or a leaking hot water cylinder, in accordance with regulation 12(7) of the Building Regulations there is no need to delay making the repair in order to make an advance notification to the **BCB**. However, in such cases it will still be necessary for the work to comply with the relevant requirements and to give a notice to the **BCB** at the earliest opportunity, unless an installer registered under an appropriate competent person scheme carries out the work. A completion certificate can then be issued in the normal way.
- c. Where the work is of a minor nature as described in the schedule of non-notifiable work (Schedule 4 to the Building Regulations), the work must still comply with the relevant requirements but need not be notified to the **BCB** (see paragraphs 3.23 to 3.25).

#### Competent person self-certification schemes

**3.19** It is not necessary to notify a **BCB** in advance of work which is to be carried out by a person registered with a competent person self-certification scheme listed in Schedule 3 to the Building Regulations. In order to join such a scheme a person must demonstrate competence to carry out the type of work the scheme covers, and also the ability to comply with all relevant requirements in the Building Regulations.

**3.20** Where work is carried out by a person registered with a competent person scheme, regulation 20 of the Building Regulations 2010 and regulation 20(1) of the Building (Approved Inspectors etc) Regulations 2010 require that the occupier of the building be given, within 30 days of the completion of the work, a certificate confirming that the work complies fully with all applicable building regulation requirements. There is also a requirement to give the **BCB** a notice of the work carried out, again within 30 days of the completion of the work. These certificates and notices are usually made available through the scheme operator.

**3.21** **BCBs** are authorised to accept these certificates and notices as evidence of compliance with the requirements of the Building Regulations. Local authority inspection and enforcement powers remain unaffected, although they are normally used only in response to a complaint that work does not comply.

**3.22** A list of authorised self-certification schemes and the types of work for which they are authorised can be found at [www.communities.gov.uk](http://www.communities.gov.uk)

#### Work which need not be notified

**3.23** Schedule 4 to the Building Regulations sets out types of work where there is no requirement to notify a **BCB** that work is to be carried out. These types of work are mainly of a minor nature where there is no significant risk to health, safety or energy efficiency. Note that the health, safety and **energy efficiency requirements** continue to apply to these types of work, and that only the need to notify a **BCB** has been removed. In addition, where only non-notifiable work is carried out by a member of a competent person self-certification scheme there is no requirement for a certificate of building regulations compliance to be given to the occupier or the **BCB**.

**3.24** The types of non-notifiable work in Schedule 4 relevant to the **energy efficiency requirements** of the Regulations are:

- a. In a heating, hot water, ventilation or air-conditioning system, the replacement of any part which is not a combustion appliance (such as a radiator, valve or pump) or the addition of an output device (such as a radiator or fan) or the addition of a control device (such as a thermostatic radiator valve). However, the work will remain notifiable whenever **commissioning** is possible and necessary to enable a reasonable use of fuel and power (see paragraphs 4.30 to 4.37).
- b. The installation of a stand-alone, self-contained fixed heating, hot water, ventilation or air-conditioning service. Such services must consist only of a single appliance and any associated controls, and must not be connected to, or form part of, any other **fixed building service**. Examples of non-notifiable services would be a fixed electric heater, a mechanical extractor fan in a kitchen or bathroom, and a room air-conditioning unit. However, if any of the following apply, the work will remain notifiable building work:
  - i. the service is a combustion appliance;
  - ii. any electrical work associated with the installation is notifiable;
  - iii. **commissioning** is possible and would affect the service's energy efficiency (see paragraphs 4.30 to 4.38);
  - iv. in the case of a ventilation appliance, the appliance is installed in a room containing a natural draught open-flued combustion appliance or service, such as a gas fire which uses a chimney as its flue.
- c. Installation of thermal insulation in a roof space or loft space where this is the only work carried out and the work is not carried out to comply with any requirement in the Building Regulations, i.e. the work is carried out voluntarily.

**3.25** Schedule 4 also sets out what types of electrical installation work in **dwelling**s are non-notifiable. Full information on this is given in Approved Document P.

## Materials and workmanship

**3.26** Any building work which is subject to the requirements imposed by schedule 1 to the Building Regulations shall be carried out in accordance with regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in the Approved Document to support regulation 7.

**3.27** Building Regulations are made for specific purposes, primarily the health and safety, welfare and convenience of people and for energy conservation. Standards and other technical specifications may provide relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance or matters which, although they relate to health and safety etc., are not covered by the Building Regulations.

**3.28** When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

## The Workplace (Health, Safety and Welfare) Regulations 1992

**3.29** The Workplace (Health, Safety and Welfare) Regulations 1992, as amended, apply to the common parts of flats and similar buildings if people such as cleaners, wardens and caretakers are employed to work in these common parts. These Regulations contain some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see *Workplace health, safety and welfare, Workplace (Health, Safety and Welfare) Regulations 1992, Approved Code of Practice and guidance*, HSE publication L24, 1996.

**3.30** Where the requirements of the Building Regulations that are covered by this Approved Document do not apply to **dwelling**s, the provisions may still be required in the situations described above in order to satisfy the Workplace Regulations.

# Section 4: Guidance relating to building work

## THE EXTENSION OF A DWELLING

### Reference method

#### Fabric standards

**4.1** Reasonable provision would be for the proposed extension to incorporate the following:

- newly constructed **thermal elements** that meet the standards set out in paragraphs 5.1 to 5.6;
- doors, windows, roof windows and rooflights that meet the standards set out in paragraphs 4.19 to 4.23;
- improvements to fabric elements that are to become **thermal elements**, following the guidance in paragraphs 5.6 to 5.11.

#### Area of windows, roof windows and doors

**4.2** In most circumstances reasonable provision would be to limit the total area of windows, roof windows and doors in extensions so that it does not exceed the sum of:

- 25 per cent of the floor area of the extension; plus
- the total area of any windows or doors which, as a result of the extension works, no longer exist or are no longer exposed.

*As a general guide, if the area of glazing is much less than 20 per cent of the total floor area, some parts of the extension and especially the part of the **dwelling** it covers may experience poor levels of daylight, resulting in increased use of electric lighting. Areas of glazing greater than 25 per cent may be acceptable, especially if this is required to make the extension consistent with the external appearance or character of the host building. In such cases and where practical, either the U-value of the window should be improved relative to the standard set out in paragraph 4.1b, or other compensating measures applied following the guidance set out in paragraphs 4.4 to 4.7.*

#### Heating and lighting in the extension

**4.3** Where a **fixed building service** is provided or extended as part of constructing the extension, reasonable provision would be to follow the guidance in paragraphs 4.24 to 4.37.

### Optional approaches with more design flexibility

**4.4** The approach set out in paragraphs 4.1 to 4.3 is somewhat prescriptive. The following paragraphs offer more flexible approaches to demonstrating that reasonable provision has been made. These alternative approaches allow some elements of the design to be relaxed through compensating measures elsewhere.

#### Area-weighted U-value method

**4.5** One way of complying would be to show that the area-weighted U-value of all the elements in the extension is no greater than that of an extension of the same size and shape that complies with the fabric standards referred to in paragraph 4.1 and the opening area standards in paragraph 4.2. Any **fixed building service** provided or extended as part of constructing the extension should follow the guidance in paragraphs 4.24 to 4.37.

The area-weighted U-value is given by the following expression:

$$\frac{\{(U_1 \times A_1) + (U_2 \times A_2) + (U_3 \times A_3) + \dots\}}{\{A_1 + A_2 + A_3 + \dots\}}$$

#### Whole dwelling calculation method

**4.6** Where even greater design flexibility is required, reasonable provision would be to use SAP 2012 to show that the calculated carbon dioxide (CO<sub>2</sub>) emission rate from the **dwelling** with its proposed extension is no greater than for the **dwelling** plus a notional extension built to the standards of paragraphs 4.1 to 4.3. The openings in the notional extension should conform with paragraph 4.2 with door area set equal to the door area of the proposed extension, with the remainder of the openings being classified as windows. The data in SAP 2012 Appendix S can be used to estimate the performance of the elements of the existing building where these are unknown.

*Approved Document C gives limiting values for individual elements to minimise condensation risk.*

**4.7** If, as part of achieving the standard set out in paragraph 4.6, upgrades are proposed to the existing **dwelling**, such upgrades should be implemented to a standard that is no worse than set out in the relevant guidance contained in this Approved Document. The relevant standards for improving retained **thermal elements** are as set out in column (b) of Table 3.

*Where it is proposed to upgrade the original building, the standards set out in this Approved Document are cost-effective and should be implemented in full. It will be worthwhile implementing them even if the improvement is greater than necessary to achieve compliance. In some cases, therefore, the standard of the extended **dwelling** may be better than that required by paragraph 4.6 alone. Paragraph 4.7 sets limits on design flexibility and ensures that no cost-effective improvement opportunities are traded away.*

### Conservatories and porches

**4.8** Where the extension is a conservatory or porch that is not exempt from the **energy efficiency requirements** (see paragraphs 3.15

and 3.16 above), then reasonable provision would be to provide:

- a. Effective thermal separation between the heated area in the existing **dwelling**, i.e. the walls, doors, and windows between the **dwelling** and the extension, should be insulated and draught proofed to at least the same extent as in the existing **dwelling**.
- b. Independent temperature and on/off controls to any heating system installed within the extension. Any **fixed building service** installed within the extension should also conform to the standards set out in paragraphs 4.24 to 4.37.
- c. Glazed elements should meet the standards set out in Table 1 and opaque elements should meet the standards set out in Table 2. However, the limitations on total area of windows, roof windows and doors as set out at paragraph 4.2 above do not apply.

**4.9** Removing, and not replacing, any or all of the thermal separation between the **dwelling** and an existing exempt extension, or extending the **dwelling's** heating system into the extension, means the extension ceases to be exempt (see paragraphs 3.15 and 3.16 above). In such situations, the extension should be treated as a conventional extension and reasonable provision would be to demonstrate that the extension meets the guidance set out in paragraphs 4.1 to 4.7 above.

## Swimming pool basins

**4.10** Where a swimming pool is being provided in a building, the U-value of the basin (walls and floor) should be not worse than 0.25 W/m<sup>2</sup>.K as calculated according to BS EN ISO 13370<sup>4</sup>.

*Design consideration should be taken with regards to compressive creep, insulation boards not being fully supported and the effects of point loading. Care should be taken to avoid thermal bridging particularly around basin wall and floor junctions with foundations.*

## MATERIAL CHANGE OF USE AND CHANGE OF ENERGY STATUS

### Material change of use

**4.11** Material changes of use (see regulation 5 of the Building Regulations) covered by this document are where, after the change:

- a. the building is used as a **dwelling**, where previously it was not;
- b. the building contains a flat, where previously it did not; or
- c. the building, which contains at least one **dwelling**, contains a greater or lesser number of **dwellings** than it did previously.

### Change of energy status

**4.12** A change to a building's energy status is defined in regulation 2(1) as:

any change which results in a building becoming a building to which the energy efficiency requirements of these Regulations apply, where previously it was not.

**4.13** The requirements relating to a change to energy status are in regulation 22:

Where there is a change in a building's energy status, such work, if any, shall be carried out to ensure that the building complies with the applicable requirements of regulation 40 and Part L of Schedule 1.

**4.14** In this regulation 'building' means the building as a whole or parts of the building that have been designed or altered to be used separately.

*For example, this could occur where a previously unheated building, or parts of the building that have been designed or altered to be used separately, were to be heated in future, or where a previously exempt building were no longer within the exempted categories. A material alteration (regulation 3(2) and (3)) may result in a change in buildings energy status.*

**4.15** In normal circumstances, reasonable provision where there is a material change of use or a change to the building's energy status would be:

- a. Where **controlled services or fittings** are being provided or extended, to meet the standards set out in paragraphs 4.17 to 4.37. If the area of openings in the newly created **dwelling** is more than 25 per cent of the total floor area, either the area of openings should be reduced to be not greater than 25 per cent, or the larger area should be compensated for in some other way using the procedure described in paragraph 4.16.
- b. Where the work involves the provision of a **thermal element**, to meet the standards set out in paragraphs 5.1 to 5.6.

*For the purposes of Building Regulations, provision means both new and replacement elements.*

- c. Where any **thermal element** is being retained, to upgrade it following the guidance given in paragraphs 5.11 to 5.13.
- d. Where an existing window (including roof window or rooflight) or door which separates a conditioned space from an unconditioned space or the external environment has a U-value that is worse than 3.3 W/(m<sup>2</sup>.K), to provide replacement units following the guidance in paragraphs 4.19 to 4.23.

<sup>4</sup> BS EN ISO 13370 Thermal performance of buildings – Heat transfer via the ground – Calculation methods [2007 incorporating corrigendum March 2009].

## Option providing more design flexibility

**4.16** To provide more design flexibility, SAP 2012 can be used to demonstrate that the total CO<sub>2</sub> emissions from all the **dwelling**s in the building as it will become are no greater than if each **dwelling** had been improved following the guidance set out in paragraph 4.15.

## WORK ON CONTROLLED FITTINGS AND SERVICES

**4.17** **Controlled services or fittings** are defined in regulation 2 as follows:

Controlled service or fitting means a service or fitting in relation to which Part G, H, J, L or P of Schedule 1 imposes a requirement;

## Controlled fittings

**4.18** In the context of this Approved Document, the application of the term **controlled fitting** to a window, roof window, rooflight or door refers to a whole unit, i.e. including the frame. Consequently, replacing the glazing whilst retaining an existing frame is not providing a **controlled fitting**, and so such work is not notifiable and does not have to meet the Part L standards, although where practical it would be sensible to do so. Similar arguments apply to doors, where the **controlled fitting** refers to the complete doorset (leaf plus frame). Replacing a door leaf whilst retaining the existing frame is not notifiable and does not have to meet the Part L standards, although where practical it would be sensible to do so.

**4.19** Where windows, roof windows, rooflights or doors are to be provided, reasonable provision in normal cases would be the installation of draught-proofed units whose performance is no worse than given in Table 1. In addition, insulated cavity closers should be installed where appropriate. Where the windows or fully glazed external pedestrian doors are unable to meet the requirements of Table 1 because of the need to maintain the external appearance of the façade or the character of the building, such fittings should meet a centre pane U-value of 1.2 W/(m<sup>2</sup>.K), where the centre-pane U-value is defined as the U-value determined in the central area of the glazing unit, making no allowance for edge spacers or window frame. As an alternative, single glazing should be supplemented with low-e secondary glazing. In this latter case, the weather stripping should be on the secondary glazing to minimise condensation risk between the primary and secondary glazing. Where enhanced performance requirements (e.g. wind load, safety, security or acoustic attenuation) require thicker glass to be used, reasonable provision would be demonstrated if the window unit with the equivalent standard glazing thickness can be shown to comply.

**4.20** U-values shall be calculated using the methods and conventions set out in BR 443<sup>5</sup>, and should be based on the whole unit (i.e. in the case of a window, the combined performance of the glazing and frame). The U-value of the window can be calculated for:

- the smaller of the two standard windows defined in BS EN 14351-1<sup>6</sup>; or
- the standard window configuration set out in BR 443; or
- the specific size and configuration of the actual window.

The U-value of the door can be calculated for:

- the standard size as laid out in BS EN 14351-1; or
- the specific size and configuration of the actual door.

*SAP 2012 Table 6e gives values for different window configurations that can be used in the absence of test data or calculated values.*

**4.21** The U-values for roof windows and rooflights given in this Approved Document are based on the U-value having been assessed with the roof window or rooflight in the vertical position. If a particular unit has been assessed in a plane other than the vertical, the standards given in this Approved Document should be modified by making an adjustment that is dependent on the slope of the unit following the guidance in BR 443.

**Table 1 Standards for controlled fittings<sup>1</sup>**

Fitting	Standard
Window, roof window or rooflight <sup>2</sup>	WER Band C or better (see paragraph 4.22), or U-value 1.6 W/(m <sup>2</sup> .K)
Doors with >60% of internal face glazed	Doorset Energy Rating (DSER) Band E or better (see paragraph 4.22), or U-value 1.8 W/(m <sup>2</sup> .K)
Other doors	DSER Band E or better (see paragraph 4.22), or U-value 1.8 W/(m <sup>2</sup> .K)

**Notes:**

- Since the U-values are determined for standard configurations (see paragraph 4.20), the effects of Georgian bars and/or leaded lights can be ignored.
- For the purposes of checking compliance with this table, the true U-value based on aperture area can be converted to the U-value based on the developed area of the rooflight. Further guidance on evaluating the U-value of out-of-plane rooflights is given in Assessment of thermal performance of out-of-plane rooflights, NARM Technical Document NTD 2 (2010). See <http://www.narm.org.uk/uploads/pdfs/NARM-TAOOPR-030311.pdf>.

**4.22** The calculation of Window Energy Rating (WER) and the Doorset Energy Rating (DSER) are set out in the GGF Guide to the Calculation of Energy Ratings for Windows,

<sup>5</sup> BR 443 Conventions for U-value calculations, BRE, 2006.

<sup>6</sup> BS EN 14351-1 Windows and doors – Product standard, performance characteristics. Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics [2006 (+AMD 1:2010)].

Roof Windows and Doors<sup>7</sup>. The guide provides different procedures for windows, roof windows, external pedestrian doors and patio/French/sliding/folding doors. **BCBs** may accept a WER and/or DSER declaration from a certification scheme that provides a quality assured process and supporting audit trail from calculating the performance of the window through to installation as evidence of compliance. Notwithstanding the suggested performance values set out in Table 1, guidance on energy efficient windows is available from the Energy Saving Trust<sup>8</sup>.

**4.23** If a window is enlarged or a new one created, then the area of windows, roof windows, rooflights and doors should not exceed 25 per cent of the total floor area of the **dwelling** unless compensating measures are included elsewhere in the work.

## Controlled services

**4.24** Whenever a **fixed building service** is extended or provided, reasonable provision would be demonstrated by following the guidance set out in the *Domestic Building Services Compliance Guide*<sup>9</sup>. The Guide covers the following services:

- a. heating and hot water systems (including insulation of pipes, ducts and vessels);
- b. mechanical ventilation;
- c. mechanical cooling/air-conditioning;
- d. fixed internal lighting;
- e. fixed external lighting;
- f. renewable energy systems.

**4.25** The efficiency claimed for the **fixed building service** should be based on the appropriate test standard as set out in the *Domestic Building Services Compliance Guide* and the test data should be certified by a notified body. It would be reasonable for **BCBs** to accept such data at face value. In the absence of such quality-assured data, **BCBs** should satisfy themselves that the claimed performance is justified.

**4.26** When replacing an existing appliance, the efficiency of the new appliance should not be significantly less than the efficiency of the appliance being replaced. If the replacement involves a fuel switch, then the relative carbon emissions associated with the new and existing fuels should be considered when assessing the reasonableness of the proposed new appliance. The *Domestic Building Services Compliance Guide* contains the detailed guidance on this issue.

**4.27** If a renewable energy generator such as a wind turbine or photovoltaic array is being replaced, the new system should have an

electrical output that is not less than the original installation.

**4.28** When replacing a heating appliance, consideration should be given to connecting to any existing local heat networks. If the work involves pipework changes, consideration should be given to providing capped off connections to facilitate subsequent connection to a planned local heat network.

**4.29** If a particular technology is not covered in the *Domestic Building Services Compliance Guide*, reasonable provision would be demonstrated by showing that the proposed technology gives a performance that is no worse than a reference system of the same type whose details are given in the Guide.

## COMMISSIONING OF FIXED BUILDING SERVICES

**4.30** Paragraph L1(b)(iii) of Schedule 1 to the Building Regulations requires **fixed building services** to be commissioned by testing and adjustment as necessary to ensure that they use no more fuel and power than is reasonable in the circumstances. In order to demonstrate that the heating and hot water systems have been adequately commissioned, regulation 44 states:

### 44 Commissioning

(1) This regulation applies to building work in relation to which paragraph F1(2) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed system for mechanical ventilation or any associated controls where testing and adjustment is not possible.

(2) This regulation applies to building work in relation to which paragraph L1(b) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed building service where testing and adjustment is not possible or would not affect the energy efficiency of that fixed building service.

(3) Where this regulation applies the person carrying out the work shall, for the purpose of ensuring compliance with paragraph F1(2) or L1(b) of Schedule 1, give to the local authority a notice confirming that the fixed building services have been commissioned in accordance with a procedure approved by the Secretary of State.

(4) The notice shall be given to the local authority–

- a. not later than the date on which the notice required by regulation 16(4) is required to be given; or
- b. where that regulation does not apply, not more than 30 days after completion of the work.

<sup>7</sup> Guide to the Calculation of Energy Ratings for Windows, Roof Windows and Doors, GGF, 2013.

<sup>8</sup> [www.energysavingtrust.org.uk/Insulation/Windows](http://www.energysavingtrust.org.uk/Insulation/Windows).

<sup>9</sup> Domestic Building Services Compliance Guide, DCLG, 2013 incorporating 2018 amendments.

**4.31** Reasonable provision would be to prepare a **commissioning** plan, identifying the systems that need to be tested and the tests that will be carried out. The notice required by regulation 44 should confirm that the **commissioning** plan has been followed and that every system has been inspected in an appropriate sequence and to a reasonable standard and that the test results confirm that performance is reasonably in accordance with the design requirements.

**4.32** Not all **fixed building services** will need to be commissioned. With some systems adjustment is not possible as the only controls are 'on' and 'off' switches. Examples of this would be some mechanical extraction systems or single fixed electrical heaters. In other cases **commissioning** would be possible but in the specific circumstances would have no effect on energy use.

***Fixed building services which do not require commissioning should be identified in the commissioning plan, along with the reason for not requiring commissioning.***

**4.33** Where **commissioning** is carried out it must be done in accordance with a procedure approved by the Secretary of State. For heating and hot water systems the approved procedures are set out in the *Domestic Building Services Compliance Guide*. For ventilation systems, an approved procedure would be to follow the guidance in the *Domestic Ventilation Compliance Guide*<sup>10</sup>.

**4.34** **Commissioning** is often carried out by the person who installs the system. In other cases it may be carried out by a subcontractor or by a specialist firm. It is important that whoever carries it out follows the relevant approved procedure in doing so.

**4.35** Where a building notice or full plans have been given to a local authority **BCB**, the notice of completion of **commissioning** should be given to that **BCB** within 5 days of the completion of the **commissioning** work. In other cases, for example where work is carried out by a person registered with a competent person scheme (see paragraphs 3.19 to 3.22), it must be given within 30 days.

**4.36** Where an approved inspector is the **BCB**, the notice of completion of **commissioning** should generally be given to the approved inspector within 5 days of the completion of work. However, where the work is carried out by a person registered with a competent person scheme (see paragraph 3.19 to 3.22), the notice must be given within 30 days. Where the installation of **fixed building services** which require **commissioning** is carried out by a person registered with a competent person scheme the notice of **commissioning** will be given by that person.

**4.37** Until the **BCB** receives the **commissioning** notice it cannot be reasonably satisfied that Part L has been complied with and consequently is unlikely to be able to give a completion/final certificate.

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<sup>10</sup> Domestic Ventilation Compliance Guide, DCLG, 2010.

## Section 5: Guidance on thermal elements

**5.1** New **thermal elements** must comply with Part L1(a)(i) of Schedule 1 to the Building Regulations. Work on existing **thermal elements** must comply with regulation 23 of the Building Regulations which states:

### Requirements for the renovation or replacement of thermal elements – Regulation 23

(1) Where the renovation of an individual thermal element—

(a) constitutes a major renovation; or

(b) amounts to the renovation of more than 50% of the element's surface area;

the renovation must be carried out so as to ensure that the whole of the element complies with paragraph L1(a)(i) of Schedule 1, in so far as that is technically, functionally and economically feasible.

(2) Where the whole or any part of an individual element is proposed to be replaced and the replacement—

(a) constitutes a major renovation; or

(b) (in the case of part replacement) amounts to the replacement of more than 50% of the thermal element's surface area;

the whole of the thermal element must be replaced so as to ensure that it complies with paragraph L1(a)(i) of Schedule 1, in so far as that is technically, functionally and economically feasible.

## THE PROVISION OF THERMAL ELEMENTS

### U-values

**5.2** U-values shall be calculated using the methods and conventions set out in BR 443.

**5.3** Reasonable provision for newly constructed **thermal elements** such as those constructed as part of an extension would be to meet the standards set out in Table 2.

**5.4** Reasonable provision for those **thermal elements** constructed as replacements for existing elements would be to meet the standards set out in Table 2.

**Table 2 Standards for new thermal elements**

Element <sup>1</sup>	Standard W/(m <sup>2</sup> .K) <sup>2</sup>
Wall	0.28
Pitched roof – insulation at ceiling level	0.16
Pitched roof – insulation at rafter level	0.18
Flat roof or roof with integral insulation	0.18
Floors <sup>3</sup>	0.22 <sup>4</sup>
Swimming pool basin	0.25

**Notes:**

1. 'Roof' includes the roof parts of dormer windows, and 'wall' includes the wall parts (cheeks) of dormer windows.
2. Area-weighted average values.
3. A lesser provision may be appropriate where meeting such a standard would result in a reduction of more than 5% in the internal floor area of the room bounded by the wall.
4. A lesser provision may be appropriate where meeting such a standard would create significant problems in relation to adjoining floor levels. The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.

## Continuity of insulation and airtightness

**5.5** The building fabric should be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements, at the joints between elements, and at the edges of elements such as those around window and door openings. Reasonable provision should also be made to reduce unwanted air leakage through the new envelope parts. The work should comply with all the requirements of Schedule 1, but particular attention should be paid to Parts F and J.

**5.6** A suitable approach to showing the requirement has been achieved would be to adopt Accredited Construction Details at [www.gov.uk](http://www.gov.uk).

*It is impractical to expect thermal bridge and temperature factor calculations for work in existing buildings.*

## Major renovation

**5.6A Major renovation** means the renovation of a building where more than 25% of the surface area of the **building envelope** undergoes renovation. When assessing whether the area proportion constitutes a **major renovation** of a building, the surface area of the whole of the external **building envelope** should be taken into account i.e. external walls, floor, roof, windows, doors, roof windows and rooflights.

## RENOVATION OF THERMAL ELEMENTS

**5.7** For the purposes of this Approved Document, **renovation** of a **thermal element** through:

- a. the provision of a new layer means either of the following activities:
  - i. Cladding or rendering the external surface of the **thermal element**; or
  - ii. Dry-lining the internal surface of a **thermal element**.
- b. the replacement of an existing layer means either of the following activities:
  - i. Stripping down the element to expose the basic structural components (brick/blockwork, timber/metal frame, joists, rafters, etc.) and then rebuilding to achieve all the necessary performance requirements. As discussed in paragraph 3.9, particular considerations apply to renovating elements of traditional construction; or
  - ii. Replacing the water proof membrane on a flat roof.

**5.8** Where a **thermal element** is subject to a **renovation** through undertaking an activity listed in paragraph 5.7a or 5.7b, the performance of the whole of the **thermal element** should be improved to achieve or better the relevant U-value set out in column (b) of Table 3, provided the area to be renovated is greater than 50% of the surface of the individual **thermal element** or constitutes a **major renovation** where more than 25% of the surface area of the **building envelope** undergoes **renovation**.

**5.8A** In relation to the renovation of individual thermal elements, when assessing the proportion of the surface area that is to be renovated, the area of the **thermal element** should be assessed as the area of each individual **thermal element**, not the area of all the elements of that type in the building. The area of each individual **thermal element** should also be interpreted in the context of whether the element is being renovated from inside or outside, e.g. if removing all the plaster finish from the inside of a solid brick wall, the area of the element is the area of external wall in the room. If removing external render, it is the area of the elevation in which that wall sits.

*This means that if all the roofing on the flat roof of an extension is being stripped down, the area of the individual element is the 'roof area' of the extension, not the 'total roof area' of the dwelling. Similarly, if the rear wall of a single storey extension is being re-rendered externally, then the rear wall of the extension should be upgraded to the standards of Table 3 column (b), even if the renovation affected less than 50% of the total area of the building elevation when viewed from the rear. If plaster is being removed from a bedroom wall, the relevant area is the area of the external wall in the room, not the area of the external elevation which contains that wall section. This is because the marginal cost of dry-lining with insulated plasterboard rather than plain plasterboard is small.*

*When a building undergoes a major renovation this may represent an opportunity to consider and take into account the technical, environmental and economic feasibility of installing high-efficiency alternative systems.*

**5.9** If achievement of the relevant U-value set out in column (b) of Table 3 is not technically or functionally feasible or would not achieve a **simple payback** of 15 years or less, the element should be upgraded to the best standard that is technically and functionally feasible and which can be achieved within a **simple payback** of no greater than 15 years. Guidance on this approach is given in Appendix A.

**5.10** When renovating **thermal elements**, the work should comply with all the requirements in Schedule 1, but particular attention should be paid to Parts F and J.

## RETAINED THERMAL ELEMENTS

**5.11** Part L of Schedule 1 to the Building Regulations applies to retained **thermal elements** in the following circumstances:

- where an existing **thermal element** is part of a building subject to a material change of use;
- where an existing element is to become part of the thermal envelope where previously it was not, e.g. as part of a loft or garage conversion where the space is now to be heated.

**5.12** Reasonable provision would be to upgrade those **thermal elements** whose U-value is worse than the threshold value in column (a) of Table 3 to achieve the U-values given in column (b) of Table 3 provided this is technically, functionally and economically feasible. A reasonable test of economic feasibility is to achieve a **simple payback** of 15 years or less. Where the standard given in column (b) is not technically, functionally or economically feasible, then the **thermal element** should be upgraded to the best standard that is technically and functionally feasible and delivers a **simple payback** period of 15 years or less. Generally, this lesser standard should not be worse than 0.7 W/(m<sup>2</sup>.K).

*Examples of where lesser provision than column (b) might apply are where the thickness of the additional insulation might reduce usable floor area of any room by more than 5 per cent or create difficulties with adjoining floor levels, or where the weight of the additional insulation might not be supported by the existing structural frame.*

**5.13** When upgrading retained **thermal elements**, the work should comply with all the requirements in Schedule 1, but particular attention should be paid to Parts F and J.

**Table 3 Upgrading retained thermal elements**

Element <sup>1</sup>	(a) Threshold U-value W/(m <sup>2</sup> .K) <sup>8</sup>	(b) Improved U-value W/(m <sup>2</sup> .K) <sup>8</sup>
Wall – cavity insulation <sup>2</sup>	0.70	0.55
Wall – external or internal insulation <sup>3</sup>	0.70	0.30
Floor <sup>4,5</sup>	0.70	0.25
Pitched roof – insulation at ceiling level	0.35	0.16
Pitched roof – insulation between rafters <sup>6</sup>	0.35	0.18
Flat roof or roof with integral insulation <sup>7</sup>	0.35	0.18

1 'Roof' includes the roof parts of dormer windows and 'wall' includes the wall parts (cheeks) of dormer windows.

2 This applies only in the case of a wall suitable for the installation of cavity insulation. Where this is not the case, it should be treated as 'wall – external or internal insulation'.

3 A lesser provision may be appropriate where meeting such a standard would result in a reduction of more than 5% in the internal floor area of the room bounded by the wall.

4 The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged building.

5 A lesser provision may be appropriate where meeting such a standard would create significant problems in relation to adjoining floor levels.

6 A lesser provision may be appropriate where meeting such a standard would create limitations on head room. In such cases, the depth of the insulation plus any required air gap should be at least to the depth of the rafters, and the thermal performance of the chosen insulant should be such as to achieve the best practicable U-value.

7 A lesser provision may be appropriate if there are particular problems associated with the load-bearing capacity of the frame or the upstand height.

8 Area-weighted average values.

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## Section 6: Consequential improvements to energy performance

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**6.1** Regulation 28 of the Building Regulations may require additional work to be undertaken to make an existing building more energy efficient when certain types of building work are proposed.

**6.2** This requirement arises in existing buildings with a total useful floor area of over 1,000 m<sup>2</sup> where the proposed work consists of:

- a. an extension;
- b. the initial provision of any **fixed building service** (other than a renewable energy generator);
- c. an increase to the installed capacity of any **fixed building service** (other than a renewable energy generator);

**6.3** **Consequential improvements** should only be carried out to the extent that they are technically, functionally and economically feasible.

**6.4** Only a relatively small number of existing **dwelling**s will exceed 1,000 m<sup>2</sup> in size. Where there is doubt the **BCB** can be consulted for advice.

**6.5** Technical guidance on achieving compliance with regulation 28 is not given in this Approved Document but where the regulation applies it is available in Approved Document L2B.

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## Section 7: Providing information

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**7.1** On completion of the work, in accordance with regulation 40, the owner of the **dwelling** should be provided with sufficient information about the building, the **fixed building services** and their operating and maintenance requirements so that the **dwelling** can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances. This requirement applies only to the work that has actually been carried out, e.g. if the work involves replacing windows, there is no obligation on the contractor to provide details on the operation of the heating system.

**7.2** Where the work involves the provision of a new heating system, a way of complying would be to provide a suitable set of operating and maintenance instructions aimed at achieving economy in the use of fuel and power in terms that householders can understand in a durable format that can be kept and referred to over the service life of the system(s). The instructions should be directly related to the particular system(s) installed as part of the work that has been carried out.

**7.3** Without prejudice to the need to comply with health and safety requirements, any instructions should explain to the occupier of the **dwelling** how to operate the system(s) efficiently. This should include:

- a. the making of adjustments to timing, temperature and flow control settings;
- b. what routine maintenance is needed to enable operating efficiency to be maintained at a reasonable level through the service life(s) of the system(s).

# Appendix A: Work to thermal elements

**1** Where the **renovation** of an individual **thermal element** constitutes a **major renovation**; or amounts to the **renovation** of more than 50% of the element's surface area, an opportunity exists for cost-effective insulation improvements to be undertaken at marginal additional cost. This appendix provides guidance on the cost-effectiveness of insulation measures when undertaking various types of work on a **thermal element**.

**2** Table A1 sets out the circumstances and the level of performance that would be considered reasonable provision in ordinary circumstances. When dealing with existing **dwelling**s some flexibility in the application of standards is necessary to ensure that the context of each scheme can be taken into account while securing, as far as possible, the reasonable improvement. The final column in Table A1 provides guidance on a number of specific issues that may need to be considered in determining an appropriate course of action. As part of this flexible approach, it will be necessary to take into account technical risk and practicality in relation to the **dwelling** under consideration and the possible impacts on any adjoining building. In general the proposed works should take account of:

- a. the requirements of any other relevant parts of Schedule 1 to the Building Regulations;
- b. the general guidance on technical risk relating to insulation improvements contained in BR 262<sup>11</sup>;
- c. for buildings falling within the categories set out in paragraphs 3.7 to 3.8, the guidance produced by English Heritage.

Where it is not reasonable in the context of the works project to achieve the performance set out in Table A1 the level of performance achieved should be as close to this as practically possible.

**3** Table A1 incorporates, in outline form, examples of construction that would achieve the proposed performance, but designers are free to use any appropriate construction that satisfies the energy performance standard, so long as they do not compromise performance with respect to any other part of the Building Regulations.

**4** General guidance is available from such sources as the Energy Saving Trust and relevant British Standards.

<sup>11</sup> BR 262 Thermal insulation: Avoiding risks, BRE, 2002.

**Table A1 Cost-effective U-value targets when undertaking renovation works to thermal elements**

Proposed works	Target U-value W/(m <sup>2</sup> .K)	Typical construction	Comments (reasonableness, practicability and cost- effectiveness)
<b>Pitched roof constructions<sup>12</sup></b>			
Renewal of roof covering – No living accommodation in the roof void – existing insulation (if any) at ceiling level. No existing insulation, existing insulation less than 50 mm, in poor condition, and/or likely to be significantly disturbed or removed as part of the planned work	0.16	Provide loft insulation – 250 mm mineral fibre or cellulose fibre as quilt laid between and across ceiling joists or loose fill or equivalent	Assess condensation risk in roof space and make appropriate provision in accordance with the requirements of Part C relating to the control of condensation. Additional provision may be required to provide access to and insulation of services in the roof void
Renewal of roof covering – Existing insulation in good condition and will not be significantly disturbed by proposed works. Existing insulation thickness 50 mm or more but less than 100 mm	0.16	Top up loft insulation to at least 250 mm mineral fibre or cellulose fibre as quilt laid between and across ceiling joists or loose fill or equivalent. This may be boarded out	Assess condensation risk in roof space and make appropriate provision in line with the requirements of Part C relating to the control of condensation. Additional provision may be required to provide insulation and access to services in the roof void  Where the loft is already boarded out and the boarding is not to be removed as part of the work, the practicality of insulation works would need to be considered
Renewal of the ceiling to cold loft space. Existing insulation at ceiling level removed as part of the works	0.16	Provide loft insulation – 250 mm mineral fibre or cellulose fibre as quilt laid between and across ceiling joists or loose fill or equivalent. This may be boarded out	Assess condensation risk in roof space and make appropriate provision in accordance with the requirements of Part C relating to the control of condensation. Additional provision may be required to provide insulation and access to services in the roof void  Where the loft is already boarded out and the boarding is not to be removed as part of the work, insulation can be installed from the underside but the target U-value may not be achievable
Renewal of roof covering – Living accommodation in roof space (room-in- the-roof type arrangement), with or without dormer windows	0.18	Cold structure – Insulation (thickness dependent on material) placed between and below rafters  Warm structure – Insulation placed between and above rafters	Assess condensation risk (particularly interstitial condensation), and make appropriate provision in accordance with the requirements of Part C relating to the control of condensation (Clause 8.4 of BS 5250:2002 and BS EN ISO 13788:2002  Practical considerations with respect to an increase in structural thickness (particularly in terraced dwellings) may necessitate a lower performance target
<b>Dormer window constructions</b>			
Renewal of cladding to side walls	0.30	Insulation (thickness dependent on material) placed between and/or fixed to outside of wall studs. Or fully external to existing structure depending on construction	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C
Renewal of roof covering	–	Follow guidance on improvement to pitched or flat roofs as appropriate	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C

**Table A1 Cost-effective U-value targets when undertaking renovation works to thermal elements**

Proposed works	Target U-value W/(m <sup>2</sup> .K)	Typical construction	Comments (reasonableness, practicability and cost- effectiveness)
<b>Flat roof constructions</b>			
Renewal of roof covering – Existing insulation, if any, less than 100 mm, mineral fibre (or equivalent resistance) or in poor condition and likely to be significantly disturbed or removed as part of the planned work	0.18	Insulation placed between and over joists as required to achieve the target U-value – Warm structure	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C. Also see BS 6229:2003 for design guidance
Renewal of the ceiling to flat roof area. Existing insulation removed as part of the works	0.18	Insulation placed between and to underside of joists to achieve target U-value	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C. Also see BS 6229:2003 for design guidance.  Where ceiling height would be adversely affected, a lower performance target may be appropriate
<b>Solid wall constructions</b>			
Renewal of internal finish to external wall or applying a finish for the first time	0.30	Dry-lining to inner face of wall – insulation between studs fixed to wall to achieve target U-value – thickness dependent on insulation and stud material used  Insulated wall board fixed to internal wall surface to achieve the required U-value – thickness dependent on material used	Assess the impact on internal floor area. In general it would be reasonable to accept a reduction of no more than 5% in the area of a room. However, the use of the room and the space requirements for movement and arrangements of fixtures, fittings and furniture should be assessed  In situations where acoustic attenuation issues are particularly important (e.g. where insulation is returned at party walls) a less demanding U-value may be more appropriate. In such cases, the U-value target may have to be increased to 0.35 or above depending on the circumstances  Assess condensation and other moisture risks and make appropriate provision in accordance with the requirements of Part C. This will usually require the provision of a vapour control and damp protection to components. Guidance on the risks involved is provided in BR 262 and, on the technical options, in Energy Saving Trust publications
Renewal of finish or cladding to external wall area or elevation (render or other cladding) or applying a finish or cladding for the first time	0.30	External insulation system with rendered finish or cladding to give required U-value	Assess technical risk and impact of increased wall thickness on adjoining buildings
<b>Ground floor constructions</b>			
Renovation of a solid or suspended floor involving the replacement of screed or a timber floor deck	See comment	Solid floor – replace screed with an insulated floor deck to maintain existing floor level  Suspended timber floor – fit insulation between floor joists prior to replacement of floor deck	The cost-effectiveness of floor insulation is complicated by the impact of the size and shape of the floor (perimeter/area ratio). In many cases existing un-insulated floor U-values are already relatively low when compared with wall and roof U-values. Where the existing floor U-value is greater than 0.70 W/(m <sup>2</sup> .K), then the addition of insulation is likely to be cost-effective. Analysis shows that the cost-benefit curve for the thickness of added insulation is very flat, and so a target U-value of 0.25 W/(m <sup>2</sup> .K) is appropriate subject to other technical constraints (adjoining floor levels, etc.)

<sup>12</sup> Specification of thickness of insulation is based on lambda values (conductivity) of 0.04 W/(m.K).

# Appendix B: Documents referred to

## BRE

[www.bre.co.uk](http://www.bre.co.uk)

BR 262 *Thermal insulation: avoiding risks* (2002 Edition) printed in 2006. ISBN 978 186081 515 4

BRE Report BR 443 *Conventions for U-value calculations*, 2006. (Available at [www.bre.co.uk/uvalues](http://www.bre.co.uk/uvalues))

## Department for Business, Innovation and Skills

[www.bis.gov.uk](http://www.bis.gov.uk)

Technical Standards and Regulations Directive 98/34/EC. (Available at [www.bis.gov.uk/policies/innovation/infrastructure/Standardisation/tech-standards-directive](http://www.bis.gov.uk/policies/innovation/infrastructure/Standardisation/tech-standards-directive))

## Department of Energy and Climate Change (DECC)

[www.decc.gov.uk](http://www.decc.gov.uk)

The Government's Standard Assessment Procedure for energy rating of dwellings, SAP 2012. (Available at [www.bre.co.uk/sap2012](http://www.bre.co.uk/sap2012))

Current Energy Prices ([www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics#energy-price-statistics](http://www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics#energy-price-statistics))

## Department for Communities and Local Government (DCLG)

[www.gov.uk](http://www.gov.uk)

*Accredited Construction Details for Part L* (Available to download from [www.planningportal.gov.uk/england/professionals/en/1115314255826.html](http://www.planningportal.gov.uk/england/professionals/en/1115314255826.html))

## Energy Saving Trust (EST)

[www.est.org.uk](http://www.est.org.uk)

Energy Efficient Glazing – guidance (Available at [www.energysavingtrust.org.uk/Home-improvements-and-products/Home-insulation-glazing/Glazing](http://www.energysavingtrust.org.uk/Home-improvements-and-products/Home-insulation-glazing/Glazing))

## English Heritage

[www.english-heritage.org.uk](http://www.english-heritage.org.uk)

Energy Efficiency and Historic Buildings, English Heritage, 2011.

## Glass and Glazing Federation (GGF)

[www.ggf.org.uk](http://www.ggf.org.uk)

Guide to the Calculation of Energy Ratings for Windows, Roof Windows and Doors, GGF, 2013.

## Health and Safety Executive (HSE)

[www.hse.gov.uk](http://www.hse.gov.uk)

L24 Workplace Health, Safety and Welfare: Workplace (Health, Safety and Welfare) Regulations 1992, Approved Code of Practice and Guidance, The Health and Safety Commission 1992. ISBN 978 0 71760 413 5

## National Association of Rooflight Manufacturers (NARM)

[www.narm.org.uk](http://www.narm.org.uk)

NARM Technical Document NTD 2, 2010.

## NBS (on behalf of the Department for Communities and Local Government)

[www.thebuildingregs.com](http://www.thebuildingregs.com)

*Domestic Building Services Compliance Guide*, DCLG, 2013 incorporating 2018 amendments.

*Domestic Ventilation Compliance Guide*, DCLG, 2010.

(Both available to download from [www.gov.uk](http://www.gov.uk))

## Legislation

Ancient Monuments and Archaeological Areas Act 1979

Listed Buildings and Conservation Areas) Act 1990

SI 2010/2214 The Building Regulations 2010

SI 2010/2215 The Building (Approved Inspectors etc.) Regulations 2010

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## Appendix C: Standards referred to

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**BS EN ISO 13370** Thermal performance of buildings – Heat transfer via the ground – Calculation methods [2007 incorporating corrigendum March 2009].

**BS EN 14351-1** Windows and doors – Product standard, performance characteristics. Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics [2006 (+AMD 1:2010)].

**BS 5250:2002** Code of practice for control of condensation in buildings.

**BS EN ISO 13788:2002** Hygrothermal performance of building components and building elements.

**BS 6229:2003** Flat roofs with continuously supported coverings. Code of practice.

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# The Building Regulations 2010

**Conservation of  
fuel and power**

**APPROVED DOCUMENT**

**L2A**

**L2A Conservation of fuel and power  
in new buildings other than dwellings**

# Main changes in the 2013 edition

This approved document, Approved Document L2A: Conservation of fuel and power in new buildings other than dwellings, supports the energy efficiency requirements of the Building Regulations. Regulation 2(1) of the Building Regulations defines the energy efficiency requirements as the requirements of regulations 23, 25A, 25B, 26, 26A, 28, 29 and 40 and Part L of Schedule 1. This approved document takes effect on 6 April 2014 and is for use in England\*. The 2010 edition will continue to apply to work begun before 6 April 2014, or to work subject to a building notice, full plans application or initial notice submitted before 6 April 2014.

## The main changes in this approved document are that:

- The notional building used to determine carbon dioxide targets is the same size and shape as the actual building, constructed to a concurrent specification. The Part L 2013 specifications have been strengthened to deliver 9 per cent carbon dioxide savings across the new non-domestic building mix relative to Part L 2010.
- A wider set of notional buildings has now been defined for top-lit, side-lit (heated only) and side-lit (heated and cooled) buildings. The notional building air permeability has been further subdivided by size.
- A summary of the Part L 2013 notional buildings is published at Table 5 in the approved document with the full detail in the *National Calculation Methodology (NCM) modelling guide*. If the actual building is constructed entirely to the notional building specifications it will meet the carbon dioxide targets and the limiting fabric and buildings services parameters. Developers are, however, free to vary the specification, provided the same overall level of carbon dioxide emissions is achieved or bettered.
- The document consolidates the amendments made in December 2012 requiring the feasibility of high-efficiency alternative systems to be taken into account before construction commences.
- The document is in a new style format and an index has been introduced.

## Main changes made by the 2016 amendments

Changes reflect alterations to the regulations, principally withdrawal of Regulations 29 to 33 of the Building Regulations 2010 and their replacement by Regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012 and changes in wording of Regulations 24, 25, 26, 26A, 27 and 27A of the Building Regulations 2010. There are no technical changes.

\* This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No.2) Order 2009. This approved document also gives guidance applying to buildings of statutory undertakers and of the Crown or carried out by Crown authorities in both England and Wales in respect of regulations 25, 25A, 25B and 26.

# The approved documents

## What is an approved document?

The Secretary of State has approved a series of documents that give practical guidance about how to meet the requirements of the Building Regulations 2010 for England. Approved documents give guidance on each of the technical parts of the regulations and on regulation 7 (see the back of this document).

Approved documents set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirements of the Building Regulations to which they refer. If you follow the guidance in an approved document, there will be a presumption of compliance with the requirements covered by the guidance. However, compliance is not guaranteed; for example, 'normal' guidance may not apply if the particular case is unusual in some way.

Note that there may be other ways to comply with the requirements – *there is no obligation to adopt any particular solution contained in an approved document*. If you prefer to meet a relevant requirement in some other way than described in an approved document, you should discuss this with the relevant building control body.

In addition to guidance, some approved documents include provisions that must be followed exactly, as required by regulations or where methods of test or calculation have been prescribed by the Secretary of State.

Each approved document relates only to the particular requirements of the Building Regulations that the document addresses. However, building work must also comply with any other applicable requirements of the Building Regulations.

## How to use this approved document

This document uses the following conventions.

- a. **Text against a green background** is an extract from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations.
- b. **Key terms, printed in green**, are defined in Appendix A.
- c. When this approved document refers to a named standard or other document, the relevant version is listed in Appendix E (documents referred to) and Appendix F (standards referred to) respectively. However, if the issuing body has revised or updated the listed version of the standard, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations.
- d. Additional *commentary in italic text* appears after some numbered paragraphs. This commentary is intended to assist understanding of the immediately preceding paragraph or sub-paragraph, or to direct readers to sources of additional information, but is not part of the technical guidance itself.

**NOTE:** *Standards and technical approvals may also address aspects of performance or matters that are not covered by the Building Regulations, or they may recommend higher standards than required by the Building Regulations.*

## Where you can get further help

If you do not understand the technical guidance or other information in this approved document or the additional detailed technical references to which it directs you, you can seek further help through a number of routes, some of which are listed below:

- a. The Planning Portal website: [www.planningportal.gov.uk](http://www.planningportal.gov.uk).
- b. *If you are the person undertaking the building work*: either from your local authority building control service or from an approved inspector.
- c. *If you are registered with a competent person scheme*: from the scheme operator.
- d. *If your query is highly technical*: from a specialist or an industry technical body for the relevant subject.

# The Building Regulations

The following is a high level summary of the Building Regulations relevant to most types of building work. Where there is any doubt you should consult the full text of the regulations, available at [www.legislation.gov.uk](http://www.legislation.gov.uk).

## Building work

Regulation 3 of the Building Regulations defines ‘building work’. Building work includes:

- a. the erection or extension of a building
- b. the provision or extension of a controlled service or fitting
- c. the material alteration of a building or a controlled service or fitting.

Regulation 4 states that building work should be carried out in such a way that, when work is complete:

- a. for new buildings or work on a building that complied with the applicable requirements of the Building Regulations: the building complies with the applicable requirements of the Building Regulations.
- b. for work on an existing building that did not comply with the applicable requirements of the Building Regulations:
  - (i) the work itself must comply with the applicable requirements of the Building Regulations
  - (ii) the building must be no more unsatisfactory in relation to the requirements than before the work was carried out.

## Material change of use

Regulation 5 defines a ‘material change of use’ in which a building or part of a building that was previously used for one purpose will be used for another.

The Building Regulations set out requirements that must be met before a building can be used for a new purpose. To meet the requirements, the building may need to be upgraded in some way.

## Materials and workmanship

In accordance with regulation 7, building work must be carried out in a workmanlike manner using adequate and proper materials. Guidance on materials and workmanship is given in Approved Document 7.

## Energy efficiency requirements

Part 6 of the Building Regulations imposes additional specific requirements for energy efficiency.

If a building is extended or renovated, the energy efficiency of the existing building or part of it may need to be upgraded.

## Notification of work

Most building work and material changes of use must be notified to a building control body unless one of the following applies.

- a. It is work that will be self-certified by a registered competent person or certified by a registered third party.
- b. It is work exempted from the need to notify by regulation 12(6A) of, or schedule 4 to, the Building Regulations.

## Responsibility for compliance

People who are responsible for building work (for example the agent, designer, builder or installer) must ensure that the work complies with all applicable requirements of the Building Regulations. The building owner may also be responsible for ensuring that work complies with the Building Regulations. If building work does not comply with the Building Regulations, the building owner may be served with an enforcement notice.

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# Approved Document L2A: Conservation of fuel and power in new buildings other than dwellings

## Summary

**0.1** This approved document is one of four approved documents that give guidance on how to comply with the **energy efficiency requirements** of the Building Regulations:

**Approved Document L1A:** Conservation of fuel and power in new dwellings

**Approved Document L1B:** Conservation of fuel and power in existing dwellings

**Approved Document L2A:** Conservation of fuel and power in new buildings other than dwellings

**Approved Document L2B:** Conservation of fuel and power in existing buildings other than dwellings

The approved documents are supported by the:

*Domestic Building Services Compliance Guide*

*Non-Domestic Building Services Compliance Guide*

**0.2** This approved document contains the following sections:

**Section 1** sets out the relevant legal requirements and provides an overview of the steps to demonstrate compliance.

**Section 2** sets out the considerations that apply to demonstrating that the design of the building will meet the **energy efficiency requirements**.

**Section 3** sets out the considerations that apply when demonstrating that the design has been appropriately translated into actual construction performance.

**Section 4** describes the information that should be provided to occupiers to help them achieve reasonable standards of energy efficiency in practice.

**Section 5** provides a pointer to some useful information on different design approaches to meeting the energy efficiency requirements.

**Appendix A:** Key terms and abbreviations

**Appendix B:** Guidance on the types of building work covered by this approved document

**Appendix C:** Guidance on the types of buildings that are exempt from the **energy efficiency requirements**

**Appendix D:** Reporting evidence of compliance

**Appendix E:** Documents referred to

**Appendix F:** Standards referred to

## Energy performance certificates

- 0.3** Regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012 requires that when a building is erected the person carrying out the work must give an **energy performance certificate** to the owner of the building and a notice to the building control body (BCB) that a certificate has been given including the reference number under which the certificate has been registered, subject to the exemptions in the 2012 Regulations. See detailed guidance on **energy performance certificates** at [www.gov.uk](http://www.gov.uk)

# Section 1: The requirements

- 1.1 This approved document, which takes effect on 6 April 2014, deals with the **energy efficiency requirements** in the Building Regulations 2010. Regulation 2(1) of the Building Regulations defines the **energy efficiency requirements** as the requirements of regulations 23, 25A, 25B, 26, 26A, 28 and 40 and Part L of Schedule 1. The **energy efficiency requirements** relevant to the guidance in this approved document, which deals with new buildings, are those in regulations 25A, 26 and 40 and Part L of Schedule 1, and are set out below.

**NOTE:** Regulation 25B 'Nearly zero-energy requirements for new buildings' will not come into force until 2019 at the earliest. Statutory guidance on compliance with regulation 25B is not included within this approved document and will be provided nearer to the time that regulation 25B comes into force.

- 1.2 Relevant extracts from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended) are set out using **text against a green background** in this approved document. Where there is any doubt you should consult the full text of the regulations, available at [www.legislation.gov.uk](http://www.legislation.gov.uk)

## Part L of Schedule 1: Conservation of fuel and power

### *Requirement*

### *Limits on application*

#### **Schedule 1 – Part L Conservation of fuel and power**

**L1.** Reasonable provision shall be made for the conservation of fuel and power in buildings by:

- (a) limiting heat gains and losses—
  - (i) through thermal elements and other parts of the building fabric; and
  - (ii) from pipes, ducts and vessels used for space heating, space cooling and hot water services;
- (b) providing fixed building services which—
  - (i) are energy efficient;
  - (ii) have effective controls; and
  - (iii) are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances.

## Demonstrating compliance

- 1.3** In the Secretary of State's view, compliance with the **energy efficiency requirements** could be demonstrated by meeting the five separate criteria set out in the following paragraphs. Compliance software should produce an output report to assist **BCBs** check that compliance has been achieved.

**NOTE:** *The output report can benefit both developers and **BCBs** during the design and construction stages as well as at completion.*

- 1.4** Criterion 1: in accordance with regulation 26, the calculated CO<sub>2</sub> emission rate for the building (the Building CO<sub>2</sub> Emission Rate, **BER**) must not be greater than the Target CO<sub>2</sub> Emission Rate (**TER**), which is determined by following the procedures set out in paragraphs 2.7 to 2.36.

**NOTE:** *Criterion 1 is a regulation and is therefore mandatory, whereas the limits on design flexibility for Criteria 2 are statutory guidance. The calculations required as part of the procedure used to show compliance with this criterion can also provide information needed to prepare the **energy performance certificate** required by the Energy Performance of Buildings (England and Wales) Regulations 2012 (SI 2012/3118).*

- 1.5** Criterion 2: the performance of the individual fabric elements and the **fixed building services** of the building should achieve reasonable overall standards of energy efficiency, following the procedure set out in paragraphs 2.37 to 2.49.

**NOTE:** *Criterion 2 is intended to place limits on design flexibility to discourage excessive and inappropriate trade-offs. For example, individual building fabric elements with poor insulation standards being offset by renewable energy systems with uncertain service lives. This emphasises the purpose of Criterion 2.*

- 1.6** Criterion 3: demonstrate that the building has appropriate passive control measures to limit solar gains. The guidance given in paragraphs 2.50 to 2.53 of this approved document provides a way of demonstrating that suitable provisions have been made.

**NOTE:** *The purpose is to limit solar gains to reasonable levels during the summer period, in order to reduce the need for, or the installed capacity of, air-conditioning systems.*

- 1.7** Criterion 4: the performance of the building, as built, should be consistent with the **BER**. The guidance in Section 3 can be used to show that this criterion has been met. Extra credits will be given in the **TER/BER** calculation where builders can provide robust evidence of quality-assured procedures in the design and construction phases.

- 1.8** Criterion 5: the necessary provisions for enabling energy-efficient operation of the building should be put in place. The procedures described in Section 4 can be used to show that this criterion has been met.

# Section 2: Design standards

## Regulations 35, 24 and 25

2.1 Regulations 35, 24 and 25 state that:

### Interpretation

**35(1).** 'Energy performance of a building' means the calculated or measured amount of energy needed to meet the energy demand associated with a typical use of the building, which includes, inter alia, energy used for heating, cooling, ventilation, hot water and lighting.

### Methodology of calculation of the energy performance of buildings

**24.** (1) The Secretary of State shall approve—

- (a) a methodology of calculation of the energy performance of buildings, including methods for calculating asset ratings and operational ratings of buildings; and
- (b) ways in which the energy performance of buildings, as calculated in accordance with the methodology, shall be expressed.

(2) In this regulation—

'asset rating' means an energy performance indicator determined from the amount of energy estimated to meet the different needs associated with a standardised use of the building; and

'operational rating' means an energy performance indicator determined from the amount of energy consumed during the occupation of a building over a period of time and the energy demand associated with a typical use of the building over that period.

### Minimum energy performance requirements for buildings

**25.** Minimum energy performance requirements shall be set by the Secretary of State calculated and expressed in accordance with the methodology approved pursuant to regulation 24, for—

- (a) new buildings (which shall include new dwellings), in the form of target CO<sub>2</sub> emission rates; and
- (b) new dwellings, in the form of target fabric efficiency rates.

## Target CO<sub>2</sub> Emission Rate (TER)

**2.2** The Target CO<sub>2</sub> Emission Rate (TER) is the minimum energy performance requirement for a new building based on the methodology approved by the Secretary of State in accordance with regulation 25. It is expressed in terms of the mass of CO<sub>2</sub> emitted per year per square metre of the **total useful floor area** of the building.

**2.3** The TER must be calculated using one of the calculation tools included in the methodology approved by the Secretary of State for calculating the energy performance of buildings pursuant to regulation 24. Those tools include:

- a. the *Simplified Building Energy Model* (SBEM) for those buildings whose design features are capable of being adequately modelled by SBEM; or
- b. other software tools approved under the *Notice of Approval*.

- 2.4** From time to time further software may be approved. An up-to-date list can be found on the Department for Communities and Local Government webpages at [www.gov.uk](http://www.gov.uk)
- 2.5** As part of the submission to a **BCB**, the applicant must show that the software tool used is appropriate to the application.
- 2.6** The **TER** is established by using approved software to calculate the CO<sub>2</sub> emission rate from a notional building of the same size and shape as the actual building, but with specified properties. These specified properties shall be as set out in the *National Calculation Methodology (NCM) modelling guide*, in the section headed 'Detailed definition of Notional Building for buildings other than dwellings'. The key components of the notional building specification can also be seen at Table 5. The **TER** is set equal to the CO<sub>2</sub> emissions from this notional building, with no further adjustment being made.

**NOTE:** *The **TER** is based on a building of the same size and shape as the actual building, constructed to a concurrent specification. This concurrent specification for Part L 2013 is given in the NCM modelling guide. Developers are still given the freedom to vary the specification, provided the same overall level of CO<sub>2</sub> emissions is achieved or bettered.*

## Criterion 1 – Achieving the TER

- 2.7** Regulation 26 states that:

### CO<sub>2</sub> emission rates for new buildings

- 26.** Where a building is erected, it shall not exceed the target CO<sub>2</sub> emission rate for the building that has been approved pursuant to regulation 25 applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.

## Calculating the CO<sub>2</sub> emissions from the actual building

- 2.8** To demonstrate that the requirement in regulation 26 has been met, the actual Building CO<sub>2</sub> Emission Rate (**BER**) must be no greater (no worse) than the **TER** calculated as set out in paragraphs 2.2 to 2.6.
- 2.9** The **BER** must be calculated using the same calculation tool as used for establishing the **TER**.
- 2.10** In order to determine the **BER**, the CO<sub>2</sub> emission factors shall be as specified in Table 12 in *The Government's Standard Assessment Procedure for energy rating of dwellings*, SAP 2012.
- 2.11** When systems are capable of being fired by more than one fuel, then:
- Where a biomass heating appliance is supplemented by an alternative appliance (e.g. gas), the CO<sub>2</sub> emission factor for the overall heating system should be based on a weighted average for the two fuels based on the anticipated usage of those fuels. The **BER** submission should be accompanied by a report, signed by a suitably qualified person, detailing how the combined emission factor has been derived.
  - Where the same appliance is capable of burning both biomass fuel and fossil fuel, the CO<sub>2</sub> emission factor for dual-fuel appliances should be used, except where the building is in a smoke control area, when the anthracite figure should be used.
  - In all other cases, the fuel with the highest CO<sub>2</sub> emission factor should be used.

**NOTE:** *This option is to cover dual-fuel systems where the choice of fuel actually used depends on prevailing market prices.*

- 2.12** If thermal energy is supplied from a district or community heating or cooling system, emission factors should be determined by considering the particular details of the scheme. Calculations

should take account of the annual average performance of the whole system (i.e. the distribution circuits and all the heat generating plant, including any Combined Heat and Power (CHP), and any waste heat recovery or heat dumping). The predicted effect of all buildings proposed to be newly connected to the system in the first 12 months of operation of the system can be considered in the calculation of the percentage of heat supplied so that the increased operation of any marginal plant (e.g. gas boilers) is properly accounted for. The electricity generated by any CHP or trigeneration scheme is always credited at an emission factor equal to the grid average. CO<sub>2</sub> emissions associated with the thermal energy streams of a trigeneration scheme should be attributed in proportion to the output energy streams. The BER submission should be accompanied by a report, signed by a suitably qualified person, detailing how the emission factors have been derived.

**NOTE:** This means that if a scheme burns  $F$  kWh of input fuel to produce  $E$  kWh of electricity and  $H$  kWh of useful heat (excluding heat rejected), the emission factor for the heat output should be taken as  $1/H \times (F \times CO_{2F} - E \times CO_{2E})$  where  $CO_{2F}$  is the emission factor for the input fuel, and  $CO_{2E}$  the factor for grid electricity. See the NCM modelling guide at [www.ncm.bre.co.uk](http://www.ncm.bre.co.uk).

## CO<sub>2</sub> emission rate calculations

**2.13** Regulation 27 of the Building Regulations states:

### CO<sub>2</sub> emission rate calculations

- 27.** (1) This regulation applies where a building is erected and regulation 26 applies.
- (2) Not later than the day before the work starts, the person carrying out the work shall give the local authority a notice which specifies—
- (a) the target CO<sub>2</sub> emission rate for the building calculated and expressed in accordance with the methodology approved pursuant to regulation 24,
  - (b) the CO<sub>2</sub> emission rate for the building as designed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24, and
  - (c) a list of specifications to which the building is to be constructed.
- (3) Not later than five days after the work has been completed, the person carrying out the work shall give the local authority—
- (a) a notice which specifies—
    - (i) the target CO<sub>2</sub> emission rate for the building calculated and expressed in accordance with the methodology approved pursuant to regulation 24,
    - (ii) the CO<sub>2</sub> emission rate for the building as constructed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24, and
    - (iii) whether the building has been constructed in accordance with the list of specifications referred to in paragraph (2)(c), and if not a list of any changes to those specifications; or
  - (b) a certificate of the sort referred to in paragraph (4) accompanied by the information referred to in subparagraph (a).
- (4) A local authority is authorised to accept, as evidence that the requirements of regulation 26 have been satisfied, a certificate to that effect by an energy assessor who is accredited to produce energy performance certificates for that category of building.
- (5) In this regulation, 'specifications' means specifications used for the calculation of the CO<sub>2</sub> emission rate.

**NOTE:** Where the BCB is an approved inspector see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

### CO<sub>2</sub> emission rate calculation before work commences

**2.14** Regulations 26 and 27 require that, before the work starts, the builder must calculate the BER of the building as designed, to demonstrate that the BER is not greater than the TER. The builder must give this design-based calculation to the BCB, along with a list of specifications used in calculating the BER.

**NOTE:** This design stage calculation and provision of a list of specifications will help the BCB to confirm that the building as designed aligns with the claimed performance. As set out at Appendix D it is expected that the builder will use compliance software to produce the list of specifications and highlight those features of the design that are critical to achieving compliance. These 'key features' can be used to prioritise the risk-based inspection of the building as part of confirming compliance with regulation 26. If a provisional energy rating is calculated and an interim recommendations report is therefore available, the developer should review the recommendations to see if further measures may be incorporated in a cost-effective manner.

## CO<sub>2</sub> emission rate calculation after completion

**2.15** After work has been completed, the builder must notify the BCB of the TER and BER and whether the building has been constructed in accordance with the list of specifications submitted to the BCB before work started. If not, a list of any changes to the design-stage list of specifications must be given to the BCB. BCBs are authorised to accept, as evidence, a certificate of compliance signed off by a suitably accredited energy assessor.

**NOTE:** It is useful to provide additional information to support the values used in the BER calculation and the list of specifications. For example, U-values may have been determined from a specific calculation, in which case the details should be provided, or from an accredited source, in which case a reference to that source is sufficient. Evidence that demonstrates that the building as designed satisfies the requirements of Criteria 2 and 3 is also useful.

## Achieving the TER

**2.16** Certain management features offer improved energy efficiency in practice. Where these management features are provided in the actual building, the BER can be reduced by an amount equal to the product of the factor given in Table 1 and the CO<sub>2</sub> emissions for the system(s) to which the feature is applied.

**NOTE:** For example, if the CO<sub>2</sub> emissions due to electrical energy consumption were 70 kgCO<sub>2</sub>/(m<sup>2</sup>·year) without power factor correction, the provision of correction equipment to achieve a power factor of 0.95 would enable the BER to be reduced by  $70 \times 0.025 = 1.75$  kgCO<sub>2</sub>/(m<sup>2</sup>·year).

**Table 1 Enhanced management and control features**

Feature	Adjustment factor
Automatic monitoring and targeting with alarms for out-of-range values <sup>1</sup>	0.050
Power factor correction to achieve a whole building power factor > 0.90 <sup>2</sup>	0.010
Power factor correction to achieve a whole building power factor > 0.95 <sup>2</sup>	0.025
Notes:	
1. Automatic monitoring and targeting with alarms for out-of-range values means a complete installation that measures, records, transmits, analyses, reports and communicates meaningful energy management information to enable the operator to manage the energy it uses.	
2. The power factor adjustment can be taken only if the whole building power factor is corrected to the level stated. The two levels of power factor correction are alternative values, not additive.	

**2.17** Provided the building satisfies the limits on design flexibility as set out in Criterion 2, the compliance procedure allows the designer full flexibility to achieve the TER utilising fabric and system measures and the integration of low and zero carbon (LZC) technologies in whatever mix is appropriate to the scheme. The approved compliance tools include appropriate algorithms that enable the designer to

assess the role LZC technologies (including local renewable and low-carbon schemes driven by the *National Planning Policy Framework*) can play in achieving the TER.

## Consideration of high-efficiency alternative systems

### Consideration of high-efficiency alternative systems for new buildings

- 25A.** (1) Before construction of a new building starts, the person who is to carry out the work must analyse and take into account the technical, environmental and economic feasibility of using high-efficiency alternative systems (such as the following systems) in the construction, if available—
- (a) decentralised energy supply systems based on energy from renewable sources;
  - (b) cogeneration;
  - (c) district or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources; and
  - (d) heat pumps.
- (2) The person carrying out the work must—
- (a) not later than the beginning of the day before the day on which the work starts, give the local authority a notice which states that the analysis referred to in paragraph (1)—
    - (i) has been undertaken;
    - (ii) is documented; and
    - (iii) the documentation is available to the authority for verification purposes; and
  - (b) ensure that a copy of the analysis is available for inspection at all reasonable times upon request by an officer of the local authority.
- (3) An authorised officer of the local authority may require production of the documentation in order to verify that this regulation has been complied with.
- (4) The analysis referred to in paragraph (1)—
- (a) may be carried out for individual buildings or for groups of similar buildings or for common typologies of buildings in the same area; and
  - (b) in so far as it relates to collective heating and cooling systems, may be carried out for all buildings connected to the system in the same area.
- (5) In this regulation—
- (a) ‘cogeneration’ means simultaneous generation in one process of thermal energy and one or both of the following—
    - (i) electrical energy;
    - (ii) mechanical energy;
  - (b) ‘district or block heating or cooling’ means the distribution of thermal energy in the form of steam, hot water or chilled liquids, from a central source of production through a network of multiple buildings or sites, for the use of space or process heating or cooling;
  - (c) ‘energy from renewable sources’ means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases; and
  - (d) ‘heat pump’ means a machine, a device or installation that transfers heat from natural surroundings such as air, water or ground to buildings or industrial applications by reversing the natural flow of heat such that it flows from a lower to a higher temperature. (For reversible heat pumps, it may also move heat from the building to the natural surroundings.)

**NOTE:** Where the BCB is an approved inspector see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

**2.18** Regulation 25A requires that, before the work starts, the person undertaking the work must carry out an analysis that considers and takes into account the technical, environmental and economic feasibility of using high-efficiency alternative systems in the building design. The following high-efficiency alternative systems may be considered if available, but other LZC systems may also be considered if available:

- a. decentralised energy supply systems based on energy from renewable sources;
- b. cogeneration;
- c. district or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources;
- d. heat pumps.

The analysis should state whether high-efficiency alternative systems have or have not been included in the building design. The requirement relates to considering, taking into account, documenting and making available for verification purposes the analysis of high-efficiency alternative systems.

**NOTE:** *The Building Regulations are technology neutral and do not require that high-efficiency alternative systems or other LZC systems are installed.*

**2.19** The analysis of the feasibility of using high-efficiency alternative systems may be carried out for individual buildings, groups of similar buildings or for common types of buildings in the same area. Where a number of buildings are connected to a community energy system, a single analysis may be carried out for all of the buildings connected to the system in the same area as the building to be constructed.

**2.20** Before work starts, the person undertaking the work must give the BCB a notice which states that the analysis of the feasibility of using high-efficiency alternative systems has been undertaken and documented and is available for verification purposes. The documented results of the analysis must be retained for inspection by the BCB upon request.

Although the analysis of high-efficiency alternative systems is not an explicit requirement of the CO<sub>2</sub> emission rate calculation, a facility within calculation software output reporting (the design-stage Building Regulations UK Part L report) may be available to the builder to declare that the analysis has been carried out and documented and where it is available for verification purposes.

**2.21** In order to facilitate incorporation of improvements in system efficiencies and the integration with LZC technologies, the designer should:

- a. consider adopting heating and cooling systems that use low distribution temperatures; and
- b. where multiple systems serve the same end use, organise the control strategies such that priority is given to the least carbon-intensive option; and

**NOTE:** *For example, where a solar hot water system is available, the controls should be arranged so that the best use is made of the available solar energy.*

- c. consider making the building easily adaptable by facilitating the integration of additional LZC technologies at a later date. Providing appropriate facilities at the construction stage can make subsequent enhancements much easier and cheaper, e.g. providing capped off connections that can link into a planned community heating scheme.

**2.22** Similarly, the designer should consider the potential impact of future climate change on the performance of the building. This might include giving consideration to how a cooling system might be provided at some future point.

## Special considerations

**2.23** Special considerations apply to certain classes of non-exempt building. These building types include:

- a. non-exempt buildings with low energy demand; the guidance specific to such buildings is given in paragraphs 2.24 to 2.27;
- b. modular and portable buildings with a planned service life of more than two years (at one or more sites); the guidance specific to such buildings is given in paragraphs 2.28 to 2.32;
- c. shell and core developments; the guidance specific to such buildings is given in paragraphs 2.34 and 2.35.

## Non-exempt buildings with low energy demand

**2.24** For the purposes of this approved document, non-exempt buildings with low energy demand are taken to be those buildings or parts thereof where:

- a. **fixed building services** for heating and/or cooling are either not provided, or are provided only to heat or cool a localised area rather than the entire enclosed volume of the space concerned (e.g. localised radiant heaters at a workstation in a generally unheated space); or
- b. **fixed building services** are used to heat space in the building to temperatures substantially less than those normally provided for human comfort (e.g. to protect a warehouse from condensation or frost).

**2.25** In the situations described in paragraph 2.24 it is not reasonable to expect the entire building envelope to be insulated to the standard expected for more typical buildings. In such situations, no **TER/BER** calculation is required, but reasonable provision would be for every **fixed building service** that is installed to meet the energy efficiency standards set out in the 2013 edition of the DCLG *Non-Domestic Building Services Compliance Guide*. In addition, the building envelope should be insulated to a degree that is reasonable in the particular case. If some general heating is provided (case b above), then it would be reasonable that no part of the opaque fabric had a U-value worse than 0.7 W/(m<sup>2</sup>·K).

**2.26** If a part of a building with low energy demand is partitioned off and is heated normally (e.g. an office area in an unheated warehouse), the separately heated area should be treated as a separate 'building' and the normal procedures for demonstrating compliance (including a **TER/BER** calculation) should be followed to demonstrate the heated area complies with the **energy efficiency requirements**.

**2.27** If a building with low energy demand subsequently changes such that the space is generally conditioned, then this is likely to involve the initial provision or an increase in the installed capacity of a **fixed building service**. Such activities are covered by regulation 28. The guidance in Approved Document L2B would require the building envelope to be upgraded and a consequential improvement to be made, a process that is likely to be much more expensive than incorporating suitable levels of insulation at the new-build stage. Alternatively, if the building shell was designed as a building with low energy demand and the first occupier of the building wanted to install (e.g.) heating, this would be first **fit-out work**, and a full **TER/BER** submission would then be required (see Appendix B paragraph 1b).

## Modular and portable buildings with a planned service life of more than two years

**2.28** Special considerations apply to modular and portable buildings. The following paragraphs detail what is considered as reasonable provision for a variety of different circumstances.

**NOTE:** *The placing of an existing module to a new site is considered to be the construction of a new building as far as the Building Regulations are concerned. In that context, it is not always appropriate to expect such a relocated unit to meet the new-build standards set out in this approved document, especially as the embodied energy in an existing module is retained, a benefit that compensates for small differences in operating energy demand. Further, portable buildings are often ‘distress purchases’, and the constraints imposed by the time in which a working building must be delivered mean that additional considerations apply.*

### At given location

**2.29** Portable buildings with a planned service life of more than two years at a given location are often new or re-sale units. In such cases, compliance with the **energy efficiency requirements** should be demonstrated by showing that satisfactory performance has been achieved against each of the five compliance criteria set out in this approved document. However, if more than 70 per cent of the external envelope of the building is to be created from sub-assemblies manufactured prior to the date this approved document comes into force, the **TER** should be adjusted by the relevant factor from Table 2. One way of demonstrating the date of manufacture of each sub-assembly is by relating the serial number to the manufacturer’s records. If the units are to be refurbished as part of the process, then the guidance in Approved Document L2B should be followed in terms of the standards to be achieved, for example for replacement windows and new lighting.

### At more than one location

**2.30** Portable buildings with a planned service life of more than two years but with an intended time of use in a given location of less than two years are often ‘distress purchases’ (e.g. following a fire), and the buildings must be up and operational in a matter of days. In such cases, different arrangements for demonstrating compliance with regulation 26 apply, as set out in the following paragraphs. An example of the evidence that the planned time of use in the given location is less than two years would be the hire agreement for the unit.

**2.31** In the case of a modular or portable building intended to be sited in a given location for less than two years, a **TER/BER** calculation should be carried out when the module is first constructed and can be based on a standard generic configuration. This calculation can then be provided as evidence of satisfying the requirements of regulation 26 whenever the building is moved to a new location, always provided its intended time of use in that new location is less than two years. In addition to the details of the calculation, the supplier should provide written confirmation that:

- a. the modules as actually provided meet or exceed the elemental energy standards of the generic module on which the calculation was based; and
- b. the activities assumed in the generic module are reasonably representative of the planned use of the actual module.

**2.32** It is recognised that in situations where the planned time of use in a given location is less than two years, the only practical heating technology is electric resistance heating. In such cases, reasonable provision would be to provide energy efficiency measures that are 15 per cent better than if using conventional fossil fuel heating. This can be demonstrated by assuming that the heating in the generic configuration used for the **TER/BER** calculation is provided by a gas boiler with an efficiency of 77 per cent. Post initial construction, any work on the module should meet the standards set out in

Approved Document L2B. If a **TER/BER** calculation is not available for a module constructed prior to 6 April 2014, reasonable provision would be to demonstrate that the **BER** is not greater than the Part L 2013 **TER** adjusted by the relevant factor from Table 2.

**Table 2 TER multiplying factor for modular and portable buildings**

Date of manufacture of 70% of modules making up the external envelope	TER multiplying factor
After 6 April 2014	1.00
1 Oct 2010 – 5 April 2014	1.10
6 April 2006 – 30 Sept 2010	1.47
1 April 2002 – 5 April 2006	1.93
Pre 1 April 2002	1.93 [2.59 <sup>1</sup> ]
Notes:	
1. For buildings with a planned time of use in a given location of less than two years, the figure in brackets is applicable.	

### Swimming pool basins

**2.33** In terms of Criterion 1, the building should be assessed as if the pool basin were not there, although the pool hall should be included. The area covered by the pool should be replaced with the equivalent area of floor with the same U-value as the pool surround.

### Shell and core developments

**2.34** If a building is offered to the market for sale or let as a shell for specific **fit-out work** by the incoming occupier, the developer should demonstrate via the design-stage **TER/BER** submission how the building shell as offered could meet the **energy efficiency requirements**. For those parts of the building where certain systems are not installed at the point the building is to be offered to the market, the model that is used to derive the **BER** should assume efficiencies for those services that will be installed as part of the first **fit-out work**. The specification provided to the **BCB** (see paragraph 2.14) should identify which services have not been provided in the base build, and the efficiency values assumed for each such system. This should enable the **BCB** to ensure that the necessary infrastructure needed to deliver the assumed fit-out specification is provided as part of the base build. At practical completion of the base building, the as-built **TER/BER** calculation should be based only on the building and systems as actually constructed; the fit-out areas should be assumed to be conditioned to temperatures appropriate to their designated use, but no associated energy demand included.

**NOTE:** As part of the design-stage calculation, a predicted **energy performance certificate (EPC)** rating for the fit-out areas should be available to inform prospective occupiers of the energy performance that is achievable. However, a formal **EPC** lodged on the **EPC register** is not required at this stage.

**2.35** When an incoming occupier does first **fit-out work** on all or part of the building through the provision or extension of any of the fixed services for heating, hot water, air-conditioning or mechanical ventilation, then **TER/BER** submission should be made to the **BCB** after completion to demonstrate compliance for the part of the building covered by the **fit-out work**. This submission should be based on the building shell as constructed and the **fixed building services** as actually installed. If the **fit-out work** does not include the provision or extension of any of the fixed services for heating, hot water, air-conditioning or mechanical ventilation, then reasonable provision would be to demonstrate that any lighting systems that are installed are at least as efficient as those assumed in the shell developer's initial submission.

**NOTE:** *Since the fit-out is specific to the needs of the particular occupier and is, by definition, uniquely controlled by him for his benefit, this is creating a new 'part designed or altered for separate use', and under regulation 29 a new **energy performance certificate** is required for that part of the physical building covered by the fit-out.*

## Industrial sites, workshops and non-residential agricultural buildings other than those with low energy demand

**2.36** Special considerations may apply in such cases, e.g. where a CO<sub>2</sub> target is established through other regulatory frameworks such as the Carbon Reduction Commitment, or where it is impractical for the generic National Calculation Methodology to adequately account for the particular industrial processes or agricultural use without leading to the possibility of negative impacts on cost-effectiveness and/or increased technical risk. In such cases, reasonable provision would be to provide **fixed building services** that satisfy the standards set out in Approved Document L2B.

## Criterion 2 – Limits on design flexibility

**2.37** While the approach to complying with Criterion 1 allows design flexibility, paragraph L1(a)(i) of Schedule 1 to the Building Regulations requires that reasonable provision be made to limit heat gains and losses through the fabric of the building, and paragraphs L1(b)(i) and (ii) require that energy-efficient **fixed building services** with effective controls be provided.

**2.38** One way of showing that the Part L requirement is satisfied is to demonstrate that the fabric elements and the **fixed building services** all meet minimum energy efficiency standards as specified in the following paragraphs.

**NOTE:** *In order to satisfy the **TER**, the building specification needs to be considerably better than the stated limiting values in many aspects of the design. Table 5 provides a summary specification of the notional building and is a better indication of the standards required to meet the **TER**.*

### Limiting fabric standards

**2.39** Table 3 sets out the limiting standards for the properties of the fabric elements of the building. The stated value represents the area-weighted average value for all elements of that type. In general, achievement of the **TER** is likely to need better fabric performance than set out in Table 3.

**2.40** U-values should be calculated using the methods and conventions set out in BR 443 *Conventions for U-value calculations*, and should be based on the whole unit (e.g. in the case of a window, the combined performance of the glazing and the frame).

The U-value of glazing can be calculated for:

- the smaller of the two standard windows defined in BS EN 14351-1; or
- the standard window configuration set out in BR 443; or
- the specific size and configuration of the actual window.

The U-value of the door can be calculated for:

- the standard size as laid out in BS EN 14351-1; or
- the specific size and configuration of the actual door.

**NOTE:** For domestic-type construction, SAP 2012 Table 6e gives values for different configurations that can be used in the absence of test data or calculated values.

- 2.41** The U-values for roof windows and roof-lights given in this approved document are based on the U-value having been assessed with the roof window or roof-light in the vertical position. If a particular unit has been assessed in a plane other than the vertical, the standards given in this approved document should be modified by making an adjustment that is dependent on the slope of the unit, following the guidance given in BR 443.

**Table 3 Limiting fabric parameters**

Roof	0.25 W/(m <sup>2</sup> ·K)
Wall	0.35 W/(m <sup>2</sup> ·K)
Floor	0.25 W/(m <sup>2</sup> ·K)
Swimming pool basin <sup>1</sup>	0.25 W/(m <sup>2</sup> ·K)
Windows, roof windows, roof-lights <sup>2</sup> , curtain walling and pedestrian doors <sup>3,4</sup>	2.2 W/(m <sup>2</sup> ·K)
Vehicle access and similar large doors	1.5 W/(m <sup>2</sup> ·K)
High-usage entrance doors	3.5 W/(m <sup>2</sup> ·K)
Roof ventilators (inc. smoke vents)	3.5 W/(m <sup>2</sup> ·K)
Air permeability	10.0 m <sup>3</sup> /(h·m <sup>2</sup> ) at 50 Pa

Notes:

- Where a swimming pool is constructed as part of a new building, reasonable provision should be made to limit heat loss from the pool basin by achieving a U-value no worse than 0.25 W/(m<sup>2</sup>·K) as calculated according to BS EN ISO 13370.
- For the purposes of checking compliance with the limiting fabric values for roof-lights, the true U-value based on aperture area can be converted to the U-value based on the developed area of the roof-light. Further guidance on evaluating the U-value of out-of-plane roof-lights is given in *Assessment of thermal performance of out-of-plane rooflights*, NARM Technical Document NTD 2 (2010).
- Excluding display windows and similar glazing. There is no limit on design flexibility for these exclusions but their impact on CO<sub>2</sub> emissions must be taken into account in calculations.
- In buildings with high internal heat gains, a less demanding area-weighted average U-value for the glazing may be an appropriate way of reducing overall CO<sub>2</sub> emissions and hence the BER. If this case can be made, then the average U-value for windows can be relaxed from the values given above. However, values should be no worse than 2.7 W/(m<sup>2</sup>·K).

**NOTE:** Approved Document C gives limiting values for individual elements to minimise the risk of condensation.

## Limiting services efficiencies

**2.42** This section sets out the design limits for **fixed building services** to meet the requirements of Part L1(b).

### Controls

**2.43** Systems should be provided with appropriate controls to enable the achievement of reasonable standards of energy efficiency in use. In normal circumstances, the following features would be appropriate for heating, ventilation and air-conditioning system controls:

- a. The systems should be subdivided into separate control zones to correspond to each area of the building that has a significantly different solar exposure, or pattern or type of use; and
- b. Each separate control zone should be capable of independent timing and temperature control and, where appropriate, ventilation and air recirculation rate; and
- c. The provision of the service should respond to the requirements of the space it serves. If both heating and cooling are provided, they should be controlled so as not to operate simultaneously; and
- d. Central plant should operate only as and when the zone systems require it. The default condition should be off.

**2.44** In addition to these general control provisions, the systems should meet specific control and efficiency standards as set out in the paragraphs below.

### System efficiencies

**2.45** Each **fixed building service** should be at least as efficient as the minimum acceptable value for the particular type of service as set out in the *Non-Domestic Building Services Compliance Guide*. If the type of service is not covered by the Guide, then reasonable provision is to demonstrate that the proposed service is not less efficient than a comparable service that is covered by the Guide.

**NOTE:** *To not inhibit innovation.*

**2.46** The efficiency claimed for the **fixed building service** should be based on the appropriate test standard set out in the *Non-Domestic Building Services Compliance Guide* and the test data should be certified by a notified body. It is reasonable for **BCBs** to accept such data at face value. In the absence of quality-assured data, the **BCB** should satisfy itself that the claimed performance is justified.

### Energy meters

**2.47** Reasonable provision for energy meters would be to install energy metering systems that enable:

- a. at least 90 per cent of the estimated annual energy consumption of each fuel to be assigned to the various end-use categories (heating, lighting etc.). Detailed guidance on how this can be achieved is given in CIBSE TM 39 *Building Energy Metering*; and
- b. the output of any renewable system to be separately monitored; and
- c. in buildings with a **total useful floor area** greater than 1000 m<sup>2</sup>, automatic meter reading and data collection facilities.

**2.48** The metering provisions should be designed such as to facilitate the benchmarking of energy performance as set out in CIBSE TM 46 *Energy Benchmarks*.

### Centralised switching of appliances

**2.49** Consideration should be given to the provision of centralised switches to allow the facilities manager to switch off appliances when they are not needed (e.g. overnight and at weekends). Where appropriate, these should be automated (with manual override) so that energy savings are maximised.

**NOTE:** *A centralised switch would be more reliable than depending on each individual occupant to switch off their (e.g.) computer.*

## Criterion 3 – Limiting the effects of heat gains in summer

**2.50** This section sets out the approach to limiting heat gains as required by paragraph L1(a)(i) of Schedule 1 to the Building Regulations.

### Limiting the effects of solar gains in summer

**2.51** The following guidance applies to all buildings, irrespective of whether they are air-conditioned or not. The intention is to limit solar gains during the summer period to either:

- a. reduce the need for air-conditioning; or
- b. reduce the installed capacity of any air-conditioning system that is installed.

**2.52** If the criterion set out below is satisfied in the context of a naturally ventilated building, this is NOT evidence that the internal environment of the building will be satisfactory, since many factors that are not covered by the compliance assessment procedure will have a bearing on the incidence of overheating (incidental gains, thermal capacity, ventilation provisions etc.).

**NOTE:** *Therefore the developer should work with the design team to specify what constitutes an acceptable indoor environment in the particular case, and carry out the necessary design assessments to develop solutions that meet the agreed brief. Some ways of assessing overheating risk are given in CIBSE TM 37 Design for improved solar shading control and, for education buildings, in Building Bulletin 101 Ventilation of school buildings.*

**2.53** For the purposes of Part L, reasonable provision for limiting solar gain through the building fabric would be demonstrated by showing that, for each space in the building that is either occupied or mechanically cooled, the solar gains through the glazing aggregated over the period from April to September inclusive are no greater than would occur through one of the following reference glazing systems with a defined total solar energy transmittance (g-value) calculated according to BS EN 410:

- a. For every space that is defined in the National Calculation Methodology (NCM) database as being side lit, the reference case is an east-facing façade with full-width glazing to a height of 1.0 m having a framing factor of 10 per cent and a normal solar energy transmittance (g-value) of 0.68.
- b. For every space that is defined in the NCM database as being top lit, and whose average zone height is not greater than 6 m, the reference case is a horizontal roof of the same total area that is 10 per cent glazed as viewed from the inside out and having roof-lights that have a framing factor of 25 per cent and a normal solar energy transmittance (g-value) of 0.68.
- c. For every space that is defined in the NCM database as being top lit and whose average zone height is greater than 6 m, the reference case is a horizontal roof of the same total area that is 20 per cent glazed as viewed from the inside out and having roof-lights that have a framing factor of 15 per cent and a normal solar energy transmittance (g-value) of 0.46;

**NOTE:** *In double-height industrial-type spaces, dirt on the roof-lights and internal absorption within the roof-light reduce solar gains. These effects, combined with temperature stratification, will reduce the impact of solar gains in the occupied space and so increased roof-light area may be justified. In such situations, the developer should pay particular attention to the design assessments referred to in paragraph 2.53b.*

- d. For the purpose of this specific guidance, an occupied space means a space that is intended to be occupied by the same person for a substantial part of the day. This excludes circulation spaces and other areas of transient occupancy, such as toilets, as well as spaces that are not intended for occupation (e.g. display windows).

## Section 3: Quality of construction and commissioning

### Criterion 4 – Building performance consistent with the BER

**3.1** Buildings should be constructed and equipped so that performance is consistent with the calculated BER. As indicated in paragraph 2.15, a calculation of the BER is required to be submitted to the BCB after completion to take account of:

- a. any changes in performance between design and construction; and
- b. the achieved air permeability, ductwork leakage and commissioned fan performance.

**NOTE:** *The following paragraphs in this section set out what in normal circumstances would be reasonable provision to ensure that the actual performance of the building is consistent with the BER. The results referred to in paragraph 2.14 would assist the BCB in checking that the key features of the design are included as specified during the construction process.*

#### Building fabric

**3.2** The building fabric should be constructed to a reasonable quality so that:

- a. the insulation is reasonably continuous over the whole building envelope; and
- b. the air permeability is within reasonable limits.

#### Continuity of insulation

**3.3** The building fabric should be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements, at the joints between elements and at the edges of elements such as those around window and door openings.

**3.4** Reductions in thermal performance can occur where the air barrier and the insulation layer are not contiguous and the cavity between them is subject to air movement. To avoid this problem, either:

- a. the insulation layer should be contiguous with the air barrier at all points in the building envelope; or
- b. the space between the insulation layer and air barrier should be filled with solid material such as in a masonry wall.

**3.5** Where linear thermal transmittances and temperature factors are calculated in support of the approaches set out in paragraph 3.7a, follow the guidance set out in BRE Report BR 497 *Conventions for calculating linear thermal transmittance and temperature factors*. Reasonable provision is to demonstrate that the specified details achieve a temperature factor that is no worse than the performance set out in BRE Information Paper IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings*.

**3.6** Similarly, in support of the approaches set out in paragraph 3.7a, the builder would have to demonstrate that an appropriate system of site inspection is in place to give confidence that the construction procedures achieve the required standards of consistency.

**3.7** Ways of demonstrating that reasonable provision has been made are:

- a. To use construction joint details that have been calculated by a person with suitable expertise and experience following the guidance set out in BR 497 and following a process flow sequence that has been provided to the BCB indicating the way in which the detail should be constructed. The calculated value can then be used in the BER calculation.

**NOTE:** Evidence of suitable expertise and experience for calculating linear thermal transmittance would be to demonstrate that the person has been trained in the software used to carry out the calculation, has applied that model to the example calculations set out in BR 497 and has achieved results that are within the stated tolerances.

- b. To use construction joints with no specific quantification of the thermal bridge values. In such cases, the generic linear thermal bridge values as given in IP 1/06 increased by 0.04 W/(m·K) or 50 per cent, whichever is greater, must be used in the BER calculation.

## Air permeability and pressure testing

**3.8** In order to demonstrate that an acceptable air permeability has been achieved, regulation 43 states:

### Pressure testing

- 43.** (1) This regulation applies to the erection of a building in relation to which paragraph L1(a)(i) of Schedule 1 imposes a requirement.
- (2) Where this regulation applies, the person carrying out the work shall, for the purpose of ensuring compliance with regulation 26 and paragraph L1(a)(i) of Schedule 1:
  - (a) ensure that:
    - (i) pressure testing is carried out in such circumstances as are approved by the Secretary of State; and
    - (ii) the testing is carried out in accordance with a procedure approved by the Secretary of State; and
  - (b) subject to paragraph (5), give notice of the results of the testing to the local authority.
- (3) The notice referred to in paragraph (2)(b) shall:
  - (a) record the results and the data upon which they are based in a manner approved by the Secretary of State; and
  - (b) be given to the local authority not later than seven days after the final test is carried out.
- (4) A local authority is authorised to accept, as evidence that the requirements of paragraph (2)(a)(ii) have been satisfied, a certificate to that effect by a person who is registered by the Independent Air Tightness Testing Scheme Limited or the Air Tightness and Testing and Measuring Association in respect of pressure testing for the air tightness of buildings.
- (5) Where such a certificate contains the information required by paragraph (3)(a), paragraph (2)(b) does not apply.

**NOTE:** Where the BCB is an approved inspector see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

**3.9** The approved procedure for pressure testing is given in the Air Tightness Testing and Measurement Association (ATTMA) publication *Measuring air permeability of building envelopes* and, specifically, the method that tests the envelope area. The preferred test method is that trickle ventilators should be temporarily sealed rather than just closed. BCBs should be provided with evidence that test equipment has been calibrated within the previous 12 months using a UKAS-accredited facility. The manner approved for recording the results and the data on which they are based is given in Section 4 of that document.

**3.10** BCBs are authorised to accept, as evidence of compliance, a certificate offered under regulation 43(4). It should be confirmed to the BCB that the person has received appropriate training and is registered to test the specific class of building concerned. See <http://www.iats-uk.org/iats-member-list/> and [https://attma.org/join-attma/registered\\_members/](https://attma.org/join-attma/registered_members/)

- 3.11** The approved circumstances under which the Secretary of State requires pressure testing to be carried out are set out in paragraphs 3.12 to 3.14.
- 3.12** All buildings that are not **dwelling**s (including extensions which are being treated as new buildings for the purposes of complying with Part L) must be subject to pressure testing, with the following exceptions:
- Buildings less than 500 m<sup>2</sup> **total useful floor area**; in this case the developer may choose to avoid the need for a pressure test provided that the **air permeability** used in the calculation of the **BER** is taken as 15 m<sup>3</sup>/(h·m<sup>2</sup>) at 50 Pa.

**NOTE:** *Compensating improvements in other elements of the building fabric and building services will be needed to keep the **BER** no worse than the **TER**.*

- A factory-made modular building of less than 500 m<sup>2</sup> floor area, with a planned service life of more than two years at more than one location, and where no site assembly work is needed other than making linkages between standard modules using standard link details. Compliance with regulation 43 can be demonstrated by giving a notice to the local authority confirming that the building as installed conforms to one of the standard configurations of modules and link details for which the installer has pressure test data from a minimum of five in-situ measurements incorporating the same module types and link details as utilised in the actual building. The results must indicate that the average test result is better than the **design air permeability** as specified in the **BER** calculation by not less than 1.0 m<sup>3</sup>/(h·m<sup>2</sup>) at 50 Pa.
- Large extensions (whose compliance with Part L is being assessed as if they were new buildings – see Approved Document L2B) where sealing off the extension from the existing building is impractical. The ATTMA publication gives guidance both on how extensions can be tested and on situations where pressure tests are inappropriate. Where it is agreed with the **BCB** that testing is impractical, the extension should be treated as a large, complex building, with the guidance in paragraph 3.12d applying.
- Large complex buildings, where due to building size or complexity it may be impractical to carry out pressure testing of the whole building. The ATTMA publication indicates those situations where such considerations might apply. Before adopting this approach developers must produce in advance of construction work in accordance with the approved procedure a detailed justification of why pressure testing is impractical. This should be endorsed by a suitably qualified person such as a competent person approved for pressure testing. In such cases, a way of showing compliance would be to appoint a suitably qualified person to undertake a detailed programme of design development, component testing and site supervision to give confidence that a continuous air barrier will be achieved. It would not be reasonable to claim **air permeability** better than 5.0 m<sup>3</sup>/(h·m<sup>2</sup>) at 50 Pa has been achieved.

**NOTE:** *One example of a suitably qualified person would be an ATTMA member. The 5.0 m<sup>3</sup>/(h·m<sup>2</sup>) at 50 Pa limit has been set because at better standards the actual level of performance becomes too vulnerable to single point defects in the air barrier.*

- Compartmentalised buildings. Where buildings are compartmentalised into self-contained units with no internal connections it may be impractical to carry out whole building pressure tests. In such cases reasonable provision would be to carry out a pressure test on a representative area of the building as detailed in the ATTMA guidance. In the event of a test failure, the provisions of paragraphs 3.13 and 3.14 would apply, but it would be reasonable to carry out a further test on another representative area to confirm that the expected standard is achieved in all parts of the building.

**3.13** Compliance with the requirement in paragraph L1(a)(i) of Schedule 1 to the Building Regulations would be demonstrated if:

- a. the measured **air permeability** is not worse than the limiting value of  $10 \text{ m}^3/(\text{h}\cdot\text{m}^2)$  at 50 Pa; and
- b. the **BER** calculated using the measured **air permeability** is not worse than the **TER**.

**NOTE:** *If it proves impractical to meet the **design air permeability**, any shortfall must be compensated through improvements to subsequent fit-out activities. Builders may therefore wish to schedule pressure tests early enough to facilitate remedial work on the building fabric, e.g. before false ceilings are up.*

## Consequences of failing a pressure test

**3.14** If satisfactory performance is not achieved, then remedial measures should be carried out on the building and new tests carried out until the building achieves the criteria set out in paragraph 3.13.

**NOTE:** *If the measured **air permeability** on retest is greater than the **design air permeability** but less than the limiting value of  $10 \text{ m}^3/(\text{h}\cdot\text{m}^2)$  then other improvements may be required to achieve the **TER**. This means that builders would be unwise to claim a **design air permeability** better than  $10 \text{ m}^3/(\text{h}\cdot\text{m}^2)$  unless they are confident of achieving the improved value.*

## Commissioning of the building services systems

**3.15** Paragraph L1(b)(iii) of Schedule 1 to the Building Regulations requires **fixed building services** to be commissioned by testing and adjusting them as necessary to ensure that they use no more fuel and power than is reasonable in the circumstances. In order to demonstrate that the heating and hot water systems have been adequately commissioned, regulation 44 states:

### Commissioning

- 44.** (1) This regulation applies to building work in relation to which paragraph F1(2) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed system for mechanical ventilation or any associated controls where testing and adjustment is not possible.
- (2) This regulation applies to building work in relation to which paragraph L1(b) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed building service where testing and adjustment is not possible or would not affect the energy efficiency of that fixed building service.
- (3) Where this regulation applies the person carrying out the work shall, for the purpose of ensuring compliance with paragraph F1(2) or L1(b) of Schedule 1, give to the local authority a notice confirming that the fixed building services have been commissioned in accordance with a procedure approved by the Secretary of State.
- (4) The notice shall be given to the local authority—
- (a) not later than the date on which the notice required by regulation 16(4) is required to be given; or
  - (b) where that regulation does not apply, not more than 30 days after completion of the work.

**NOTE:** *Where the **BCB** is an approved inspector see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).*

**3.16** It would be useful to prepare a **commissioning** plan, identifying the systems that need to be tested and the tests that will be carried out and provide this with the design-stage **TER/BER** calculation so that the **BCB** can check that the **commissioning** is being done as the work proceeds.

**NOTE:** *The use of the templates in the Model Commissioning Plan (BSRIA BG 8/2009) is a way of documenting the process in an appropriate way.*

**3.17** Not all **fixed building services** will need to be commissioned. With some systems it is not possible as the only controls are 'on' and 'off' switches. Examples of this would be some mechanical ventilation systems or single fixed electrical heaters. In other cases **commissioning** would be possible but in the

specific circumstances would have no effect on energy use.

**3.18** Where **commissioning** is carried out it should be done in accordance with procedures approved by the Secretary of State comprising:

- a. the CIBSE Commissioning Code M: *Commissioning management*; and

**NOTE:** *This provides guidance on the overall process and includes a schedule of all the relevant guidance documents relating to the **commissioning** of specific building services systems.*

- b. the procedures for air leakage testing of ductwork given in paragraphs 3.26 and 3.27.

**3.19** **Commissioning** must be carried out in such a way as not to prejudice compliance with any applicable health and safety requirements.

**3.20** **Commissioning** is often carried out by the person who installs the system. Sometimes it may be carried out by a subcontractor or even by a specialist firm. It is important that whoever carries it out follows the relevant approved procedure.

### Notice of completion

**3.21** The Building Regulations (regulation 44(3)) and the Building (Approved Inspectors etc) Regulations (regulation 20(6)) require that a notice be given to the relevant **BCB** that **commissioning** has been carried out according to a procedure approved by the Secretary of State.

**3.22** The notice should include a declaration confirming that:

- a. a **commissioning** plan has been followed so that every system has been inspected and commissioned in an appropriate sequence and to a reasonable standard; and
- b. the results of tests confirm that the performance is reasonably in accordance with the actual building design, including written commentaries where excursions are proposed to be accepted.

**NOTE:** *It would be helpful to **BCBs** if such declarations were to be signed by someone suitably qualified by relevant training and experience. A way of achieving this would be to employ a member of the Commissioning Specialists Association or the Commissioning Group of the Building and Engineering Services Association (B&ES) in respect of heating, ventilation and air-conditioning (HVAC) systems, or a member of the Lighting Industry Commissioning Scheme in respect of fixed internal or external lighting. The use of the templates in the Model Commissioning Plan is a way of documenting the process in an appropriate way.*

**3.23** Where a building notice or full plans have been given to a local authority, the notice should be given within five days of the completion of the **commissioning** work; in other cases, for example where work is carried out by a person registered with a competent person scheme, it must be given within 30 days.

**3.24** Where an approved inspector is the **BCB**, the notice should generally be given within five days of the completion of the building work. However, where the work is carried out by a person registered with a competent person scheme the notice must be given within 30 days. Where the installation of **fixed building services** which require **commissioning** is carried out by a person registered with a competent person scheme the notice of **commissioning** will be given by that person.

**3.25** Until the **BCB** receives the **commissioning** notice it may not be able to be reasonably satisfied that Part L has been complied with and consequently is unlikely to be able to give a completion/final certificate.

**NOTE:** *Energy efficiency in practice can often be enhanced by a sustained period of fine tuning to ensure the systems are operating as intended and controls are configured to the needs of the occupier. The Soft Landings initiative is an example of an appropriate fine tuning process (see <https://www.bsria.co.uk/services/design/soft-landings/>).*

## Air leakage testing of ductwork

**3.26** Ductwork leakage testing should be carried out where required by and in accordance with the procedures set out in B&ES DW/143 and B&ES DW/144 on systems served by fans with a design flow rate greater than 1 m<sup>3</sup>/s.

**NOTE:** DW/143 does not call for any testing of low-pressure (class A) ductwork. However, where at least 10 per cent of low-pressure ductwork is tested at random and achieves the low-pressure standard as defined by DW/143 the National Calculation Methodology recognises an improvement in the BER. A decision to test low-pressure ductwork should be made at the initial design phase prior to commencement on site.

Membership of the B&ES specialist ductwork group or the Association of Ductwork Contractors and Allied Services (ADCAS) could be a way of demonstrating suitable qualifications for this testing work.

**Table 4 Ductwork pressure classes**

Duct pressure class	Design static pressure (Pa)		Maximum air velocity (m/s)	Air leakage limit (l/(s.m <sup>2</sup> ) of duct surface area) <sup>1</sup>
	Maximum positive	Maximum negative		
Low pressure (class A)	500	500	10	0.027 $\Delta p^{0.65}$
Medium pressure (class B)	1000	750	20	0.009 $\Delta p^{0.65}$
High pressure (class C)	2000	750	40	0.003 $\Delta p^{0.65}$
High pressure (class D)	2000	750	40	0.001 $\Delta p^{0.65}$

Note 1: where  $\Delta p$  is the differential pressure in pascals

**3.27** If a ductwork system fails to meet the leakage standard, remedial work should be carried out as necessary to achieve satisfactory performance in retests and further ductwork sections should be tested as set out in DW/143.

## Section 4: Providing information

### Criterion 5 – Provisions for energy-efficient operation of the building

- 4.1** In accordance with regulation 40, the owner of the building should be provided with sufficient information about the building, the **fixed building services** and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

#### Information about use of fuel and power

- 40.** (1) This regulation applies where paragraph L1 of Schedule 1 imposes a requirement relating to building work.
- (2) The person carrying out the building work shall not later than five days after the work has been completed provide to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

### Building log book

- 4.2** A way of showing compliance with regulation 40 would be to produce information following the guidance in CIBSE TM 31 *Building log book toolkit*. The information should be presented in templates as or similar to those in TM 31. The information could draw on or refer to information available as part of other documentation, such as the Operation and Maintenance Manuals and the Health and Safety file required by the Construction (Design and Management) (CDM) Regulations.

**NOTE:** *Further advice is provided in BSRIA BG 26/2011 Building manuals and building user guides.*

- 4.3** The data used to calculate the **TER** and the **BER** should be included with the log book. The occupier should also be provided with the recommendations report generated with the 'on-construction' **energy performance certificate**. This will inform the occupier how the energy performance of the building might be further improved.

**NOTE:** *It would also be sensible to retain an electronic copy of the TER/BER input file for the energy calculation to facilitate any future analysis that may be required by the owner when altering or improving the building.*

## Section 5: Model designs

- 5.1 The **TER** is based on a building of the same size and shape as the actual building, constructed to a concurrent specification. If the actual building is constructed entirely to this specification it will meet the **TER** and therefore pass Criterion 1. Table 5 provides a summary of the concurrent notional building specifications for each category of building. More detailed information can be found in the *NCM modelling guide*.
- 5.2 It should be noted, however, that the concurrent notional building specifications are not prescriptive and may not be the most economic specification in every case. Designers are free to explore the most economic specification to meet the **TER** in each case, provided that this specification meets all other provisions within this approved document, in particular the limiting fabric parameters in Table 3.
- 5.3 Some builders may prefer to adopt model design packages rather than to engage in design for themselves. Such model packages of fabric U-values, boiler seasonal efficiencies, window opening allowances etc. should, if suitably robust, help the builder achieve compliance. The construction industry may develop model designs for this purpose and make them available on the Internet at: [www.modeldesigns.info](http://www.modeldesigns.info)
- 5.4 It will still be necessary to demonstrate compliance in the particular case by going through the procedures described in paragraphs 2.7 to 2.15.

**Table 5 Summary of concurrent notional building specification**

Element	Side lit or unlit (where HVAC specification is heating only)	Side lit or unlit (where HVAC specification includes cooling)	Top lit
Roof U-value (W/(m <sup>2</sup> ·K))	0.18	0.18	0.18
Wall U-value (W/(m <sup>2</sup> ·K))	0.26	0.26	0.26
Floor U-value (W/(m <sup>2</sup> ·K))	0.22	0.22	0.22
Window U-value (W/(m <sup>2</sup> ·K))	1.6 (10% FF)	1.6 (10% FF)	N/A
G-value (%)	40	40	N/A
Light transmittance (%)	71	71	N/A
Roof-light U-value (W/(m <sup>2</sup> ·K))	N/A	N/A	1.8 (15% FF)
G-value (%)	N/A	N/A	55
Light transmittance (%)	N/A	N/A	60
Air permeability (m <sup>3</sup> /(m <sup>2</sup> ·hour))	5	5	7
Gross internal area less than or equal to 250 m <sup>2</sup>			
Air permeability (m <sup>3</sup> /(m <sup>2</sup> ·hour))	3	3	7
Gross internal area greater than 250 m <sup>2</sup> and less than 3500 m <sup>2</sup>			
Air permeability (m <sup>3</sup> /(m <sup>2</sup> ·hour))	3	3	5
Gross internal area greater than or equal to 3500 m <sup>2</sup> and less than 10,000 m <sup>2</sup>			
Air permeability (m <sup>3</sup> /(m <sup>2</sup> ·hour))	3	3	3
Gross internal area greater than or equal to 10,000 m <sup>2</sup>			
Lighting luminaire (lm/circuit watt)	60	60	60
Occupancy control (Yes/No)	Yes	Yes	Yes
Daylight control (Yes/No)	Yes	Yes	Yes
Maintenance factor	0.8	0.8	0.8
Constant illuminance control	No	No	No
Heating efficiency (heating and hot water) (%)	91	91	91
Central ventilation SFP (W/(l·s))	1.8	1.8	1.8
Terminal unit SFP (W/(l·s))	0.3	0.3	0.3
Cooling (air-conditioned) (SEER/SSEER)	N/A	4.5 / 3.6	4.5 / 3.6
Cooling (mixed mode) (SSEER) <sup>1</sup>	N/A	2.7	2.7
Heat recovery efficiency (%)	70	70	70
Variable speed control of fans and pumps, controlled via multiple sensors	Yes	Yes	Yes
Demand control (mechanical ventilation only). Variable speed control of fans via CO <sub>2</sub> sensors	Yes	Yes	Yes
Note 1: Mixed mode assumed to be cooled by DX unit where SSEER includes indoor and outdoor units and fans, pumps and losses			

# Appendix A: Key terms and abbreviations

## Key terms

The following are key terms used in this document:

**Air permeability** is the physical property used to measure airtightness of the building fabric. It is defined as air leakage rate per hour per square metre of envelope area at the test reference pressure differential of 50 pascals (50 N/m<sup>2</sup>). The envelope area, or measured part of the building, is the total area of all floors, walls and ceilings bordering the internal volume that is the subject of the pressure test. This includes walls and floors below external ground level. Overall internal dimensions are used to calculate this envelope area and no subtractions are made for the area of the junctions of internal walls, floors and ceilings with exterior walls, floors and ceilings.

The **limiting air permeability** is the worst allowable **air permeability**.

The **design air permeability** is the target value set at the design stage, and must always be no worse than the limiting value.

The **assessed air permeability** is the value used in establishing the **BER**, and is based on a specific measurement of the building concerned.

**BCB** means building control body: a local authority or an approved inspector.

**BER** is the Building CO<sub>2</sub> Emission Rate expressed as kgCO<sub>2</sub>/(m<sup>2</sup>·year).

**Commissioning** means the advancement of a fixed building service following installation, replacement or alteration of the whole or part of the system, from the state of static completion to working order by testing and adjusting as necessary to ensure that the system as a whole uses no more fuel and power than is reasonable in the circumstances, without prejudice to the need to comply with health and safety requirements. For each system **commissioning** includes setting-to-work, regulation (that is testing and adjusting repetitively) to achieve the specified performance, the calibration, setting up and testing of the associated automatic control systems, and recording of the system settings and the performance test results that have been accepted as satisfactory.

**Controlled service or fitting** means a service or fitting in relation to which Part G (sanitation, hot water safety and water efficiency), H (drainage and waste disposal), J (combustion appliances and fuel storage systems), L (conservation of fuel and power) or P (electrical safety) of Schedule 1 to the Building Regulations imposes a requirement.

**Display window** means an area of glazing, including glazed doors, intended for the display of products or services on offer within the building, positioned:

- at the external perimeter of the building; and
- at an access level; and
- immediately adjacent to a pedestrian thoroughfare.

There should be no permanent workspace within one glazing height of the perimeter. Glazing more than 3 m above such an access level should not be considered part of a **display window** except:

- a. where the products on display require a greater height of glazing;
- b. in cases where building work involving changes to the façade and glazing requiring planning consent, where planners require a greater height of glazing, e.g. to fit with surrounding buildings or to match the character of the existing façade.

It is expected that **display windows** will be found in planning Use Classes A1, A2, A3 and D2 as detailed in the table below.

Planning Use Classes	
Class	Use
A1	Shops: including retail-warehouse, undertakers, showrooms, post offices, hairdressers, shops for sale of cold food for consumption off premises
A2	Financial and professional services: banks, building societies, estate and employment agencies, betting offices
A3	Food and drink: restaurants, pubs, wine bars, shops for sale of hot food for consumption off premises
D2	Assembly and leisure: cinemas, concert halls, bingo halls, casinos, sports and leisure uses

**Display lighting** means lighting intended to highlight displays of exhibits or merchandise, or lighting used in spaces for public leisure and entertainment such as dance halls, auditoria, conference halls, restaurants and cinemas.

**Dwelling** includes a dwelling-house and a flat and means a self-contained unit designed to accommodate a single household. Buildings exclusively containing **rooms for residential purposes** such as nursing homes, student accommodation and similar are not **dwellings**, and in such cases, this Approved Document L2A applies.

**Emergency escape lighting** means that part of emergency lighting that provides illumination for the safety of people leaving an area or attempting to terminate a dangerous process before leaving an area.

**Energy efficiency requirements** means the requirements of regulations 23, 25A, 25B, 26, 26A, 28 and 40 of, and Part L of Schedule 1 to, the Building Regulations.

**NOTE:** *In respect of new buildings other than **dwellings**, the applicable requirements are those of Part L and regulations 25A and 26.*

**Energy performance certificate** means a certificate which complies with regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012.

**Fit-out work** means that work needed to complete the partitioning and building services within the external fabric of the building (the shell) to meet the specific needs of incoming occupiers.

**Fit-out work** can be carried out in whole or in parts:

- a. in the same project and time frame as the construction of the building shell; or
- b. at some time after the shell has been completed.

**Fixed building services** means any part of, or any controls associated with—

- (a) fixed internal or external lighting systems (but not including emergency escape lighting or specialist process lighting);
- (b) fixed systems for heating, hot water, air conditioning or mechanical ventilation; or
- (c) any combination of systems of the kinds referred to in paragraph (a) or (b).

**High-usage entrance door** means a door to an entrance primarily for the use of people that is expected to experience large volumes of traffic, and where robustness and/or powered operation is the main performance requirement. To qualify as a **high-usage entrance door**, the door should be equipped with automatic closers and, except where operational requirements preclude it, be protected by a lobby.

**Room for residential purposes** means a room, or a suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep and includes a room in a hostel, an hotel, a boarding house, a hall of residence or a residential home, but does not include a room in a hospital, or other similar establishment, used for patient accommodation.

**Specialist process lighting** means lighting intended to illuminate specialist tasks within a space, rather than the space itself. It could include theatre spotlights, projection equipment, lighting in TV and photographic studios, medical lighting in operating theatres and doctors' and dentists' surgeries, illuminated signs, coloured or stroboscopic lighting, and art objects with integral lighting such as sculptures, decorative fountains and chandeliers.

**TER** is the Target CO<sub>2</sub> Emission Rate expressed as kgCO<sub>2</sub>/(m<sup>2</sup>·year).

**Total useful floor area** is the total area of all enclosed spaces measured to the internal face of the external walls. In this convention:

- a. the area of sloping surfaces such as staircases, galleries, raked auditoria and tiered terraces should be taken as their area on plan; and
- b. areas that are not enclosed such as open floors, covered ways and balconies are excluded.

**NOTE:** *This area is the gross floor area as measured in accordance with the guidance issued to surveyors by the Royal Institution of Chartered Surveyors (RICS).*

## Abbreviations

CO <sub>2</sub> :	carbon dioxide
BRUKL:	Building Regulations UK Part L
UKAS:	The United Kingdom Accreditation Service
HVAC:	heating, ventilation and air-conditioning
LZC:	low and zero carbon
SFP:	specific fan power
SEER:	seasonal energy efficiency ratio
SSEER:	seasonal system energy efficiency ratio
FF:	frame factor
DX:	direct exchange

## Appendix B: Types of work covered by this approved document

1. This approved document gives guidance on what, in ordinary circumstances, may be considered reasonable provision to comply with the requirements of regulations 26 and 40 of, and Part L of Schedule 1 to, the Building Regulations in relation to works comprising:
  - a. The construction of new buildings other than **dwelling**s.
  - b. **Fit-out work** where the work is either part of the construction of a new building, or is the first fit-out of a shell and core development where the shell is sold or let before the **fit-out work** is carried out. (Approved Document L2B applies to **fit-out work** in other circumstances.)
  - c. The construction of extensions to existing buildings that are not **dwelling**s where the **total useful floor area** of the extension is greater than 100 m<sup>2</sup> and greater than 25 per cent of the **total useful floor area** of the existing building.

In addition, this approved document gives guidance on how to comply with regulations 25A, 27, 43 and 44 of the Building Regulations, and regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 where an approved inspector is the **BCB**.

2. When a building that contains **dwelling**s is being constructed, account should also be taken of the guidance in Approved Document L1A. In most instances, use Approved Document L1A for guidance relating to the work on the individual **dwelling**s, and this Approved Document L2A for guidance relating to the parts of the building that are not a **dwelling**, such as heated common areas and, in the case of mixed-use developments, the commercial or retail space.

**NOTE:** *Dwelling includes a dwelling-house and a flat and means self-contained units designed to accommodate a single household. For new boarding houses, hostels and student accommodation blocks that contain **rooms for residential purposes** this approved document applies.*

3. If a building contains both living accommodation and space to be used for commercial purposes (e.g. as a workshop or office), the whole building should be treated as a **dwelling** as long as the commercial part can revert to domestic use. This can be the case if, for example:
  - a. there is direct access between the industrial or commercial space and the living accommodation; and
  - b. both are contained within the same thermal envelope; and
  - c. the living accommodation occupies a substantial proportion of the total area of the building.

**NOTE:** *Sub-paragraph c means that, for example, the presence of a small flat for a manager in a large non-domestic building does not result in the whole building being treated as a **dwelling**. Similarly, if a room is used as an office or utility space within a **dwelling** that does not mean that the building should not be treated as a **dwelling**.*

## Appendix C: Buildings that are exempt from the energy efficiency requirements

1. New buildings other than **dwelling**s which are roofed constructions having walls and which use energy to condition the indoor climate must comply with the **energy efficiency requirements** unless they are exempt as set out at regulation 21(3) of the Building Regulations. For the purposes of the **energy efficiency requirements** of the Building Regulations a building means the whole of a building or parts of it designed or altered to be used separately. The following classes of new buildings or parts of new buildings other than **dwelling**s are exempt:
  - a. buildings which are used primarily or solely as places of worship;
  - b. temporary buildings with a planned time of use of two years or less, industrial sites, workshops and non-residential agricultural buildings with low energy demand;
  - c. stand-alone buildings other than **dwelling**s with a **total useful floor area** of less than 50 m<sup>2</sup>;
  - d. some conservatories and porches.
2. The following paragraphs give guidance on those exemptions that relate to new buildings that are not **dwelling**s.
  - a. **Places of worship:** For the purposes of the **energy efficiency requirements**, places of worship are those buildings or parts of a building that are used for formal public worship, plus adjoining spaces whose function is directly linked to that use (for example, a vestry in a church). Traditional, religious or cultural constraints often make it impossible for buildings or parts of buildings that are used for public worship to comply with the **energy efficiency requirements**. Parts of the building that are designed to be used separately, such as offices, catering facilities, day centres, meeting halls and accommodation, are not exempt from the **energy efficiency requirements**.
  - b. **Temporary buildings:** For the purpose of the **energy efficiency requirements**, a temporary building with a planned time of use of two years or less is exempt. Portable or modular buildings, whether on one or more sites, which have a planned service life longer than two years, are not exempt.
  - c. **Industrial sites, workshops and non-residential agricultural buildings with low energy demand:** In relation to this category of exempt building, the low energy demand only relates to the energy used by fixed heating or cooling systems, NOT to energy required for or created by process needs. The following are examples of buildings in the above categories that have low energy demand:
    - i. buildings or parts of buildings where the space is not generally heated or cooled other than by process heat;
    - ii. buildings or parts of buildings that only require heating or cooling for short periods each year, such as during critical periods in the production cycle (e.g. plant germination, egg hatching) or during very severe weather conditions.

Industrial sites, workshops and non-residential agricultural buildings are exempt only if they meet the low energy demand criterion. In other cases, such buildings must comply with **energy efficiency requirements**. Other buildings which have a low energy demand but do not fall into one of the above categories are not exempt.

## Appendix D: Reporting evidence of compliance

1. To facilitate effective communication between the builder and BCB, it would be beneficial to adopt a standardised format for presenting the evidence that demonstrates compliance with the energy efficiency requirements. (Other than the CO<sub>2</sub> target which is mandatory, the limiting values for individual fabric elements and building services represent reasonable provision in normal circumstances. In unusual circumstances, alternative limits may represent reasonable provision, but this would have to be demonstrated in the particular case.)
2. Since the data in compliance software and the results they calculate can provide a substantial proportion of the evidence in support of the compliance demonstration, compliance software should produce this report as a standard output option.
3. Two versions of the standardised report may be produced by the compliance software: the first before commencement of works to include the TER/BER calculation plus supporting list of specifications, and the second after completion to include the as-built TER/BER calculation plus any changes to the list of specifications. The first design-stage report and accompanying list of specifications can then be used by the BCB to assist checking that what has been designed is actually built. A standardised report should enable the source of the evidence to be indicated, and allow the credentials of those submitting the evidence to be declared.
4. An important part of demonstrating compliance is to make a clear connection between the product specifications and the data inputs required by the compliance software (e.g. what is the wall construction that delivers the claimed U-value?). Examples as to how compliance software might provide this link are:
  - a. By giving each data input a reference code that can be mapped against a separate submission by the builder/developer that details the specification corresponding to each unique reference code in the data input.
  - b. By providing a free-text entry facility along with each input parameter that has a unique reference code, thereby allowing the software to capture the specification of each item and so include the full details in an integrated output report.
  - c. By including one or more utility programs that derive the data input from the specification, e.g. a U-value calculator that conforms to BR 443 and that calculates the U-value based on the layer thicknesses and conductivities, repeating thermal bridge effects etc. Outputs from such a utility program could then automatically generate the type of integrated report described at sub-paragraph b.

It would also help the BCB if the software included a facility to compare the 'as designed' and 'as constructed' data input files and automatically produce a schedule of changes.

5. The report should highlight any items whose specification is better than typically expected values. The BCB is advised to give particular attention to such 'key features', as their appropriate installation will be critical in achieving the TER.

It is expected that low and zero carbon technologies will increasingly be employed for compliance, particularly where the average performance of elements in the actual building is worse than the concurrent specification. The report should highlight where these low and zero carbon technologies have been used and the BCB is advised to give particular attention to their installation.

The BCB is advised to give particular attention to those aspects where the claimed specification delivers an energy efficiency standard in advance of that defined in the following schedule.

Parameter	
Wall U-value	0.23 W/(m <sup>2</sup> ·K)
Roof U-value	0.15 W/(m <sup>2</sup> ·K)
Floor U-value	0.20 W/(m <sup>2</sup> ·K)
Window/door U-value	1.5 W/(m <sup>2</sup> ·K)
Design air permeability	5.0 m <sup>3</sup> /(h·m <sup>2</sup> ) at 50 Pa
Fixed building service efficiency more than 15% better than that recommended for its type in the <i>Non-Domestic Building Services Compliance Guide</i> .	
Use of any low-carbon or renewable energy technology.	

## Appendix E: Documents referred to

### **Air Tightness Testing and Measurement Association (ATTMA)**

[www.attma.org](http://www.attma.org)

Technical Standard L2 Measuring air permeability of building envelopes [2010].

### **Building and Engineering Services Association (B&ES)**

[www.b-es.org](http://www.b-es.org)

DW/143 A practical guide to Ductwork Leakage Testing [2013].

DW/144 Specification for Sheet Metal Ductwork [2013].

### **BRE**

[www.bre.co.uk](http://www.bre.co.uk)

BR 443 Conventions for U-value calculations [2006]. ([www.bre.co.uk/uvalues](http://www.bre.co.uk/uvalues))

BRE Report BR 497 Conventions for calculating linear thermal transmittance and temperature factors [2007 and 2010 amendment and conventions].

ISBN 978 1 86081 986 5

Information Paper IP 1/06 Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings [2006].

ISBN 978 1 86081 904 9

National Calculation Methodology (NCM) modelling guide (for buildings other than dwellings in England) [2013]. ([www.ncm.bre.co.uk](http://www.ncm.bre.co.uk))

Simplified Building Energy Model (SBEM) User manual and software. ([www.ncm.bre.co.uk](http://www.ncm.bre.co.uk))

### **BSRIA**

[www.bsria.co.uk](http://www.bsria.co.uk)

BG 8/2009 Model Commissioning Plan.

BG 26/2011 Building manuals and building user guides.

### **Chartered Institution of Building Services Engineers (CIBSE)**

[www.cibse.org](http://www.cibse.org)

Commissioning Code M Commissioning Management [2003].

ISBN 978 1 90328 733 0

TM 31 Building Log Book Toolkit [2006].

ISBN 978 1 90328 771 2

TM 37 Design for improved solar shading control [2006].

ISBN 978 1 90328 757 6

TM 39 Building energy metering [2009].

ISBN 978 1 90684 611 4

TM 46 Energy benchmarks [2008].

ISBN 978 1 90328 795 8

### **Department for Energy and Climate Change (DECC)**

[www.decc.gov.uk](http://www.decc.gov.uk)

The Government's Standard Assessment Procedure for energy rating of dwellings, SAP 2012. (Available at [www.bre.co.uk/sap2012](http://www.bre.co.uk/sap2012))

### **Department for Communities and Local Government**

[www.communities.gov.uk](http://www.communities.gov.uk)

National Planning Policy Framework [2012].

Non-Domestic Building Services Compliance Guide [2013].

Notice of Approval of the methodology of calculation of the energy performance of buildings in England.

### **Department for Education (DfE)**

[www.education.gov.uk](http://www.education.gov.uk)

Building Bulletin 101 Ventilation of School Buildings, School Building and Design Unit [2006].

### **National Association of Rooflight Manufacturers (NARM)**

[www.narm.org.uk](http://www.narm.org.uk)

Technical Document NTD 2 Assessment of thermal performance of out-of-plane rooflights [2010].

## Appendix F: Standards referred to

**BS EN ISO 13370** Thermal performance of buildings. Heat transfer via the ground. Calculation methods [2007 incorporating corrigendum March 2009].

**BS EN 410** Glass in building. Determination of luminous and solar characteristics of glazing [2011].

**BS EN 14351-1** Windows and doors. Product standard, performance characteristics. Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics [2006 (+AMD 1:2010)].

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**Publications (excluding British Standards)**

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Building log book toolkit (CIBSE TM 31, 2006) 4.2

Commissioning management (CIBSE Commissioning Code M, 2003) 3.18

Conventions for calculating linear thermal transmittance and temperature factors (BRE BR 497, 2007/2010) 3.5, 3.7

Conventions for U-value calculations (BRE BR 443, 2006), 2.40, 2.41, Appendix D(4)

Design for improved solar shading control (CIBSE TM 37, 2006) 2.52

Energy benchmarks (CIBSE TM 46, 2008) 2.48

Measuring air permeability of building envelopes (ATTMA L2, 2010) 3.9

Model Commissioning Plan (BSRIA BG 8/2009) 3.16

National Calculation Methodology (NCM) modelling guide (2013) 2.6, 2.12, 5.1

National Planning Policy Framework (DCLG, 2012) 2.17

Non-Domestic Building Services Compliance Guide (DCLG, 2013) 2.25, 2.45–2.46,

Notice of Approval of the methodology of calculation of the energy performance of buildings in England (DCLG) 2.3

Practical guide to ductwork leakage testing (B&ES DW/143, 2013) 3.26, 3.27

Specification for sheet metal ductwork (B&ES DW/144, 2013) 3.26

Standard Assessment Procedure for energy rating of dwellings (SAP 2012, DECC) 2.10, 2.40

Ventilation of school buildings (DfE BB101, 2006) 2.52

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## Conservation of fuel and power

**APPROVED  
DOCUMENT**

# L2B

**L2B Conservation of fuel and power  
in existing buildings other than dwellings**

In effect from 1 October 2010

For use in England\*

**2010 edition**  
incorporating 2010,  
2011, 2013 and 2016  
amendments

## MAIN CHANGES IN THE 2010 EDITION

1. This Approved Document L2B came into force on 1 October 2010 in support of the Building Regulations 2010, SI 2010/2214. The main changes to the legal requirements and the supporting guidance since the issue of the previous Approved Document L2B are as follows:

### Changes in the legal requirements

2. The exemption from the energy efficiency provisions for extensions consisting of a conservatory or porch is amended to grant the exemption only where any existing walls, windows or doors are retained, or replaced if removed, and where the heating system of the building is not extended into the conservatory or porch.
3. The list of work in Schedule 4 (work that need not be notified to building control) is amended to include the installation of thermal insulation in a roof space or loft space where this is the only work carried out and the work is not carried out to comply with any requirement in the Building Regulations.

### Changes in the technical guidance

4. The notional building used to determine 4. In this Approved Document the guidance is generally based upon an elemental approach to demonstrating compliance, with additional guidance that provides greater flexibility. The main technical changes comprise a general strengthening of energy efficiency standards that are considered reasonable for work on thermal elements, controlled fittings and controlled services in existing buildings.
5. Amended guidance is given for historic and traditional buildings which may have an exemption from the energy efficiency requirements or where special considerations apply.
6. Amended guidance is given where an extension is a conservatory or porch that is not exempt from the energy efficiency requirements.
7. The guidance for the renovation of a thermal element through the provision of a new layer or through the replacement of an existing layer has been expanded.
8. Guidance is provided for swimming pool basins (walls and floor) in existing buildings.

## Main changes made by the 2010 and 2011 amendments

This 2010 edition, incorporating the further 2010 amendments reflects the changes made as a result of the Building Regulations 2010; Building Approved inspector etc Regulations and the Building (Amendment) Regulations 2011. The changes mainly reflect regulation number changes as a result of re-ordering. There have been no amendments to the substantive requirements in Schedule 1 (i.e. Parts A to P) of the Building Regulations.

Please note the simplification of the definition of 'room for residential purposes' in regulation 2 of the Building Regulations 2010 and the amendment of the definition of "renovation" in regulation 2(1) of the Building (Amendment) Regulations 2011. Please also note that L1(c) has now become regulation 40.

## Main changes made by the 2013 amendments

The main changes, which apply only to England\*, are:

- To take account of a recast of the European Energy Performance of Buildings Directive
- Materials and workmanship guidance updated
- Updated references to third party guidance

## Main changes made by the 2016 amendments

Changes reflect alterations to the regulations, principally withdrawal of Regulations 29 to 33 of the Building Regulations 2010 and their replacement by Regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012 and changes in wording of Regulations 24, 25, 26, 26A, 27 and 27A of the Building Regulations 2010. There are no technical changes.

\*This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No 2) Order 2009.

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# Section 1: Introduction

## What is an Approved Document?

**1.1** This Approved Document, which takes effect on 1 October 2010, has been approved and issued by the Secretary of State to provide practical guidance on ways of complying with the **energy efficiency requirements** (see Section 2) and regulation 7 of the Building Regulations 2010 (SI 2010/2214) for England and Wales. Regulation 2(1) of the Building Regulations defines the **energy efficiency requirements** as the requirements of regulations 23, 25A, 25B, 26, 28 and 40 and Part L of Schedule 1. The Building Regulations 2010 are referred to throughout the remainder of this Document as ‘the Building Regulations’.

**1.2** The intention of issuing Approved Documents is to provide guidance about compliance with specific aspects of building regulations in some of the more common building situations. They set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirement(s) of building regulations to which they refer.

**1.3** If guidance in an Approved Document is followed there will be a presumption of compliance with the requirement(s) covered by the guidance. However, this presumption can be overturned, so simply following guidance does not guarantee compliance; for example, if the particular case is unusual in some way, then ‘normal’ guidance may not be applicable. It is also important to note that there may well be other ways of achieving compliance with the requirements. **There is therefore no obligation to adopt any particular solution contained in this Approved Document if you would prefer to meet the relevant requirement in some other way. Persons intending to carry out building work should always check with their building control body, either the local authority or an approved inspector, that their proposals comply with building regulations.**

**1.4** It is important to note that this Approved Document, as well as containing guidance, also contains extracts from the Regulations. Such regulatory text must be complied with as stated. For example, the requirement that the **fixed building services** must be commissioned (Regulation 44) is a regulatory requirement. There is therefore no flexibility to ignore this requirement; neither can compliance with this particular regulation be demonstrated via any route other than that set out in Regulation 44.

**1.5** The guidance contained in this Approved Document relates only to the particular requirements of the Building Regulations that the document addresses (set out in Section 2). However, building work may be subject to more than one requirement of building regulations. In such cases the work will also have to comply with any other applicable requirements of building regulations.

**1.6** There are Approved Documents that give guidance on each of the Parts of Schedule 1 and on regulation 7. A full list of these is provided at the back of this document.

## Consideration of technical risk

**1.7** Building work to existing buildings must satisfy all the technical requirements set out in regulations 22, 23 and 28 of, and Schedule 1 to, the Building Regulations. When considering the incorporation of energy efficiency measures in buildings, attention should also be paid in particular to the need to comply with Part B (fire safety), Part C (site preparation and resistance to contaminants and moisture), Part E (resistance to the passage of sound), Part F (ventilation), paragraph G3 (hot water supply and systems), Part J (combustion appliances and fuel storage systems) and Part P (electrical safety) of Schedule 1 to the Building Regulations, as well as Part L. The adoption of any particular energy efficiency measure should not involve unacceptable technical risk of, for instance, excessive condensation. Designers and builders should refer to the relevant Approved Documents and to other generally available good practice guidance to help minimise these risks.

## How to use this Approved Document

**1.8** This Approved Document is subdivided into seven sections as detailed below. These main sections are followed by supporting appendices.

This **introductory** section sets out the general context in which the guidance in the Approved Document must be considered.

**Section 2** sets out the relevant legal requirements contained in the Building Regulations.

**Section 3** contains general guidance, including the definition of key terms, the types of building work covered by this Approved Document, the types of building work that are exempt, procedures for notifying work, materials and workmanship and health and safety issues, an overview of the routes to compliance, and how to deal with ‘special’ areas of buildings that contain **dwelling**s.

**Section 4** details the considerations that apply to demonstrating that the building work will meet the **energy efficiency requirements**. This section begins the detailed technical guidance relating to showing compliance with the **energy efficiency requirements**.

**Section 5** details the considerations that apply when providing or renovating **thermal elements**.

**Section 6** gives guidance about the requirement for **consequential improvements** for buildings over 1,000 m<sup>2</sup>.

**Section 7** describes the information that should be provided to occupiers to help them achieve reasonable standards of energy efficiency in practice.

**1.9** In this document the following conventions have been adopted to assist understanding and interpretation:

- a. Texts shown against a green background are extracts from the Building Regulations 2010/(2010/2214) or Building (Approved Inspectors etc.) Regulations 2010/(2010/2215), and set out the legal requirements that relate to compliance with the **energy efficiency requirements** of building regulations. As stated previously, there is no flexibility in respect of such text; it defines a legal requirement, not guidance for typical situations. It should also be remembered that, as noted above, building works must comply with all the other applicable requirements of building regulations.
- b. Key terms are defined in paragraph 3.1 and are printed in **bold italic text**.
- c. Details of technical publications referred to in the text of this Approved Document will be given in footnotes and repeated as references at the end of the document. A reference to a publication is likely to be made for one of two main reasons. The publication may contain additional or more comprehensive technical detail, which it would be impractical to include in full in the Approved Document but which is needed to fully explain ways of meeting the requirements; or it is a source of more general information. The reason for the reference will be indicated in each case. The reference will be to a specified edition of the document. The Approved Document may be amended from time to time to include new references or to refer to revised editions where this aids compliance.
- d. Additional *commentary in italic text* appears after some numbered paragraphs. This commentary is intended to assist understanding of the immediately preceding paragraph or sub-paragraph, or to direct readers to sources of additional information, but is not part of the technical guidance itself.

## Where you can get further help

**1.10** If you do not understand the technical guidance or other information set out in this Approved Document and the additional detailed technical references to which it directs you, there are a number of routes through which you can seek further assistance:

- the Government website: [www.gov.uk](http://www.gov.uk);
- if you are the person undertaking the building work, you can seek assistance either from your local authority building control service or from your approved inspector (depending on which building control service you are using);

- persons registered with a competent person self-certification scheme may be able to get technical advice from their scheme operator;
- if your query is of a highly technical nature, you may wish to seek the advice of a specialist, or industry technical body, for the relevant subject.

## Responsibility for compliance

**1.11** It is important to remember that if you are the person (e.g. designer, builder, installer) carrying out building work to which any requirement of building regulations applies you have a responsibility to ensure that the work complies with any such requirement. The building owner may also have a responsibility for ensuring compliance with building regulation requirements and could be served with an enforcement notice in cases of non-compliance.

## Section 2: The Requirements

**2.1** This Approved Document, which takes effect on 1 October 2010, deals with the **energy efficiency requirements** in the Building Regulations. Regulation 2(1) of the Building Regulations defines the **energy efficiency requirements** as the requirements of regulations 23, 25A, 25B, 26, 28 and 40 and Part L of Schedule 1. The **energy efficiency requirements** relevant to this Approved Document, which deals with existing buildings other than **dwelling**s, are those in regulations 23, 28 and 40 of, and Part L of Schedule 1 to, those Regulations and are set out below.

### Requirements for the renovation or replacement of thermal elements – Regulation 23

- (1) Where the renovation of an individual thermal element—
- (a) constitutes a major renovation; or
  - (b) amounts to the renovation of more than 50% of the element's surface area;
- the renovation must be carried out so as to ensure that the whole of the element complies with paragraph L1(a)(i) of Schedule 1, in so far as that is technically, functionally and economically feasible.
- (2) Where the whole or any part of an individual element is proposed to be replaced and the replacement—
- (a) constitutes a major renovation; or
  - (b) (in the case of part replacement) amounts to the replacement of more than 50% of the thermal element's surface area;
- the whole of the thermal element must be replaced so as to ensure that it complies with paragraph L1(a)(i) of Schedule 1, in so far as that is technically, functionally and economically feasible.

### Consequential improvements to energy performance – Regulation 28

- (1) Paragraph (2) applies to an existing building with a total useful floor area over 1000 m<sup>2</sup> where the proposed building work consists of or includes—
- (a) an extension;
  - (b) the initial provision of any fixed building services; or
  - (c) an increase to the installed capacity of any fixed building services.
- (2) Subject to paragraph (3), where this paragraph applies, such work, if any, shall be carried out as is necessary to ensure that the building complies with the requirements of Part L of Schedule 1.
- (3) Nothing in paragraph (2) requires work to be carried out if it is not technically, functionally or economically feasible.
- Regulation 35 defines 'building' in regulation 28 as follows:

**Regulation 35 Interpretation**

In this Part—

‘building’ means the building as a whole or parts of it that have been designed or altered to be used separately.

*Requirement**Limits on application***Schedule 1 – Part L Conservation of fuel and power**

**L1.** Reasonable provision shall be made for the conservation of fuel and power in buildings by:

- (a) limiting heat gains and losses—
  - (i) through thermal elements and other parts of the building fabric; and
  - (ii) from pipes, ducts and vessels used for space heating, space cooling and hot water services;
- (b) providing fixed building services which—
  - (i) are energy efficient;
  - (ii) have effective controls; and
  - (iii) are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances; and

**Information about use of fuel and power**

40. (1) This regulation applies where paragraph L1 of Schedule 1 imposes a requirement in relation to building work.

(2) The person carrying out the work shall, not later than five days after the work has been completed provide to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

**LIMITATION ON REQUIREMENTS**

**2.2** In accordance with regulation 8 of the Building Regulations, the requirements in Parts A to D, F to K and P (except for paragraphs G2, H2 and J7) of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings).

**2.3** Paragraph G2 is excluded as it deals with water efficiency and paragraphs H2 and J7 are excluded from regulation 8 because they deal directly with prevention of the contamination of water. Parts E and M (which deal, respectively, with resistance to the passage of sound, and access to and use of buildings) are excluded from regulation 8 because they address the welfare and convenience of building users. Part L is excluded from regulation 8 because it addresses the conservation of fuel and power.

## Section 3: General guidance

### Key terms

**3.1** The following are key terms used in this document:

**BCB** means Building Control Body: a local authority or an approved inspector.

**Building envelope** in relation to a building means the walls, floor, roof, windows, doors, roof windows and roof-lights.

**Commissioning** means the advancement of a **fixed building service** following installation, replacement or alteration of the whole or part of the system, from the state of static completion to working order by testing and adjusting as necessary to ensure that the system as a whole uses no more fuel and power than is reasonable in the circumstances, without prejudice to the need to comply with health and safety requirements. For each system **commissioning** includes setting-to-work, regulation (that is testing and adjusting repetitively) to achieve the specified performance, the calibration, setting up and testing of the associated automatic control systems, and recording of the system settings and the performance test results that have been accepted as satisfactory.

**Consequential improvements** means those energy efficiency improvements required by regulation 28.

**Controlled service or fitting** means a service or fitting in relation to which Part G (sanitation, hot water safety and water efficiency), H (drainage and waste disposal), J (combustion appliances and fuel storage systems), L (conservation of fuel and power) or P (electrical safety) of Schedule 1 to the Building Regulations imposes a requirement.

**Display window** means an area of glazing, including glazed doors, intended for the display of products or services on sale within the building, positioned at the external perimeter of the building, at an access level and immediately adjacent to a pedestrian thoroughfare. There should be no permanent workspace within one glazing height of the perimeter. Glazing that extends beyond 3 m above such an access level is not part of a **display window** except:

- where the products on display require a greater height of glazing;
- in existing buildings, when replacing **display windows** that already extend to a greater height;
- in cases of building work involving changes to the façade and glazing and requiring planning consent, where planners have discretion to require a greater height of glazing, e.g. to fit in with surrounding buildings or to match the character of the existing façade.

It is expected that **display windows** will be found in buildings in Planning Use Classes A1, A2, A3 and D2 as detailed in Table 1.

Table 1 Planning Use Classes

Class	Use
A1	Shops: including retail-warehouse, undertakers, showrooms, post offices, hairdressers, shops for sale of cold food for consumption off premises
A2	Financial and professional services: banks, building societies, estate and employment agencies, betting offices
A3	Food and drink: restaurants, pubs, wine bars, shops for sale of hot food for consumption off premises
D2	Assembly and leisure: cinemas, concert halls, bingo halls, casinos, sports and leisure uses

**Dwelling** means a self-contained unit, including a house or flat, designed to be used separately to accommodate a single household. (**Rooms for residential purposes** are not **dwellings** so this Approved Document L2B applies to work in such buildings).

**Emergency escape lighting** means that part of emergency lighting that provides illumination for the safety of people leaving an area or attempting to terminate a dangerous process before leaving an area.

**Energy efficiency requirements** means the requirements of regulations 23, 25A, 25B, 26, 28 and 40 of, and Part L of Schedule 1 to, the Building Regulations.

*In respect of existing buildings the applicable requirements consist of Part L and regulations 23 and 28.*

**energy performance certificate** means a certificate which complies with regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012.

**Fit-out work** means that work needed to complete the internal layout and servicing of the building shell to meet the specific needs of an incoming occupier. The building shell is the structural and non-structural envelope of a building provided as a primary stage (usually for a speculative developer) for a subsequent project to fit out with internal accommodation works.

**Fixed building services** means any part of, or any controls associated with—

- fixed internal or external lighting systems (but not including emergency escape lighting or specialist process lighting);
- fixed systems for heating, hot water, air conditioning or mechanical ventilation; or
- any combination of systems of the kinds referred to in paragraph (a) or (b).

**Major renovation** means the renovation of a building where more than 25% of the surface area of the building envelope undergoes renovation.

**High-usage entrance door** means a door to an entrance primarily for the use of people that is expected to experience large traffic volumes, and where robustness and/or powered operation is the primary performance requirement. To qualify as a **high-usage entrance door**, the door should be equipped with automatic closers and, except where operational requirements preclude, be protected by a lobby.

**Principal works** means the work necessary to achieve the client's purposes in extending the building and/or increasing the installed capacity of any **fixed building services**. The value of the **principal works** is the basis for determining a reasonable provision of **consequential improvements**.

**Renovation** in relation to a thermal element means the provision of a new layer in the thermal element (other than where that new layer is provided solely as a means of repair to a flat roof) or the replacement of an existing layer, but excludes decorative finishes, and 'renovate' shall be construed accordingly.

**Simple payback** means the amount of time it will take to recover the initial investment through energy savings, and is calculated by dividing the marginal additional cost of implementing an energy efficiency measure by the value of the annual energy savings achieved by that measure taking no account of VAT. When making this calculation, the following guidance should be used:

- a. The marginal additional cost is the additional cost (materials and labour) of incorporating (e.g.) additional insulation, not the whole cost of the work.
- b. The cost of implementing the measure should be based on prices current at the date the proposals are made known to the **BCB** and be confirmed in a report signed by a suitably qualified person.
- c. The annual energy savings should be estimated using an energy calculation tool approved by the Secretary of State pursuant to regulation 24.
- d. For the purposes of this Approved Document, the energy prices that are current at the time of the application to building control should be used when evaluating the annual energy savings. Current energy prices can be obtained from the DECC website<sup>1</sup>.

**Thermal element** is defined in regulation 2(3) of the Building Regulations as follows:

(3) In these Regulations 'thermal element' means a wall, floor or roof (but does not include windows, doors, roof windows or roof-lights) which separates a thermally conditioned part of the building ('the conditioned space') from:

- a. the external environment (including the ground); or

- b. in the case of floors and walls, another part of the building which is:
  - i. unconditioned;
  - ii. an extension falling within class VII in Schedule 2; or
  - iii. where this paragraph applies, conditioned to a different temperature, and includes all parts of the element between the surface bounding the conditioned space and the external environment or other part of the building as the case may be.

(4) Paragraph (3)(b)(iii) applies only to a building which is not a dwelling, where the other part of the building is used for a purpose which is not similar or identical to the purpose for which the conditioned space is used.

*Note that this definition encompasses the walls and floor of a swimming pool basin where this is part of an existing building.*

**Total useful floor area** is the total area of all enclosed spaces measured to the internal face of the external walls, that is to say it is the gross floor area as measured in accordance with the guidance issued to surveyors by the RICS. In this convention:

- a. the area of sloping surfaces such as staircases, galleries, raked auditoria, and tiered terraces should be taken as their area on plan; and
- b. areas that are not enclosed such as open floors, covered ways and balconies are excluded.

*This equates to the gross floor area as measured in accordance with the guidance issued to surveyors by the RICS.*

## Types of work covered by this Approved Document

**3.2** This Approved Document is intended to give guidance on what, in ordinary circumstances, may be considered reasonable provision for compliance with the requirements of regulations 23, 28 and 40 of, and Part L of Schedule 1 to, the Building Regulations when carrying out work on existing buildings that are not **dwelling**s. In addition it gives guidance on compliance with regulations 25A, 27, 43 and 44 of the Building Regulations and 20(1), 20(2) and 20(6) of the Approved Inspectors Regulations 2010.

*It should be noted that **dwelling**s are defined as self-contained units. **Rooms for residential purposes** are not **dwelling**s, and so this Approved Document applies to them.*

**3.3** In particular, this Approved Document gives guidance on compliance with the **energy efficiency requirements** where the following occurs:

- a. the construction of an extension (see paragraphs 4.1 to 4.13);
- b. a material change of use or a change to the building's energy status (paragraphs 4.15 to 4.21);

<sup>1</sup> [www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics#energy-price-statistics](http://www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics#energy-price-statistics)

- c. the provision or extension of a **controlled fitting** or **controlled service** (see paragraphs 4.22 to 4.48);
- d. the replacement or **renovation** of a **thermal element** (Section 5);
- e. the **major renovation** of a building;
- f. **consequential improvements** (Section 6).

**3.4** For certain types of work in relation to an existing building, it may be more appropriate to use the guidance from the other Approved Documents L, or to follow only a limited amount of the guidance in this Approved Document. The following sub-paragraphs identify some of the circumstances in which this might be appropriate:

- a. For **first fit-out works** in buildings such as shell and core office buildings or business park units, the guidance in Approved Document L2A (new non-domestic buildings) covering first fit-out should be followed (but note that the appropriate guidance for any subsequent **fit-out works** is contained in this Approved Document).
- b. Large extensions (as defined in paragraph 4.2) should be carried out in accordance with the guidance in Approved Document L2A. However, regulation 28 (**consequential improvements** to energy performance) may apply, in which case the guidance in relation to that regulation set out in this Approved Document would be relevant.
- c. Modular and portable buildings: where the work involves the construction of subassemblies that have been obtained from a centrally held stock or from the disassembly or relocation of such buildings at other premises, the guidance in Approved Document L2A should be followed but regulation 28 (**consequential improvements** to energy performance) may also apply if the work was to extend an existing building. In that context, the guidance in relation to that regulation as set out in this Approved Document would be relevant.

*Note that erecting a separate unit on a site with an existing building is not extending that existing building, but is the creation of a new building, unless the new unit is to be permanently linked to the existing building.*

- d. Where the work involves a building that either before the work or after the work is completed contains one or more **dwellings**, the guidance in Approved Document L1B would apply to each **dwelling**.

*It should be noted that **dwellings** are defined as self-contained units. **Rooms for residential purposes** are not **dwellings**, and so this Approved Document applies to them.*

## Buildings exempt from the energy efficiency requirements

### 3.5 Building work in most existing buildings

other than **dwellings** will need to comply with the **energy efficiency requirements** of the Building Regulations where the buildings are roofed constructions having walls and use energy to condition the indoor climate. Regulation 21 of the Regulations, however, grants an exemption from compliance with the **energy efficiency requirements** to certain classes of buildings:

- a. buildings which are:
  - i. listed in accordance with section 1 of the Planning (Listed Buildings and Conservation Areas) Act 1990;
  - ii. in a conservation area designated in accordance with section 69 of that Act; or
  - iii. included in the schedule of monuments maintained under section 1 of the Ancient Monuments and Archaeological Areas Act 1979,

where compliance with the **energy efficiency requirements** would unacceptably alter their character or appearance;

- b. buildings which are used primarily or solely as places of worship;
- c. temporary buildings with a planned time of use of 2 years or less, industrial sites, workshops and non-residential agricultural buildings with low energy demand;
- d. stand-alone buildings other than **dwellings** with a **total useful floor area** of less than 50 m<sup>2</sup>;
- e. carports, covered yards, covered ways and some conservatories or porches attached to existing buildings. Guidance on these is given at paragraphs 3.21 and 3.22 below.

### Special considerations

**3.6** Special considerations apply to certain classes of non-exempt building. These building types are:

- a. historic buildings and buildings used primarily or solely as places of worship; the considerations that apply to such existing buildings are given in paragraphs 3.9 to 3.14;
- b. buildings with low energy demand; the guidance specific to such buildings is given in paragraphs 3.15 to 3.20;
- c. modular and portable buildings; for the construction of such buildings with a planned service life of more than 2 years at one or more locations, the guidance in Approved Document L2A should be followed. Any changes to the building fabric or **fixed building services** should comply with this Approved Document.

### Historic and traditional buildings which may have an exemption

**3.7** As mentioned above in paragraph 3.5 the following classes of buildings have an exemption from the **energy efficiency requirements** where compliance would unacceptably alter the character or appearance of the buildings:

- a. listed buildings;
- b. buildings in conservation areas; and
- c. scheduled ancient monuments.

### Historic and traditional buildings where special considerations may apply

**3.8** There are three further classes of buildings where special considerations in making reasonable provision for the conservation of fuel or power may apply:

- a. buildings which are of architectural and historical interest and which are referred to as a material consideration in a local authority's development plan or local development framework;
- b. buildings which are of architectural and historical interest within national parks, areas of outstanding natural beauty, registered historic parks and gardens, registered battlefields, the curtilages of scheduled ancient monuments and world heritage sites;
- c. buildings of traditional construction with permeable fabric that both absorbs and readily allows the evaporation of moisture.

**3.9** When undertaking work on or in connection with a building that falls within one of the classes listed above, the aim should be to improve energy efficiency as far as is reasonably practical. The work should not prejudice the character of the host building or increase the risk of long-term deterioration of the building fabric or fittings.

**3.10** The guidance given by English Heritage<sup>2</sup> should be taken into account in determining appropriate energy performance standards for building work in historic buildings.

*In addition English Heritage has produced detailed technical guidance on how to implement specific energy efficiency measures. (See list of available guidance documents at <http://www.english-heritage.org.uk/professional/advice/advice-by-topic/climate-change/energy-efficiency/>.)*

**3.11** In general, new extensions to historic or traditional buildings should comply with the standards of energy efficiency as set out in this Approved Document. The only exception would be where there is a particular need to match the external appearance or character of the extension to that of the host building.

**3.12** Particular issues relating to work in historic buildings that warrant sympathetic treatment and where advice from others could therefore be beneficial include:

- a. restoring the historic character of a building that has been subject to previous inappropriate alteration, e.g. replacement windows, doors and rooflights;

- b. rebuilding a former historic building (e.g. following a fire or filling a gap site in a terrace);
- c. making provisions enabling the fabric of historic buildings to 'breathe' to control moisture and potential long-term decay problems.

**3.13** In assessing reasonable provision for energy efficiency improvements for historic buildings of the sort described in paragraphs 3.7 and 3.8, it is important that the **BCB** takes into account the advice of the local authority's conservation officer. The views of the conservation officer are particularly important where building work requires planning permission and/or listed building consent.

### Places of worship

**3.14** For the purposes of the **energy efficiency requirements**, places of worship are taken to mean those buildings or parts of a building that are used for formal public worship, including adjoining spaces whose function is directly linked to that use. Such parts of buildings of this type often have traditional, religious or cultural constraints that mean that compliance with the **energy efficiency requirements** would not be possible. Other parts of the building that are designed to be used separately, such as offices, catering facilities, day centres and meeting halls are not exempt.

### Industrial sites, workshops and non residential agricultural buildings with low energy demand

**3.15** In relation to this category of exempt building, the low energy demand relates only to the energy used by fixed heating or cooling systems, NOT to energy required for or created by process needs. The following are examples of buildings in the above categories that are low energy demand:

- a. buildings or parts of buildings where the space is not generally heated, other than by process heat, or cooled;
- b. buildings or parts of buildings that require heating or cooling only for short periods each year, such as during critical periods in the production cycle (e.g. plant germination, egg hatching) or in very severe weather conditions.

**3.16** Industrial sites, workshops and non-residential agricultural buildings are only exempt if they meet the low energy demand criterion. If not exempt, such buildings must comply with **energy efficiency requirements**. Similarly, other buildings (e.g. some types of warehouse) may have low energy demand but are not exempt because they do not fall into one of the above categories.

### Non-exempt buildings with low energy demand

**3.17** For the purposes of this Approved Document, non-exempt buildings with low energy demand are taken to be those buildings or parts thereof where:

<sup>2</sup> Energy Efficiency and Historic Buildings, English Heritage, 2011  
[www.english-heritage.org.uk/publications/energy-efficiency-historic-buildings-pt1/](http://www.english-heritage.org.uk/publications/energy-efficiency-historic-buildings-pt1/)

- a. **fixed building services** are used to heat or cool only a localised area rather than the entire enclosed volume of the space concerned (e.g. localised radiant heaters at a workstation in a generally unheated space); or
- b. **fixed building services** are used to heat spaces in the building to temperatures substantially lower than those normally provided for human comfort (e.g. to provide condensation or frost protection in a warehouse).

**3.18** In such situations, it is not reasonable to expect the entire building envelope to be insulated to the standard expected for more typical buildings. Therefore, if an existing building with low levels of heating is extended or parts of the fabric renovated, the new or renovated building envelope should be insulated only to a degree that is reasonable in the particular case. If some general heating is provided (case b above), then it would be reasonable that no part of the opaque fabric had a U-value worse than 0.7 W/m<sup>2</sup>.K. In addition, reasonable provision would be for every **fixed building service** that is installed to meet the energy efficiency standards set out in the *Non-Domestic Building Services Compliance Guide*<sup>3</sup>.

**3.19** If a part of a building with low energy demand is partitioned off and heated normally (e.g. an office area in an unheated warehouse), the separately heated area should be treated as a separate 'building' and the normal procedures for demonstrating compliance should be followed in respect of the enclosure.

**3.20** If a building with low energy demand subsequently changes such that the space is generally conditioned, then this is likely to involve the initial provision or an increase in the installed capacity of a **fixed building service**. Such activities may fall within regulation 28 which would require the building envelope to be upgraded and **consequential improvements** to be made (see the guidance in Section 6 of this Approved Document). Alternatively, if the building shell was designed as a building with low energy demand and the first occupier of the building wanted to install (e.g.) heating, this would be a first **fit-out works**, and Approved Document L2A would apply.

### Conservatories and porches

**3.21** Regulation 21 of the Building Regulations exempts some conservatory and porch extensions from the **energy efficiency requirements**. The exemption applies only to conservatories or porches:

- which are at ground level;
- where the floor area is less than 30m<sup>2</sup>;
- where the glazing complies with Parts K 4, K 5.1, K 5.2, K 5.3 and K 5.4 of Schedule 1;
- where the existing walls, doors and windows which separate the conservatory from the building are retained or, if removed, are replaced

by walls, windows and doors which meet the **energy efficiency requirements**; and

- where the heating system of the building is not extended into the conservatory or porch.

**3.22** Where any conservatory or porch does not meet all the requirements in the preceding paragraph, it is not exempt and must comply with the relevant **energy efficiency requirements** (see paragraphs 4.12 and 4.13 below).

### Notification of work covered by the energy efficiency requirements

**3.23** In most instances, in order to comply with the Building Regulations it will be necessary to notify a **BCB** before the work starts. If you choose to use the local authority this must be by deposit of full plans. There is no set procedure where the **BCB** is an Approved Inspector provided it has been notified at least 5 days before work starting.

**3.24** In certain situations, however, other procedures apply:

- a. Where the work is being carried out by a person registered with a relevant competent person self-certification scheme listed in Schedule 3 to the Building Regulations, no advance notification to the **BCB** is needed (see paragraphs 3.25 to 3.28);
- b. Where the work involves an emergency repair, e.g. to a failed boiler or a leaking hot water cylinder, in accordance with regulation 12(8) of the Building Regulations there is no need to delay making the repair in order to make an advance notification to the **BCB**. However, in such cases it will still be necessary for the work to comply with the relevant requirements and to give a notice to the **BCB** at the earliest opportunity, unless an installer registered under an appropriate competent person scheme carries out the work. A completion certificate can then be issued in the normal way;
- c. Where the work is of a minor nature as described in the schedule of non-notifiable work (Schedule 4 to the Building Regulations), the work must still comply with the relevant requirements but need not be notified to the **BCB** (see paragraphs 3.29 and 3.30).

### Competent person self-certification schemes

**3.25** It is not necessary to notify a **BCB** in advance of work which is to be carried out by a person registered with a relevant competent person self-certification scheme listed in Schedule 3 to the Building Regulations. In order to join such a scheme, a person must demonstrate competence to carry out the type of work the scheme covers, and also the ability to comply with all relevant requirements in the Building Regulations.

**3.26** Where work is carried out by a person registered with a competent person scheme, regulation 20 of the Building Regulations and

<sup>3</sup> *Non-Domestic Building Services Compliance Guide*, DCLG, 2013.

regulation 20(1) of the Approved Inspectors Regulations require that the occupier of the building be given, within 30 days of the completion of the work, a certificate confirming that the work complies fully with all applicable building regulation requirements. There is also a requirement to give the **BCB** a notice of the work carried out, again within 30 days of the completion of the work. These certificates and notices are usually made available through the scheme operator.

**3.27 BCBs** are authorised to accept these certificates and notices as evidence of compliance with the requirements of the Building Regulations. Local authority inspection and enforcement powers remain unaffected, although they are normally used only in response to a complaint that work does not comply.

**3.28** A list of authorised self-certification schemes and the types of work for which they are authorised can be found at [www.communities.gov.uk](http://www.communities.gov.uk).

### Work which need not be notified

**3.29** Schedule 4 to the Building Regulations sets out types of work where there is no requirement to notify a **BCB** that work is to be carried out. These types of work are mainly of a minor nature where there is no significant risk to health, safety or energy efficiency. Note that the health, safety and **energy efficiency requirements** continue to apply to these types of work, and that only the need to notify a **BCB** has been removed. In addition, where only non-notifiable work is carried out by a member of a competent person self-certification scheme there is no requirement for a certificate of building regulations compliance to be given to the occupier or the **BCB**.

**3.30** The types of non-notifiable work in Schedule 4 relevant to the **energy efficiency requirements** of the Regulations are:

- a. In a heating, hot water service, ventilation or air-conditioning system, the replacement of any part which is not a combustion appliance (such as a radiator, valve or pump) or the addition of an output device (such as a radiator or fan) or the addition of a control device (such as a thermostatic radiator valve). However, the work will remain notifiable whenever **commissioning** is possible and necessary to enable a reasonable use of fuel and power.
- b. The installation of a stand-alone, self-contained fixed heating, hot water, ventilation or air-conditioning service. Such services must consist only of a single appliance and any associated controls, and must not be connected to any other **fixed building service**. Examples of non-notifiable services would be a fixed electric heater, a mechanical extractor fan in a kitchen or bathroom, and a room air-conditioning unit. However, if any of the following apply, the work will remain notifiable building work:

- i. the service is a combustion appliance; or
  - ii. **commissioning** is possible and would affect the service's energy efficiency (see paragraphs 4.36 to 4.48); or
  - iii. in the case of a ventilation appliance, the appliance is installed in a room containing a natural draught open-flued combustion appliance or service, such as a gas fire which uses a chimney as its flue.
- c. Installation of thermal insulation in a roof space or loft space where this is the only work carried out and the work is carried out voluntarily and not in order to comply with any requirement in the Building Regulations.

## Materials and workmanship

**3.31** Any building work which is subject to the requirements imposed by schedule 1 to the Building Regulations shall be carried out in accordance with regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in the Approved Document to support regulation 7.

**3.32** Building Regulations are made for specific purposes, primarily the health and safety, welfare and convenience of people and for energy conservation. Standards and other technical specifications may provide relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance or matters which, although they relate to health and safety etc., are not covered by the Building Regulations.

**3.33** When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

## The Workplace (Health, Safety and Welfare) Regulations 1992

**3.34** The Workplace (Health, Safety and Welfare) Regulations 1992, as amended, apply to the common parts of flats and similar buildings if people such as cleaners, wardens and caretakers are employed to work in these common parts. These Regulations contain some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see *Workplace health, safety and welfare, Workplace (Health, Safety and Welfare) Regulations 1992, Approved Code of Practice and guidance*, HSE publication L24, 1996.

# Section 4: Guidance relating to building work

## EXTENSIONS

**4.1** Under regulation 28 of the Building Regulations, the construction of an extension triggers the requirement for **consequential improvements** in buildings with a **total useful floor area** greater than 1000m<sup>2</sup>. In such cases, the guidance in Section 6 should be followed in addition to the following specific guidance.

### Large extensions

**4.2** Where the proposed extension has a **total useful floor area** that is both:

- greater than 100 m<sup>2</sup>, and
- greater than 25 per cent of the **total useful floor area** of the existing building,

the work should be regarded as a new building and the guidance in Approved Document L2A (2010 edition)<sup>4</sup> followed. The requirement for **consequential improvements**, if appropriate, should also be met by following the guidance in Section 6 of this Approved Document.

### Other extensions – reference method

#### Fabric standards

**4.3** Reasonable provision would be for the proposed extension to incorporate the following:

- doors, windows, roof windows, rooflights and smoke vents that meet the standards set out in paragraphs 4.23 to 4.28;
- newly constructed **thermal elements** that meet the standards set out in paragraphs 5.1 to 5.7;
- existing opaque fabric which becomes a **thermal element** where previously it was not should be upgraded so that it meets the standards in paragraphs 5.12 to 5.14.

#### Opening areas

**4.4** The area of windows and rooflights in the extension should generally not exceed the values given in Table 2. However, where a greater proportion of glazing is present in the part of the building to which the extension is attached, reasonable provision would be to limit the proportion of glazing in the extension so that it is no greater than the proportion that exists in the part of the building to which it is attached.

#### Building services systems in the extension

**4.5** Where **fixed building services** are provided or extended as part of constructing the extension, reasonable provision would be to follow the guidance in paragraphs 4.29 to 4.48.

### Optional approaches with more design flexibility

**4.6** The approach set out in paragraphs 4.3 to 4.5 is somewhat prescriptive. The following paragraphs offer more flexible approaches to demonstrating that reasonable provision has been made. These alternative approaches allow some elements of the design to be relaxed through compensating measures elsewhere.

#### Area-weighted U-value method

**4.7** The U-values given in paragraph 4.3 and the opening areas given in paragraph 4.4 may be varied provided that the area-weighted U-value of all the elements in the extension is no greater than that of an extension of the same size and shape that complies with the U-value standards referred to in paragraph 4.3 and the opening area standards in paragraph 4.4. Any **fixed building service** provided or extended as part of constructing the extension should follow the guidance in paragraphs 4.29 to 4.48.

**4.8** The area-weighted U-value is given by the following expression:

$$\frac{\{(U_1 \times A_1) + (U_2 \times A_2) + (U_3 \times A_3) + \dots\}}{\{(A_1 + A_2 + A_3 + \dots)\}}$$

**Table 2 Opening areas in the extension**

Building type	Windows and personnel doors as % of exposed wall	Rooflights as % of area of roof
Residential buildings where people temporarily or permanently reside	30	20
Places of assembly, offices and shops	40	20
Industrial and storage buildings	15	20
Vehicle access doors and display windows and similar glazing	As required	N/A
Smoke vents	N/A	As required

<sup>4</sup> Notwithstanding the withdrawal of Approved Document L2A (2010 Edition) in DCLG Circular 04/13 it may be used for this purpose.

### Whole building calculation method

**4.9** Where even greater design flexibility is required, reasonable provision would be to use an approved calculation tool to demonstrate that the calculated CO<sub>2</sub> emissions from the building and proposed extension are no greater than for the building plus a notional extension complying with the standards of paragraphs 4.3 to 4.5.

*Approved Document C gives limiting values for individual elements to minimise condensation risk.*

**4.10** The specification of the existing building used in conjunction with the notional extension as the basis of setting the CO<sub>2</sub> target for the building work shall include all upgrades that will be included in fulfilment of the requirement for **consequential improvements** (see Section 6).

*Otherwise all the low-cost measures would have been taken by the compensatory measures, leaving little leeway for overall improvement.*

**4.11** Where additional upgrades over and above the **consequential improvements** are proposed in the actual building to compensate for lower performance in the extension, then such upgrades should be implemented to a standard that is no worse than set out in the relevant guidance contained in this Approved Document. The relevant standards for upgrading retained **thermal elements** are as set out in column (b) of Table 5.

*Where it is proposed to upgrade, the standards set out in this Approved Document are cost-effective and should be implemented in full. It will be worthwhile implementing them even if the improvement is greater than necessary to achieve compliance. In some cases, therefore, the standard of the extended building may be better than that required by paragraphs 4.1 to 4.10.*

### Conservatories and porches

**4.12** Where the extension is a conservatory or porch that is not exempt from the **energy efficiency requirements** (see paragraphs 3.21 and 3.22 above), then reasonable provision would be to provide:

- Effective thermal separation between the heated area in the existing building, i.e. the walls, doors and windows between the building and the extension should be insulated and draughtproofed to at least the same extent as in the existing building.
- Independent temperature and on/off controls to any heating system installed within the extension. Any fixed building service installed within the extension should also conform to the standards set out in paragraphs 4.29 to 4.48.
- Glazed elements should meet the standards set out in Table 3 and opaque elements should meet the standards set out in Table 4. However, the limitations on total area of windows, roof windows and doors as set out at paragraph 4.4 above do not apply.

**4.13** Removing, and not replacing, any of the thermal separation between the building and an existing exempt extension, or extending the building's heating system into the extension, means that the extension ceases to be exempt (see paragraphs 3.21 and 3.22 above). In such situations, the extension should be treated as a conventional extension and reasonable provision would be to demonstrate that the extension meets the guidance set out in paragraphs 4.1 to 4.11 above.

### Swimming pool basins

**4.14** Where a swimming pool is being provided in a building, the U-value of the basin (walls and floor) should be not worse than 0.25 W/m<sup>2</sup>.K as calculated according to BS EN ISO 13370<sup>5</sup>.

*Design consideration should be taken with regards to compressive creep, insulation boards not being fully supported and the effects of point loading. Care should be taken to avoid thermal bridging particularly around basin wall and floor junctions with foundations.*

## MATERIAL CHANGE OF USE AND CHANGE OF ENERGY STATUS

### Material change of use

**4.15** Material changes of use (see regulation 5 of the Building Regulations) covered by this document are where, after the change:

- the building is used as a hotel or a boarding house, where previously it was not;
- the building is used as an institution, where previously it was not;
- the building is used as a public building, where previously it was not;
- the building is not a building described in Classes I to VI in Schedule 2, where previously it was;
- the building contains a room for residential purposes, where previously it did not;
- the building, which contains at least one room for residential purposes, contains a greater or lesser number of such rooms than it did previously; or
- the building is used as a shop where previously it was not.

### Change of energy status

**4.16** A change to a building's energy status is defined in regulation 2(1) as:

any change which results in a building becoming a building to which the energy efficiency requirements of these Regulations apply, where previously it was not.

<sup>5</sup> BS EN ISO 13370 Thermal performance of buildings – Heat transfer via the ground – Calculation methods [2007 incorporating corrigendum March 2009].

**4.17** The requirements relating to a change to energy status are in regulation 22:

Where there is a change in a building's energy status, such work, if any, shall be carried out to ensure that the building complies with the applicable requirements of Part L of Schedule 1.

**4.18** In this regulation 'building' means the building as a whole or parts of the building that have been designed or altered to be used separately.

*For example, this could occur where a previously unheated building, or parts of the building that have been designed or altered to be used separately, were to be heated in future, or where a previously exempt building were no longer within the exempted categories. A material alteration (regulation 3(2) and (3)) may result in a change in a building's energy status.*

**4.19** In normal circumstances, reasonable provision when there is a material change of use or a change to the building's energy status would be:

- a. Where **controlled services or fittings** are being provided or extended, to meet the standards set out in paragraphs 4.22 to 4.48. If the area of openings in the newly created building is more than 25 per cent of the total floor area, the area of openings should either be reduced to be not greater than 25 per cent, or the larger area should be compensated for in some other way using the procedure described in paragraph 4.21.
- b. Where the work involves the provision of a **thermal element**, to meet the standards set out in paragraphs 5.1 to 5.7.

*For the purposes of the Building Regulations, provision means both new and replacement elements.*

- c. Where any **thermal element** is being retained, to upgrade it following the guidance given in paragraphs 5.12 to 5.14. This guidance should also be followed in respect of any existing element that becomes part of the thermal envelope of the building where previously it was not.

*As an example, this would include the party wall between units in a terrace of industrial units which originally were unheated, but heating is to be provided to one of the units.*

- d. Where an existing window (including roof window or rooflight) or door which separates a conditioned space from an unconditioned space or the external environment has a U-value that is worse than 3.3 W/(m<sup>2</sup>.K), to follow the guidance in paragraphs 4.23 to 4.28 unless it is a **display window** or **high usage entrance door**. It would be reasonable in these latter cases to make some lesser provision for energy efficiency.

**4.20** As well as satisfying the **energy efficiency requirements** in respect of the material change of use or change in energy status, such building work may be one of the triggers for **consequential**

**improvements** – see regulation 28 and Section 6.

### Option providing more design flexibility

**4.21** To provide more design flexibility, an approved calculation tool can be used to demonstrate that the CO<sub>2</sub> emissions from the building as it will become are no worse than if the building had been improved following the guidance set out in paragraph 4.19.

## WORK ON CONTROLLED FITTINGS AND SERVICES

**4.22** A **controlled service or fitting** is defined in Regulation 2(1) as follows:

'Controlled service or fitting' means a service or fitting in relation to which Part G, H, J, L or P of Schedule 1 imposes a requirement;

### Controlled fittings

**4.23** In the context of this Approved Document, the application of the term **controlled fitting** to a window, roof window, rooflight or door refers to a whole unit, i.e. including the frame. Consequently, replacing the glazing whilst retaining an existing frame is not providing a **controlled fitting**, and so such work is not notifiable and does not have to meet the Part L standards, although where practical it would be sensible to do so. Similar arguments apply to a new door in an existing frame.

**4.24** Where windows, roof windows, rooflights or doors are to be provided, reasonable provision in normal cases would be the installation of draught-proofed units whose performance is no worse than given in Table 3. In addition, insulated cavity closers should be installed where appropriate. If a window, pedestrian door or rooflight is enlarged or a new one created, then the area of the windows and pedestrian doors and of rooflights expressed as a percentage of the total floor area of the building should not exceed the relevant value from Table 2, or should be compensated for in some other way. Where the windows or fully glazed external pedestrian doors are unable to meet the requirements of Table 3 because of the need to maintain the external appearance of the façade or the character of the building, such fittings should meet a centre pane U-value of 1.2 W/(m<sup>2</sup>.K), where the centre-pane U-value is defined as the U-value determined in the central area of the glazing unit, making no allowance for edge spacers or window frame. As an alternative, single glazing should be supplemented with low-e secondary glazing. In this latter case, the weather stripping should be on the secondary glazing to minimise condensation risk between the primary and secondary glazing. Where enhanced performance requirements (e.g. wind load, safety, security or acoustic attenuation) require thicker glass to be used, reasonable provision would be demonstrated if the window unit with the equivalent standard glazing thickness can be shown to comply.

**4.25** U-values of windows, roof-windows, rooflights and doors shall be calculated using the

Table 3 Standards for controlled fittings

Fitting	Standard
Windows in buildings that are essentially domestic in character <sup>2</sup>	Window Energy Rating <sup>3</sup> of Band C or 1.6 W/(m <sup>2</sup> .K)
All other windows and roof windows and rooflights <sup>1,4</sup>	U-value 1.8 W/(m <sup>2</sup> .K) for the whole unit
Curtain walling	See paragraph 4.28
Pedestrian doors where the door has more than 60% of its external face area glazed	U-value 1.8 W/(m <sup>2</sup> .K)
All other pedestrian doors	U-value 1.8 W/(m <sup>2</sup> .K)
High usage entrance doors for people	U-value 3.5 W/(m <sup>2</sup> .K)
Vehicle access and similar large doors	U-value 1.5 W/(m <sup>2</sup> .K)
Roof ventilators (including smoke extract ventilation)	U-value 3.5 W/(m <sup>2</sup> .K)

**Notes:**

- 1 Display windows are not required to meet the standard given in this table.
- 2 For example, student accommodation, care homes and similar uses where the occupancy levels and internal gains are essentially domestic in character.
- 3 See Guide to the Calculation of Energy Ratings for Windows, Roof Windows and Doors, GGF, 2013 at [www.ggf.org.uk](http://www.ggf.org.uk).
- 4 For the purposes of checking compliance with this table, the true U-value based on aperture area can be converted to the U-value based on the developed area of the rooflight. Further guidance on evaluating the U-value of out-of-plane rooflights is given in Assessment of thermal performance of out-of-plane rooflights, NARM Technical Document NTD 2 (2010). See <http://www.narm.org.uk/uploads/pdfs/NARM-TAOOPR-030311.pdf>.

methods and conventions set out in BR 443<sup>6</sup>, and should be based on the whole unit (i.e. in the case of a window, the combined performance of the glazing and frame). The U-value for windows can be taken as that for:

- a. the smaller of the two standard windows defined in BS EN 14351-1<sup>7</sup>; or
- b. the standard configuration referred to in BR 443; or
- c. the specific size and configuration of the actual window.

The U-value of the door can be calculated for:

- a. the standard size as laid out in BS EN 14351-1; or
- b. the specific size and configuration of the actual door.

*For domestic type construction, SAP 2012 Table 6e gives values for different window configurations that can be used in the absence of test data or calculated values.*

**4.26** The U-values for roof windows and rooflights given in this Approved Document are based on the particular U-value having been assessed with the roof window or rooflight in the vertical position. If a particular unit has been assessed in a plane other than the vertical, the standards given in this Approved Document should be modified by making a U-value adjustment following the guidance given in BR 443.

*The stated standard for a replacement plastic rooflight as given in Table 3 is 1.8 W/(m<sup>2</sup>.K). This is for the unit assessed in the vertical plane. If the performance of a triple-skin rooflight was*

*assessed in the horizontal plane, then, based on the guidance given in BR 443, the standard would be adjusted by 0.3 W/(m<sup>2</sup>.K) (the value from BR 443 for a horizontal triple-skin rooflight), requiring the rooflight as assessed in the horizontal plane to achieve a standard of  $1.8 + 0.3 = 2.1$  W/(m<sup>2</sup>.K).*

**4.27** In certain classes of building with high internal gains, a less demanding U-value for glazing may be an appropriate way of reducing overall CO<sub>2</sub> emissions. If this case can be made, then the average U-value for windows, doors and rooflights can be relaxed from the values given in Table 3, but the value should not exceed 2.7 W/(m<sup>2</sup>.K).

**4.28** The overall U-value of curtain walling should be no greater than the better of 1.8 W/(m<sup>2</sup>.K) or a limiting U-value  $U_{\text{limit}}$  given by:

$$U_{\text{limit}} = 0.8 + \{(1.2 + (\text{FOL} \times 0.5)) \times \text{GF}\}$$

where FOL is the fraction of opening lights and GF is the glazed fraction.

*This means that if an area of curtain walling is to be 60 per cent glazed and 40 per cent opaque, with 50 per cent opening lights, the U-value standard should be  $0.8 + (1.2 + 0.5 \times 0.5) \times 0.6 = 1.7$  W/(m<sup>2</sup>.K).*

## Controlled services

**4.29** Where the work involves the provision or extension of **controlled services**, reasonable provision would be demonstrated by following the guidance set out in the *Non-Domestic Building Services Compliance Guide*. The Guide covers the following services:

- a. heating and hot water systems (including insulation of pipes, ducts and vessels;
- b. mechanical ventilation;

<sup>6</sup> BR 443 Conventions for U-value calculations, BRE, 2006

<sup>7</sup> BS EN 14351-1 Windows and doors – Product standard, performance characteristics. Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics [2006 (+AMD 1:2010)].

- c. mechanical cooling/air-conditioning;
- d. fixed internal lighting; note that as detailed in Schedule 4, the work is not notifiable if the floor area that is to be provided with new fixed lighting is not greater than 100m<sup>2</sup>. Although not notifiable, the work should still meet the standards set out in the compliance guide.
- e. renewable energy systems.

**4.30** In general terms, the aim should be to:

- a. provide new **fixed building services** that meet reasonable standards of energy efficiency, which in normal circumstances would be:
  - i. an efficiency not less than set out in the *Non-Domestic Building Services Compliance Guide*. The efficiency claimed for the **fixed building service** should be based on the appropriate test standard as set out in the Guide and the test data should be certified by a notified body. It would be reasonable for **BCBs** to accept such data at face value. In the absence of such quality assured data, **BCBs** should satisfy themselves that the claimed performance is justified. If a particular technology is not covered in the Guide, reasonable provision would be demonstrated by showing that the proposed technology gives a performance that is no worse than a reference system of the same type whose details are given in the Guide; and
  - ii. an efficiency not less than that of the **controlled service** being replaced. If the new service uses a different fuel, the efficiency of the new appliance should be multiplied by the ratio of the CO<sub>2</sub> emission factor of the fuel used in the appliance being replaced to that of the fuel used in the new appliance before making this check.

*This will prevent an existing low-carbon component being replaced by a lesser provision when fuel switching. For example, if an existing electric chiller with a Co-efficient of Performance (CoP) of 2.5 is replaced by an absorption chiller with a CoP of 0.8 but fired by waste heat, the equivalent efficiency of the absorption chiller would be  $0.8 \times (0.519/0.058) = 7.2$ , and so test (ii) would be satisfied. 0.519 and 0.058 kgCO<sub>2</sub>/kWh are the emission factors for electricity and waste heat respectively<sup>8</sup>.*

- b. provide new HVAC systems with appropriate controls to achieve reasonable standards of energy efficiency. In normal circumstances reasonable provision would be to provide the following control features on each system in addition to the system-specific controls detailed in subsequent paragraphs:
  - i. the **fixed building services** systems should be sub-divided into separate control zones to correspond to each area of the

building that has a significantly different solar exposure, occupancy period, or type of use;

- ii. each separate control zone should be capable of independent switching and control of set-point;
- iii. the provision of the service should respond to the requirements of the space it serves. If both heating and cooling are provided, they should be controlled so they do not operate simultaneously;
- iv. central plant serving the zone-based systems should operate only as and when required. The default condition should be off;
- v. in addition to these general control requirements, the systems should meet the specific control requirements and general energy efficiency criteria as set out in the *Non-Domestic Building Services Compliance Guide*.

- c. demonstrate the new service has been effectively commissioned (see paragraphs 4.36 to 4.48);
- d. demonstrate that reasonable provision of energy meters has been made for effective monitoring of the performance of newly installed plant (see paragraphs 4.33 to 4.35);
- e. demonstrate that the relevant information has been recorded in a new log book or incorporated into an update of the existing one as described in Section 7.

**4.31** If a renewable energy generator such as a wind turbine or photovoltaic array is being replaced, the new system should have an electrical output that is not less than the original installation.

**4.32** When replacing a heating appliance, consideration should be given to connecting to any existing local heat networks. If the work involves pipework changes, consideration should be given to providing capped off connections to facilitate subsequent connection to a planned local heat network.

### Energy meters

**4.33** The aim for buildings as a whole is to enable building occupiers to assign at least 90 per cent of the estimated annual energy consumption of each fuel to the various end-use categories (heating, lighting, etc.).

**4.34** Reasonable provision for energy meters in existing buildings would be to install energy metering systems in the building service systems provided as part of the works in accordance with the recommendations in CIBSE TM 39<sup>9</sup>.

<sup>8</sup> See Table 12 at [www.bre.co.uk/sap2012](http://www.bre.co.uk/sap2012).

<sup>9</sup> TM 39 *Building energy metering*, CIBSE, 2009.

**4.35** In addition to this:

- a. meters should be provided to enable the performance of any renewable energy system provided as part of the works to be separately monitored;
- b. in buildings with a **total useful floor area** greater than 1000 m<sup>2</sup>, the metering system should enable automatic meter reading and data collection;
- c. the metering provisions should be designed such as to facilitate the benchmarking of energy performance as set out in TM 46<sup>10</sup>.

Following implementation of the Energy Services Directive, there are likely to be legal obligations for persons **commissioning** building work on existing buildings with floor areas in excess of 1000 m<sup>2</sup> to notify their intentions to the energy supply companies.

## COMMISSIONING OF FIXED BUILDING SERVICES

**4.36** Regulation 44 (**Commissioning**) states:

**44–(1)** This regulation applies to building work in relation to which paragraph F1(2) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed system for mechanical ventilation or any associated controls where testing and adjustment is not possible.

(2) This regulation applies to building work in relation to which paragraph L1(b) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed building service where testing and adjustment is not possible or would not affect the energy efficiency of that fixed building service.

(3) Where this regulation applies the person carrying out the work shall, for the purpose of ensuring compliance with paragraph F1(2) or L1(b) of Schedule 1, give to the local authority a notice confirming that the fixed building services have been commissioned in accordance with a procedure approved by the Secretary of State.

(4) The notice shall be given to the local authority–

- (a) not later than the date on which the notice required by regulation 16(4) is required to be given; or
- (b) where that regulation does not apply, not more than 30 days after completion of the work.

**4.37** Reasonable provision could be to prepare a **commissioning** plan, identifying the systems that need to be tested and the tests that will be carried out. The notice required by regulation 44 should confirm that the **commissioning** plan has been followed and that every system has been inspected in an appropriate sequence and to a reasonable standard and that the test results

confirm that performance is reasonably in accordance with the design requirements.

**4.38** Not all **fixed building services** will need to be commissioned. With some systems it is not possible as the only controls are ‘on’ and ‘off’ switches. Examples of this would be some mechanical extraction systems or single fixed electrical heaters. In other cases **commissioning** would be possible but in the specific circumstances would have no effect on energy use.

**Fixed building services which do not require commissioning should be identified in the commissioning plan, along with the reason for not requiring commissioning.**

**4.39 Commissioning** must be carried out in such a way as not to prejudice compliance with any applicable health and safety requirements.

**4.40** In existing buildings other than **dwelling commissioning** is most often carried out by the person who installs the system. Sometimes it may be carried out by a subcontractor or by a specialist firm. It is important that whoever carries it out follows the relevant approved procedure.

*Energy efficiency in practice can often be enhanced by a sustained period of fine tuning to ensure the systems are operating as intended and controls are configured to the needs of the occupier. The Soft Landings initiative is an example of an appropriate fine tuning process, see <http://www.bsria.co.uk/services/design/soft-landings/>.*

## Notice of completion of commissioning

**4.41** The Building Regulations (regulation 44(3)) and the Building (Approved Inspectors etc) Regulations (regulation 20(1) and (5)) require that a notice be given to the relevant **BCB** that **commissioning** has been carried out according to a procedure approved by the Secretary of State.

**4.42** The procedure approved by the Secretary of State is set out in:

- a. CIBSE Commissioning Code M on commissioning management<sup>11</sup>; and

*This provides guidance on the overall process and includes a schedule of all the relevant guidance documents relating to the **commissioning** of specific building services systems.*

- b. for leakage testing of ductwork, paragraphs 4.47 and 4.48.

**4.43** Where a building notice or full plans have been given to a **BCB**, the notice should be given within 5 days of the completion of the commissioning work. In other cases, for example where work is carried out by a person registered with a competent person scheme, it must be given within 30 days.

<sup>10</sup> TM 46 Energy benchmarks, CIBSE, 2008.

<sup>11</sup> CIBSE Commissioning Code M: Commissioning management, CIBSE, 2003.

**4.44** Where an approved inspector is the **BCB**, the notice should generally be given within 5 days of the completion of the **commissioning** work. However, where the work is carried out by a person registered with a competent person scheme (see paragraphs 3.25 to 3.28) the notice must be given within 30 days.

**4.45** Where the installation of **fixed building services** which require **commissioning** is carried out by a person registered with a competent person scheme the notice of **commissioning** will be given by that person.

**4.46** Until the **BCB** receives the **commissioning** notices it may be unable to be reasonably satisfied that Part L has been complied with and consequently may be unable to give a completion/final certificate.

*Membership of the Commissioning Specialists Association or the Commissioning group of the HVCA may be a way of demonstrating suitability to sign the report in respect of the HVAC systems. For lighting control systems, suitability may be demonstrated by accreditation under the Lighting Industry Commissioning Scheme.*

**4.47** Ductwork leakage testing should be carried out on new or refurbished ducting where practicable in accordance with the procedures set out in HVCA DW/143<sup>12</sup> on systems served by fans with a design flow rate greater than 1 m<sup>3</sup>/s and for those sections of ductwork where the pressure class is such that DW/143 recommends testing.

*Membership of the HVCA specialist ductwork group or the Association of Ductwork Contractors and Allied Services could be a way of demonstrating suitable qualifications for this testing work.*

**4.48** If a ductwork system fails to meet the leakage standard, remedial work should be carried out as necessary to achieve satisfactory performance in retests and further ductwork sections should be tested as set out in DW/143.

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<sup>12</sup> DW/143 A Practical Guide to Ductwork Leakage Testing, HVCA, 2000.

# Section 5: Guidance on thermal elements

## THE PROVISION OF THERMAL ELEMENTS

**5.1** New **thermal elements** must comply with paragraph L1(a)(i) of Schedule 1 to the Building Regulations. Work on existing **thermal elements** must comply with regulation 23 of the Building Regulations.

### Requirements for the renovation or replacement of thermal elements – Regulation 23

(1) Where the renovation of an individual thermal element—

(a) constitutes a major renovation; or

(b) amounts to the renovation of more than 50% of the element's surface area;

the renovation must be carried out so as to ensure that the whole of the element complies with paragraph L1(a)(i) of Schedule 1, in so far as that is technically, functionally and economically feasible.

(2) Where the whole or any part of an individual element is proposed to be replaced and the replacement—

(a) constitutes a major renovation; or

(b) (in the case of part replacement) amounts to the replacement of more than 50% of the thermal element's surface area;

the whole of the thermal element must be replaced so as to ensure that it complies with paragraph L1(a)(i) of Schedule 1, in so far as that is technically, functionally and economically feasible.

## U-values

**5.2** U-values shall be calculated using the methods and conventions set out in BR443.

**5.3** Reasonable provision for newly constructed **thermal elements** such as those constructed as part of an extension would be to meet the standards set out in Table 4.

**5.4** Reasonable provision for those **thermal elements** constructed as replacements for existing elements would be to meet the standards set out in Table 4.

*Curtain walling is treated as a **controlled fitting** and guidance is given in paragraph 4.28.*

**Table 4 Standards for new *thermal elements***

Element <sup>1</sup>	Standard W/(m <sup>2</sup> .K)
Wall	0.28 <sup>2</sup>
Pitched roof – insulation at ceiling level	0.16
Pitched roof – insulation at rafter level	0.18
Flat roof or roof with integral insulation	0.18
Floors <sup>3</sup>	0.22 <sup>4</sup>
Swimming pool basin	0.25 <sup>5</sup>

**Notes:**

- <sup>1</sup> 'Roof' includes the roof parts of dormer windows, and 'wall' includes the wall parts (cheeks) of dormer windows.
- <sup>2</sup> A lesser provision may be appropriate where meeting such a standard would result in a reduction of more than 5% in the internal floor area of the room bounded by the wall.
- <sup>3</sup> The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged building.
- <sup>4</sup> A lesser provision may be appropriate where meeting such a standard would create significant problems in relation to adjoining floor levels.
- <sup>5</sup> See paragraph 4.14.

## Continuity of insulation and airtightness

**5.5** The building fabric should be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements, at the joints between elements, and at the edges of elements such as those around window and door openings. Reasonable provision should also be made to reduce unwanted air leakage through the new envelope parts. The work should comply with all the requirements of Schedule 1, but particular attention should be paid to Parts F and J.

**5.6** Significant reductions in thermal performance can occur where the air barrier and the insulation layer are not contiguous and the cavity between them is subject to air movement. To avoid this problem, either the insulation layer should be contiguous with the air barrier at all points in the building envelope, or the space between them should be filled with solid material such as in a masonry wall.

**5.7** A suitable approach to showing the requirement has been achieved would be to submit a report signed by a suitably qualified person confirming that appropriate design details and building techniques have been specified, and that the work has been carried out in ways that can be expected to achieve reasonable conformity with the specifications. Reasonable provision would be to:

- a. adopt design details published on the Accredited Construction Details website; or
- b. demonstrate that the specified details provide adequate protection against surface condensation using the guidance in IP 1/06<sup>13</sup> and BR 497<sup>14</sup>.

## Major renovation

**5.7A Major renovation** means the renovation of a building where more than 25% of the surface area of the **building envelope** undergoes renovation. When assessing whether the area proportion constitutes a **major renovation** of a building, the surface area of the whole of the external **building envelope** should be taken into account i.e. external walls, floor, roof, windows, doors, roof windows and rooflights.

## RENOVATION OF THERMAL ELEMENTS

**5.8** For the purposes of this Approved Document, renovation of a thermal element through:

- a. the provision of a new layer means either of the following activities:

- i. Cladding or rendering the external surface of the thermal element; or
- ii. Dry-lining the internal surface of a thermal element.
- b. the replacement of an existing layer means either of the following activities:
  - i. stripping down the element to expose the basic structural components (brick/blockwork, timber/metal frame, joists, rafters, etc.) and then rebuilding to achieve all the necessary performance requirements. As discussed in paragraph 3.9, particular considerations apply to renovating elements of traditional construction; or
  - ii. replacing the water proof membrane on a flat roof.

**5.9** Where a **thermal element** is subject to a **renovation** through undertaking an activity listed in paragraph 5.8a or 5.8b, the performance of the whole of the **thermal element** should be improved to achieve or better the relevant U-value set out in column (b) of Table 5, provided the area to be renovated is greater than 50% of the surface of the individual **thermal element** or constitutes a **major renovation** where more than 25% of the surface area of the **building envelope** undergoes **renovation**.

**5.9A** In relation to the renovation of individual thermal elements, when assessing the proportion of the surface area that is to be renovated, the area of the **thermal element** should be assessed as the area of each individual **thermal element**, not the area of all the elements of that type in the building. The area of each individual **thermal element** should also be interpreted in the context of whether the element is being renovated from inside or outside, e.g. if removing all the plaster finish from the inside of a solid brick wall, the area of the element is the area of external wall in the room. If removing external render, it is the area of the elevation in which that wall sits.

*This means that if all the roofing on the flat roof of an extension is being stripped down, the area of the individual element is the 'roof area' of the extension, not the 'total roof area' of the building. Similarly, if the rear wall of a single storey extension is being re-rendered externally, then the rear wall of the extension should be upgraded to the standards of Table 5 column (b), even if the renovation affected less than 50% of the total area of the building elevation when viewed from the rear. If plaster is being removed from a bedroom wall, the relevant area is the area of the external wall in the room, not the area of the external elevation which contains that wall section. This is because the marginal cost of dry-lining with insulated plasterboard rather than plain plasterboard is small.*

*When a building undergoes a major renovation this may represent an opportunity to consider and take into account the technical, environmental*

<sup>13</sup> IP 1/06 Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings, BRE 2006.

<sup>14</sup> BRE Report BR 497 Conventions for Calculating Linear Thermal Transmittance and Temperature Factors, BRE [2007 and 2010 amendments and conventions].

and economic feasibility of installing high-efficiency alternative systems.

**5.10** If achievement of the relevant U-value set out in column (b) of Table 5 is not technically or functionally feasible or would not achieve a **simple payback** of 15 years or less, the element should be upgraded to the best standard that is technically and functionally feasible and which can be achieved within a **simple payback** of no greater than 15 years. Guidance on this approach is given in Appendix A to Approved Document L1B.

**5.11** When renovating **thermal elements**, the work should comply with all the requirements in Schedule 1, but particular attention should be paid to Parts F and J.

## RETAINED THERMAL ELEMENTS

**5.12** Part L of Schedule 1 to the Building Regulations applies to **thermal elements** in the following circumstances:

- where an existing **thermal element** is part of a building subject to a material change of use;
- where an existing element is to become part of the thermal envelope, where previously it was not;
- where an existing element is being upgraded as a **consequential improvement** (regulation 28) in accordance with paragraphs 6.1 to 6.11.

**5.13** Reasonable provision would be to upgrade those **thermal elements** whose U-value is worse than the threshold value in column (a) of Table 5 to achieve the U-value given in column (b) of Table 5, provided this is technically, functionally and economically feasible. A reasonable test of economic feasibility is to achieve a **simple payback** of 15 years or less. Where the standard given in column (b) is not technically, functionally or economically feasible, then the element should be upgraded to the best standard that is technically and functionally feasible and which meets a **simple payback** criterion of 15 years or less. Generally, this lesser standard should not be worse than 0.7 W/(m<sup>2</sup>.K).

*Examples of where lesser provision than column (b) might apply are where the thickness of the additional insulation might reduce usable floor area by more than 5 per cent or create difficulties with adjoining floor levels, or where the weight of the additional insulation might not be supported by the existing structural frame.*

**5.14** When renovating **thermal elements**, the work should comply with all the requirements in Schedule 1, but particular attention should be paid to Parts F and J.

**Table 5 Upgrading retained thermal elements**

Element <sup>1</sup>	U-value W/(m <sup>2</sup> .K)	
	(a) Threshold	(b) Improved
Wall – cavity insulation	0.70	0.55 <sup>2</sup>
Wall – external or internal insulation	0.70	0.30 <sup>3</sup>
Floors <sup>4,5</sup>	0.70	0.25
Pitched roof – insulation at ceiling level	0.35	0.16
Pitched roof – insulation at rafter level <sup>6</sup>	0.35	0.18
Flat roof or roof with integral insulation <sup>7</sup>	0.35	0.18

**Notes:**

- 'Roof' includes the roof parts of dormer windows, and 'wall' includes the wall parts (cheeks) of dormer windows.
- This applies only in the case of a cavity wall capable of accepting insulation. Where this is not the case it should be treated as for 'wall – external or internal insulation'.
- A lesser provision may be appropriate where meeting such a standard would result in a reduction of more than 5% in the internal floor area of the room bounded by the wall.
- The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged building.
- A lesser provision may be appropriate where meeting such a standard would create significant problems in relation to adjoining floor levels.
- A lesser provision may be appropriate where meeting such a standard would create limitations on head room. In such cases, the depth of the insulation plus any required air gap should be at least to the depth of the rafters, and the thermal performance of the chosen insulant should be such as to achieve the best practicable U-value.
- A lesser provision may be appropriate if there are particular problems associated with the load-bearing capacity of the frame or the upstand height.

## Section 6: Consequential improvements

**6.1** Regulation 28 of the Building Regulations may require additional work to be undertaken to make an existing building more energy efficient when certain types of building work are proposed.

**6.2** This requirement arises in existing buildings with a **total useful floor area** of over 1,000 m<sup>2</sup> where the proposed work consists of or includes:

- a. an extension;
- b. the initial provision of any **fixed building service** (other than a renewable energy generator);
- c. an increase to the installed capacity of any **fixed building service** (other than a renewable energy generator).

**6.3** Where regulation 28 applies, **consequential improvements**, in addition to the proposed building work (the **principal works**), should be made to ensure that the building complies with Part L, to the extent that such improvements are technically, functionally and economically feasible. Paragraphs 6.4 to 6.11 below set out guidance on what will constitute technically, functionally and economically feasible **consequential improvements** in various circumstances.

*The principal works must comply with the energy efficiency requirements in the normal way.*

**6.4** Where improvement works other than the 'trigger activities' listed in regulation 28(1) are planned as part of the building work, owners can use these as contributing to the **consequential improvements**. The exception to this is if additional work is being done to the existing building to compensate for a poorer standard of an extension (see paragraphs 4.9 to 4.11).

*For example, if, as well as extending the building, the proposals included total window replacement, then the window replacement work would satisfy the requirement for consequential improvements, provided the cost was at least 10 per cent of the cost of the extension.*

**6.5** Measures such as those listed in Table 6 that achieve a **simple payback** not exceeding 15 years will be economically feasible unless there are unusual circumstances.

*For example, if the remaining life of the building is less than 15 years it would be economic to carry out only improvements with payback periods within that life.*

**Table 6 Improvements that in ordinary circumstances are practical and economically feasible**

*Items 1 to 7 will usually meet the economic feasibility criterion set out in paragraph 6.5. A shorter payback period is given in item 8 because such measures are likely to be more capital intensive or more risky than the others.*

No.	Improvement measure
1	Upgrading heating systems more than 15 years old by the provision of new plant or improved controls
2	Upgrading cooling systems more than 15 years old by the provision of new plant or improved controls
3	Upgrading air-handling systems more than 15 years old by the provision of new plant or improved controls
4	Upgrading general lighting systems that have an average lamp efficacy of less than 40 lamp-lumens per circuit-watt and that serve areas greater than 100 m <sup>2</sup> by the provision of new luminaires or improved controls
5	Installing energy metering following the guidance given in CIBSE TM 39
6	Upgrading <b>thermal elements</b> which have U-values worse than those set out in column (a) of Table 5 following the guidance in paragraphs 5.12 and 5.13
7	Replacing existing windows, roof windows or rooflights (but excluding display windows) or doors (but excluding high-usage entrance doors) which have a U-value worse than 3.3 W/m <sup>2</sup> .K following the guidance in paragraphs 4.23 to 4.28
8	Increasing the on-site low and zero carbon (LZC) energy-generating systems if the existing on-site systems provide less than 10% of on-site energy demand, provided the increase would achieve a simple payback of 7 years or less
9	Measures specified in the Recommendations Report produced in parallel with a valid Energy Performance Certificate

### Consequential improvements on extending a building

*Constructing a new free-standing building on an existing site (e.g. a new out-patients building at an existing hospital site, or a new classroom block at a school) is not an extension. These should be treated as new buildings.*

**6.6** Where a building is extended, or the habitable area is increased, a way of complying with regulation 28 would be to adopt measures such as those in Table 6 to the extent that their value is not less than 10 per cent of the value of the **principal works**. The value of the **principal works** and the value of the **consequential improvements** should be established using prices current at the date the proposals are made known to the **BCB**. They should be made known by way of a report signed by a suitably qualified person as part of the initial notice or deposit of plans.

*An example of a suitably qualified person would be a chartered quantity surveyor.*

## Consequential improvements on installing building services

**6.7** Where it is proposed to install a **fixed building service** as a first installation, or as an installation which increases the installed capacity per unit area of an existing service, reasonable provision would be to:

- a. firstly improve the fabric of those parts of the building served by the service, where this is economically feasible; and

*This means for example that if heating systems are to be installed for the first time in a building or part thereof, or the installed heating capacity per unit area of an existing system is to be increased, the fabric should be improved. The aim in these cases is to make cost-effective improvements to the performance of the fabric so that the installed capacity (and the initial cost) of the **fixed building services** and their subsequent energy consumption are not excessive.*

- b. additionally, make improvements in line with the guidance in paragraph 6.6. The cost of any improvement made as a result of following the guidance in sub-paragraph a above cannot be taken as contributing to the value of the **consequential improvements** specified in paragraph 6.3.

*If only the improvements under a) were made, then the CO<sub>2</sub> emissions from the building might well increase as a result of the higher level of servicing. By also requiring the general improvements in b), an overall improvement should be achieved.*

**6.8** For the purposes of this Approved Document, the installed capacity of a **fixed building service** is defined as the design output of the distribution system output devices (the terminal units) serving the space in question, divided by the **total useful floor area** of that space.

*This means that if (e.g.) the size of central boiler plant is increased to serve a new extension rather than to increase the heating provision in the existing building, the **consequential improvements** in paragraph 6.6 would be required but those in the following paragraphs would not apply.*

**6.9** Reasonable provision for improving the fabric of those parts of the building served by the service in line with paragraph 6.7a above would be to follow the guidance in paragraphs 6.10 and 6.11 to the extent that the work is technically, functionally and economically feasible. The extent of such work is not limited by the 10 per cent threshold. The following paragraphs give guidance on what in normal circumstances would be economically feasible.

**6.10** Where the installed capacity per unit area of a heating system is increased:

- a. the **thermal elements** within the area served which have U-values worse than those set out in column (a) of Table 5 should be upgraded following the guidance in paragraphs 5.12 and 5.13; and
- b. existing windows, roof windows or rooflights (but excluding **display windows**) or doors (but excluding **high-usage entrance doors**) within the area served and which have U-values worse than 3.3 W/m<sup>2</sup>.K should be replaced following the guidance in paragraphs 4.23 to 4.28.

**6.11** Where the installed capacity per unit area of a cooling system is increased:

- a. **thermal elements** within heated areas which have U-values worse than those set out in column (a) of Table 5 should be upgraded following the guidance in paragraphs 5.12 and 5.13; and
- b. if the area of windows, roof windows (but excluding **display windows**) within the area served exceeds 40 per cent of the façade area or the area of rooflights exceeds 20 per cent of the area of the roof and the design solar load exceeds 25 W/m<sup>2</sup>, then the solar control provisions should be upgraded such that at least one of the following four criteria is met:
  - i. the solar gain per unit floor area averaged over the period 0630 to 1630 GMT is not greater than 25 W/m<sup>2</sup> when the building is subject to solar irradiances for July as given in the table of design irradiancies in CIBSE Design Guide A;
  - ii. the design solar load is reduced by at least 20 per cent;
  - iii. the effective g-value is no worse than 0.3;
  - iv. the zone or zones satisfies the criterion 3 check in Approved Document L2A based on calculations by an approved software tool; and

*This will reduce the solar gain and hence the space cooling demand. Section 5.1 of TM 37<sup>15</sup> gives guidance on calculating solar gains, and Sections 4.4 and 4.5 give guidance on the effective g-value.*

- c. any general lighting system within the area served by the relevant **fixed building service** which has an average lamp efficacy of less than 45 lamp-lumens per circuit-watt should be upgraded with new luminaires and/or controls following the guidance in the *Non-Domestic Building Services Compliance Guide*.

*This will reduce the lighting load and hence the space cooling demand.*

<sup>15</sup> TM 37 Design for improved solar shading control, CIBSE, 2006.

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## Section 7: Providing information

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**7.1** On completion of the work, in accordance with Regulation 40, the owner of the building should be provided with sufficient information about the building, the **fixed building services** and their operating and maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances. This requirement applies only to the work that has actually been carried out – e.g. if the work involves replacing windows, there is no obligation on the contractor to provide details on the operation of the heating system.

### Building log book

**7.2** A way of showing compliance with the requirement would be to produce the necessary information following the guidance in CIBSE TM 31 *Building log book toolkit*<sup>16</sup>, or to add it to an existing log book. If an alternative guidance document is followed in preparing the log book, then the information conveyed and the format of presentation should be equivalent to TM 31.

**7.3** The information should be presented in templates as or similar to those in TM 31. The information should be provided in summary form, suitable for day-to-day use. It could draw on or refer to information available as part of other documentation, such as the Operation and Maintenance Manuals and the Health and Safety file required by the CDM Regulations.

*Further advice is provided in BSRIA BG 26/2011 Building Manuals and Building User Guides*<sup>17</sup>.

**7.4** The new or updated log book should provide details of:

- a. any newly provided, renovated or upgraded **thermal elements** or **controlled fittings**;
- b. any newly provided **fixed building services**, their method of operation and maintenance;
- c. any newly installed energy meters; and
- d. any other details that collectively enable the energy consumption of the building and building services constituting the works to be monitored and controlled.

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<sup>16</sup> TM 31 *Building log book toolkit*, CIBSE, 2006.

<sup>17</sup> *Building Manuals and User Guides*, BG 26/2011, BSRIA, 2011.

# Appendix A: Documents referred to

## BRE

[www.bre.co.uk](http://www.bre.co.uk)

BR 443 Conventions for U-value calculations, 2006. (Downloadable from [www.bre.co.uk/uvalues](http://www.bre.co.uk/uvalues))

Information Paper IP1/06 Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings, 2006. ISBN 978 1 86081 904 9

BRE Report BR 497 Conventions for Calculating Linear Thermal Transmittance and Temperature Factors [2007 and 2010 amendments and conventions]. ISBN 978 1 86081 986 5

## BSRIA

[www.bsria.co.uk](http://www.bsria.co.uk)

Building Manuals and User Guides, BG 26/2011, BSRIA, 2011.

## CIBSE

[www.cibse.org](http://www.cibse.org)

TM 31 Building Log Book Toolkit, CIBSE 2006. ISBN 978 1 90328 771 2

TM 37 Design for improved solar shading control, 2006. ISBN 978 1 90328 757 6

TM 39 Building energy metering, CIBSE, 2009. ISBN 978 1 90684 611 4

TM 46 Energy benchmarks, CIBSE 2008.

CIBSE Commissioning Code M: Commissioning management, CIBSE 2003. ISBN 978 1 10328 733 0

## Department for Business, Innovation and Skills

[www.bis.gov.uk](http://www.bis.gov.uk)

Technical Standards and Regulations Directive 98/34/EC (Available at [www.bis.gov.uk/policies/innovation/infrastructure/standardisation/tech-standards-directive](http://www.bis.gov.uk/policies/innovation/infrastructure/standardisation/tech-standards-directive))

## Department of Energy and Climate Change (DECC)

[www.decc.gov.uk](http://www.decc.gov.uk)

The Government's Standard Assessment Procedure for energy rating of dwellings, SAP 2012. (Available at [www.bre.co.uk/sap2012](http://www.bre.co.uk/sap2012))

Current Energy Prices ([www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics#energy-price-statistics](http://www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics#energy-price-statistics))

## English Heritage

[www.english-heritage.org.uk](http://www.english-heritage.org.uk)

Energy Efficiency and Historic Buildings, English Heritage, 2011.

## Glass and Glazing Federation (GGF)

[www.ggf.org.uk](http://www.ggf.org.uk)

Guide to the Calculation of Energy Ratings for Windows, Roof Windows and Doors, GGF, 2013.

## Health and Safety Executive (HSE)

[www.hse.gov.uk](http://www.hse.gov.uk)

L24 Workplace Health, Safety and Welfare: Workplace (Health, Safety and Welfare) Regulations 1992, Approved Code of Practice and Guidance, The Health and Safety Commission, 1992. ISBN 978 0 71760 413 5

## Heating and Ventilating Contractors Association

[www.hvca.org.uk](http://www.hvca.org.uk)

DW/143 A practical guide to ductwork leakage testing, HVCA 2000. ISBN 978 0 90378 330 9

## National Association of Rooflight Manufacturers (NARM)

[www.narm.org.uk](http://www.narm.org.uk)

NARM Technical Document NTD 2, 2010.

## NBS (on behalf of the Department for Communities and Local Government)

[www.thebuildingregs.com](http://www.thebuildingregs.com)

*Non-Domestic Building Services Compliance Guide*, DCLG, 2013. (Available to download from [www.gov.uk](http://www.gov.uk))

## Legislation

SI 2010/2214 The Building Regulations 2010

SI 2010/2215 The Building (Approved Inspectors etc.) Regulations 2010

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## **Appendix B: Standards referred to**

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**BS EN ISO 13370** Thermal performance of buildings – Heat transfer via the ground – Calculation methods [2007 incorporating corrigendum March 2009].

**BS EN 14351-1** Windows and doors – Product standard, performance characteristics. Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics [2006 (+AMD 1:2010)].

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     Building log book toolkit (CIBSE TM31, 2006) 7.2  
     Commissioning management (CIBSE Code M, 2002) 4.42  
     Conventions for calculating linear thermal transmittance and temperature factors (BRE 497, 2007) 5.7  
     Energy benchmarks (CIBSE TM46, 2008) 4.35  
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# The Building Regulations 2010

## Access to and use of buildings

**APPROVED DOCUMENT**

**M**

### **Volume 1: Dwellings**

**M4(1) Category 1: Visitable dwellings**

**M4(2) Category 2: Accessible and adaptable dwellings**

**M4(3) Category 3: Wheelchair user dwellings**

2015 edition incorporating 2016 amendments –  
for use in England\*

# Main changes in the 2015 edition

This volume of this approved document supports requirements M4(1), M4(2) and M4(3) of Schedule 1 to the Building Regulations 2010. It takes effect on 1 October 2015 for use in England\*. The 2004 edition of Approved Document M with 2010 and 2013 amendments will continue to apply to work started before 1 October 2015 or work subject to a building notice, full plans application or initial notice submitted before that date.

## The main changes are:

- Approved Document M has been split into two parts:
  - Volume 1: Dwellings
  - Volume 2: Buildings other than dwellings.
- Requirement M4 'Sanitary conveniences in dwellings' has been replaced by new requirements:
  - M4(1) Category 1: Visitable dwellings
  - M4(2) Category 2: Accessible and adaptable dwellings
  - M4(3) Category 3: Wheelchair user dwellings.

Regulation M4(1) is mandatory for all new dwellings unless one of the optional requirements M4(2) or M4(3) applies.

## Main changes made by the 2016 amendments

The changes are corrections and clarifications, as set out in the 2016 AD M Volume 1 Corrigenda.

\* This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No.2) Order 2009.

# The approved documents

## What is an approved document?

The Secretary of State has approved a series of documents that give practical guidance about how to meet the requirements of the Building Regulations 2010 for England. Approved documents give guidance on each of the technical parts of the regulations and on regulation 7 (see the back of this document).

Approved documents set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirements of the Building Regulations to which they refer. If you follow the guidance in an approved document, there will be a presumption of compliance with the requirements covered by the guidance. However, compliance is not guaranteed; for example, 'normal' guidance may not apply if the particular case is unusual in some way.

Note that there may be other ways to comply with the requirements – *there is no obligation to adopt any particular solution contained in an approved document*. If you prefer to meet a relevant requirement in some other way than described in an approved document, you should discuss this with the relevant building control body.

In addition to guidance, some approved documents include provisions that must be followed exactly, as required by regulations or where methods of test or calculation have been prescribed by the Secretary of State.

Each approved document relates only to the particular requirements of the Building Regulations that the document addresses. However, building work must also comply with any other applicable requirements of the Building Regulations.

## How to use this approved document

This document uses the following conventions.

- a. **Text against a green background** is an extract from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations.
- b. **Key terms, printed in green**, are defined in Appendix A.
- c. When this approved document refers to a named standard or other document, the relevant version is listed in Appendix B (standards) or Appendix C (other documents). However, if the issuing body has revised or updated the listed version of the standard or document, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations.

**NOTE:** Standards and technical approvals may also address aspects of performance or matters that are not covered by the Building Regulations, or they may recommend higher standards than required by the Building Regulations.

## Where you can get further help

If you do not understand the technical guidance or other information in this approved document or the additional detailed technical references to which it directs you, you can seek further help through a number of routes, some of which are listed below.

- a. The Government website: [www.gov.uk](http://www.gov.uk)
- b. *If you are the person undertaking the building work*: either from your local authority building control service or from an approved inspector
- c. *If you are registered with a competent person scheme*: from the scheme operator
- d. *If your query is highly technical*: from a specialist or an industry technical body for the relevant subject.

# The Building Regulations

The following is a high level summary of the Building Regulations relevant to most types of building work. Where there is any doubt you should consult the full text of the regulations, available at [www.legislation.gov.uk](http://www.legislation.gov.uk).

## Building work

Regulation 3 of the Building Regulations defines ‘building work’. Building work includes:

- a. the erection or extension of a building
- b. the provision or extension of a controlled service or fitting
- c. the material alteration of a building or a controlled service or fitting.

Regulation 4 states that building work should be carried out in such a way that, when work is complete:

- a. *For new buildings or work on a building that complied with the applicable requirements of the Building Regulations:* the building complies with the applicable requirements of the Building Regulations.
- b. *For work on an existing building that did not comply with the applicable requirements of the Building Regulations:*
  - (i) the work itself must comply with the applicable requirements of the Building Regulations
  - (ii) the building must be no more unsatisfactory in relation to the requirements than before the work was carried out.

## Material change of use

Regulation 5 defines a ‘material change of use’ in which a building or part of a building that was previously used for one purpose will be used for another.

The Building Regulations set out requirements that must be met before a building can be used for a new purpose. To meet the requirements, the building may need to be upgraded in some way.

## Materials and workmanship

In accordance with regulation 7, building work must be carried out in a workmanlike manner using adequate and proper materials. Guidance on materials and workmanship is given in Approved Document 7.

## Energy efficiency requirements

Part 6 of the Building Regulations imposes additional specific requirements for energy efficiency.

If a building is extended or renovated, the energy efficiency of the existing building or part of it may need to be upgraded.



## Notification of work

Most building work and material changes of use must be notified to a building control body unless one of the following applies.

- a. It is work that will be self-certified by a registered competent person or certified by a registered third party.
- b. It is work exempted from the need to notify by regulation 12(6A) of, or Schedule 4 to, the Building Regulations.

## Responsibility for compliance

People who are responsible for building work (e.g. agent, designer, builder or installer) must ensure that the work complies with all applicable requirements of the Building Regulations. The building owner may also be responsible for ensuring that work complies with the Building Regulations. If building work does not comply with the Building Regulations, the building owner may be served with an enforcement notice.

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# Section 0: Approved Document M

## Volume 1: Access to and use of dwellings

### Summary

**0.1** This approved document gives guidance about how to comply with requirements M4(1), M4(2) and M4(3) of the Building Regulations. It contains the following sections:

**Section 1:** Category 1 – Visitable dwellings

**Section 2:** Category 2 – Accessible and adaptable dwellings

**Section 3:** Category 3 – Wheelchair user dwellings

### Application

**0.2** The recommendations of this volume of this approved document apply to newly erected dwellings, and dwellings undergoing material alteration, only. They do not apply to the extension of a dwelling.

### Optional requirements

**0.3** Requirements M4(2) and M4(3) are ‘optional requirements’ as defined in the Building Regulations. An optional requirement only applies where a condition that one or more dwellings should meet the relevant optional requirement is imposed on new development as part of the process of granting planning permission. Where no condition is imposed, dwellings only need to meet requirements M4(1). Compliance should be assessed against only one of requirements M4(1), M4(2) or M4(3) for any given dwelling.

**0.4** Where any part of an approach route, including vertical circulation in the common parts of a block of flats, is shared between dwellings of different categories, Section A of the optional requirement for the highest numbered category of dwelling served will apply to that part of the approach route.

**0.5** Where a local planning authority sets a planning condition for Category 3 (wheelchair user) housing it can specify which dwellings should be wheelchair accessible by including in the planning permission a condition stating that optional requirement M4(3)(2)(b) applies. Where no such condition is applied, optional requirement M4(3)(2)(a) will apply by default requiring that dwellings should be wheelchair adaptable.

**0.6** The person carrying out building work must inform the building control body where any optional requirements apply.

### Interaction with other legislation

#### The Workplace (Health, Safety and Welfare) Regulations

**0.7** If people, such as cleaners and caretakers, are employed to work in the common parts of flats and similar buildings the Workplace (Health, Safety and Welfare) Regulations will apply.

**0.8** The Workplace (Health, Safety and Welfare) Regulations contain some requirements that affect building design. The main requirements are covered by the Building Regulations. For further information see [www.hse.gov.uk](http://www.hse.gov.uk).

## The Equality Act 2010 and Equality Act 2010 (Disability) Regulations

- 0.9** Those who dispose of, let or manage premises are subject to the provisions in Part 4 of the Equality Act 2010. The Act protects people who meet the Act's definition of a disabled person from disability discrimination, harassment and victimisation. The provisions in Part 4 of the Act do not apply to the erection of new dwellings.

## Mixed use development

- 0.10** Common areas in mixed use development containing both domestic and non domestic functions should meet the requirements for non-domestic buildings in Approved Document M: Volume 2.

## Material alterations

- 0.11** Where a **dwelling** is subject to a material alteration, the building should be no less compliant with requirement M4(1) than it was prior to the building work taking place.

## Historic buildings

- 0.12** Historic buildings include listed buildings, buildings in conservation areas, buildings of architectural merit referred to as a material consideration in a Local Plan, buildings of architectural and historic merit within national parks, areas of outstanding natural beauty, world heritage sites and vernacular buildings of traditional form and construction.
- 0.13** Requirements for accessibility should be balanced against preserving historic buildings or environments. In achieving an appropriate balance it would be appropriate to take into account the advice of the local authority's conservation and access officers, English Heritage and the views of local access groups.

## Interaction with Parts C and K of the Building Regulations

- 0.14** Requirements M4(1), M4(2) and M4(3) of Part M set out requirements for stepped and ramped approaches forming part of accessible **approach routes** in and around **dwellings**. Part K sets out requirements for stepped or ramped approaches which form part of a building other than where the requirements of Part M are applicable. Where both Part M and Part K apply, requirement M4(1), M4(2) or M4(3) as appropriate of Part M takes precedence.
- 0.15** In meeting the provisions of Part M by providing a level or ramped approach and level threshold, care must be taken to ensure the moisture resistance and design of the dwelling as a whole also complies with requirements C2 and C4.

## Requirement M4(1): Category 1 – Visitable dwellings

This section of the approved document deals with the following requirement from Part M of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
<b>Category 1 – visitable dwelling</b>	
<b>Access and use</b>	
<b>M4(1).</b> Reasonable provision should be made for people to—	Requirement M4(1) does not apply to:
(a) gain access to; and	(a) an extension to a dwelling; or
(b) use, the dwelling and its facilities	(b) any part of a building that is used solely to enable the building or any service or fitting in the building to be inspected, repaired or maintained.

### Performance

In the Secretary of State's view, requirement M4(1) will be met when a new **dwelling** makes reasonable provision for most people, including wheelchair users, to approach and enter the **dwelling** and to access **habitable rooms** and sanitary facilities on the **entrance storey**. Reasonable provision is made if the **dwelling** complies with all of the following.

- Within the curtilage of the **dwelling** or the building containing the **dwelling**, it is possible to approach and gain access to the **dwelling**.
- It is possible to gain access to the **dwelling**, or the building containing the **dwelling**, from the most likely point of alighting from a car.
- A disabled person who is able to walk is able to visit any **dwelling** in a building containing one or more **dwellings**.
- Visitors can access and use the **habitable rooms** and a WC within the **entrance storey of the dwelling** (or the **principal storey** where the **entrance storey** does not contain a **habitable room**).
- Where the **habitable rooms** and the WC are located on the **entrance storey**, access between them is step free.
- Wall-mounted switches and socket outlets in **habitable rooms** are reasonably accessible to people who have reduced reach.

## Section 1: Category 1 – Visitable dwellings

### Section 1A: Approach to the dwelling

#### Application

- 1.1 The provisions of Section 1A apply to external and internal areas and elements that form part of the **approach route** to the **dwelling** and fall within the plot (or curtilage) of the individual **dwelling**, or the building containing the **dwelling**.
- 1.2 Where parking is not provided within the curtilage, the provisions apply to the **approach route** between the **dwelling** and the nearest point at which a visitor, including a disabled person, would expect to get in and out of a car. This **point of access** may be within or outside the plot of the **dwelling**, or the building containing the **dwelling** (such as a block of **flats**). These provisions do not apply beyond the curtilage of the development.

#### Approach routes

##### General

- 1.3 The **approach route** should be safe and convenient for everyone, including older and disabled people and some wheelchair users. It should adopt the shallowest gradient that can reasonably be achieved and be **step-free** where possible.
- 1.4 The **approach route** should be **level**, **gently sloping**, or, where necessary, **ramped**. On **steeply sloping plots**, a **stepped approach** can be used.
- 1.5 Normally these provisions will apply to the **principal private entrance** but where this is not possible, access to a suitable alternative entrance would be reasonable.
- 1.6 To enable most people to approach the **dwelling**, **approach routes** should comply with all of the following.
  - a. The **approach route** is **level**, **gently sloping**, **ramped** or, where unavoidable, **stepped**.
  - b. All external parts of the **approach route** have a **suitable ground surface**.
  - c. The **approach route** is a minimum of 900mm wide with a maximum cross fall of 1 in 40.
  - d. Where a driveway forms all, or part of, the **approach route**, an additional allowance of at least 900mm wide should be provided so that a wheelchair user can pass a parked car.

##### External ramps forming part of an approach route

- 1.7 A ramped approach should comply with all of the following.
  - a. Individual flights are:
    - for gradients up to 1:15 – not more than 10m long
    - for gradients up to 1:12 – not more than 5m long
  - b. Every flight has a minimum **clear width** of 900mm.

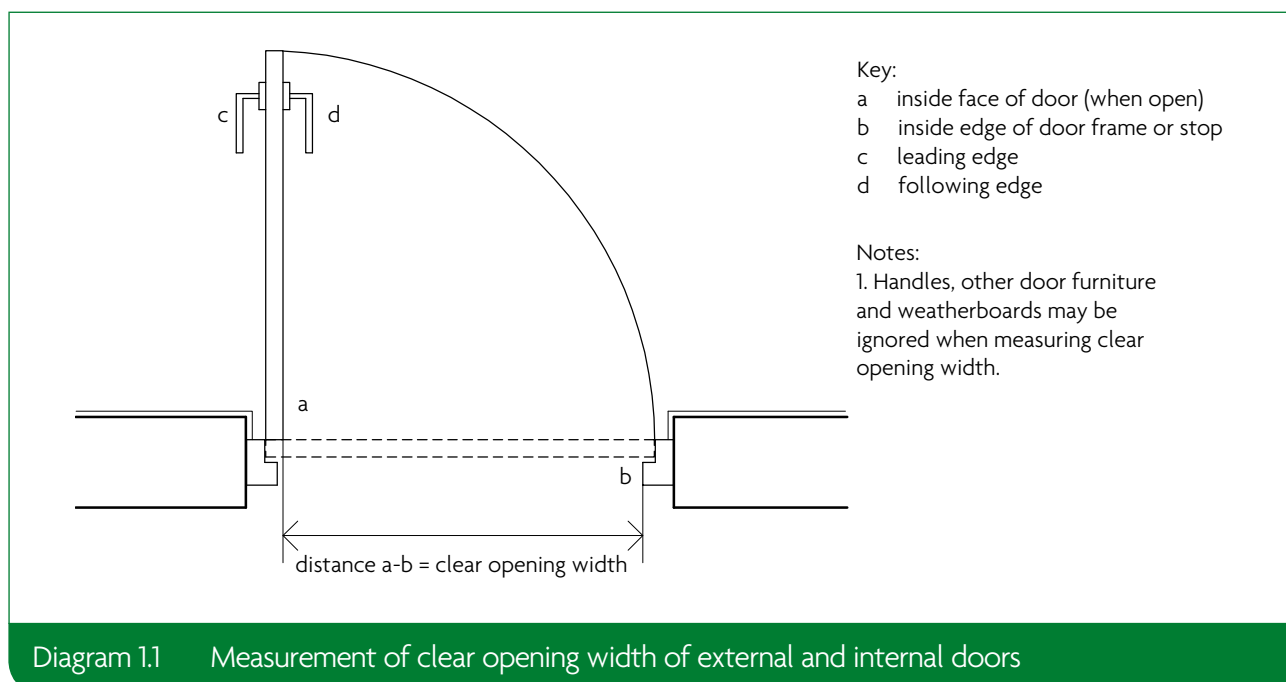
- c. Every flight has a top and bottom landing.
- d. An intermediate landing is provided between individual flights and at any change of direction.
- e. Every landing is a minimum of 1200mm long, clear of the swing of any door (or gate).

### External stepped approach

- 1.8** Where it is not possible to achieve **step-free** access to any **private** entrance (as may occur on a **steeply sloping plot**) a stepped approach is acceptable if it complies with all of the following.
- a. Steps are uniform with a rise of 75-150mm and a minimum going of 280mm (for tapered steps measured at a point 270mm from the 'inside' (narrow end) of the step).
  - b. Steps have **suitable tread nosings**.
  - c. No individual flight has a rise of more than 1800mm between landings.
  - d. Every flight has a minimum **clear width** of 900mm.
  - e. Top and bottom and, where necessary, intermediate landings, are provided and every landing has a minimum length of 900mm.
  - f. Every flight with three or more risers has a suitable handrail to one side. This grippable handrail is 850-1000mm above the pitch line of the flight and extends a minimum of 300mm beyond the top and bottom nosings.

### Communal entrances

- 1.9** The **principal communal entrance** door of the building containing the **dwelling** should comply with all of the following.
- a. The door has a minimum **clear opening width** of 775mm, when measured in accordance with Diagram 1.1.



- b. Any threshold is an **accessible threshold**.
- c. The ground surface (or entrance flooring) does not impede wheelchairs.

## Communal lifts and stairs

### General provisions

**1.10** A passenger lift is the most convenient way for many people to move from one storey to another. Where a lift is provided, it should be suitable for a wheelchair user. Where lift access cannot reasonably be achieved it is acceptable to provide a suitable stair.

### Communal passenger lifts

**1.11** A suitable lift should comply with all of the following.

- a. There is a clear landing a minimum 1500mm long and 1500mm wide directly in front of the lift door at every floor level.
- b. The load capacity is at least 400kg.
- c. The doors have a minimum **clear opening width** of 800mm.
- d. The car is a minimum 900mm wide and 1250mm deep inside.
- e. Tactile indication, to identify each storey, is provided on the landing and adjacent to the lift call button.
- f. Tactile indication, to confirm the floor selected, is provided on, or adjacent to, the lift buttons within the car.
- g. The lift incorporates a signalling system that gives visual notification that the lift is answering a landing call.
- h. The lift has a dwell time of five seconds before its doors begin to close after they are fully open.
- i. The system can be overridden by a door re-activating device that relies on appropriate electronic methods (but not a door edge pressure system); provided that the lift door remains fully open for at least three seconds.
- j. When the lift serves more than three storeys, it provides visual and audible indicators to identify the floor reached.
- k. Landing and car controls are between 900mm and 1200mm above the car floor and a minimum 400mm (measured horizontally) from the inside of the front wall.

**NOTE:** A lift complying with **BS EN 81-70** type 1 would satisfy the requirements of provisions f. to j. of paragraph 1.11.

### Communal stairs

**1.12** The principal **communal** stairs that give access to the **dwelling** should comply with one of the following:

- a. Where the **dwelling** is on an upper floor and does not have lift access, the stair meets the requirements of Part K for a general access stair.
- b. Where the **dwelling** is on an upper floor and does have lift access, the stair meets the requirements of Part K for a utility stair.

## Section 1B: Private entrances and spaces within the dwelling

### Application

**1.13** Except where noted, the provisions of Section 1B apply to the **principal private entrance** and to key areas within the **entrance storey** (or where there are no **habitable rooms** on the **entrance storey**, the **principal storey**) of the **dwelling**. This applies to all **dwelling** types, including upper floor **flats**.

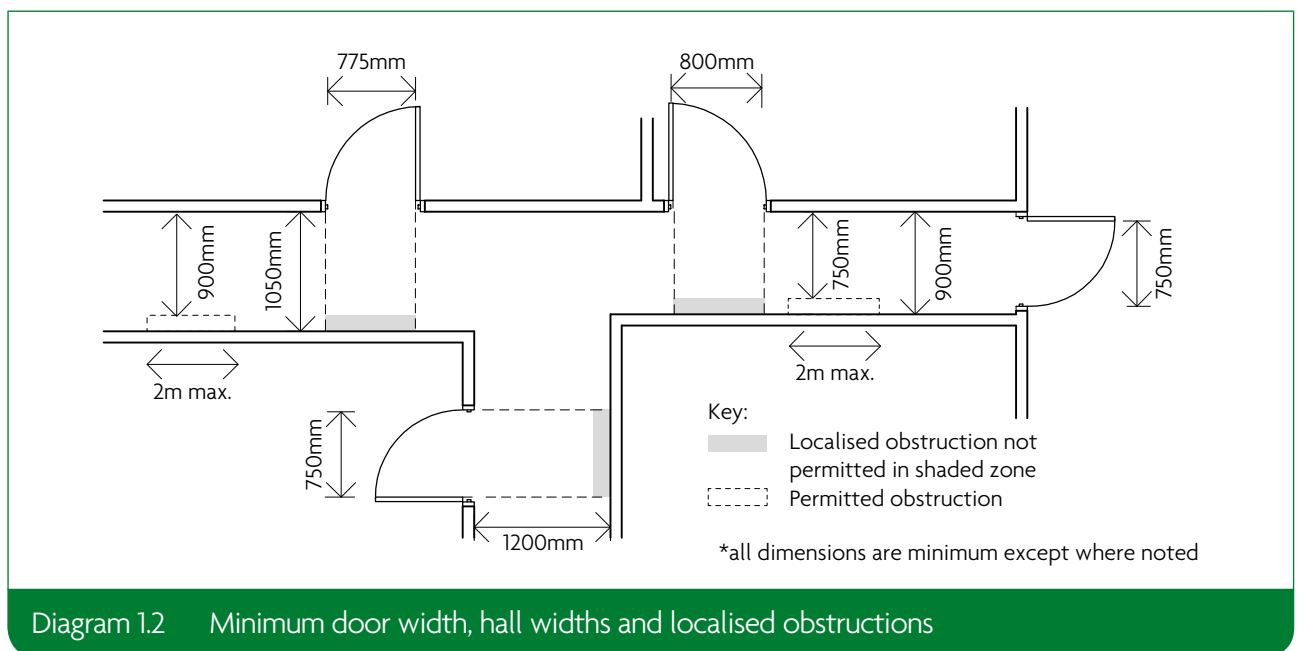
### Private entrances

- 1.14** The **principal private entrance** to the **dwelling** (or the alternative entrance where the **approach route** is not to the **principal private entrance**) should comply with all of the following.
- The door has a minimum **clear opening width** of 775mm, when measured in accordance with Diagram 1.1.
  - Any threshold is an **accessible threshold**.
  - Where a step into the **dwelling** is unavoidable, the rise is a maximum 150mm and is aligned with the outside face of the door threshold.

### Circulation areas and internal doorways

#### Door and hall widths

- 1.15** To facilitate access into **habitable rooms** and to a WC in the **entrance storey**, door and hall widths should comply with all of the following (see Diagram 1.2).
- Every door to a **habitable room** and the room containing the WC has a minimum **clear opening width** as set out in Table 1.1, when measured in accordance with Diagram 1.1.
  - Any **localised obstruction**, such as a radiator, does not occur opposite or close to a doorway, and is no longer than 2m in length; and the corridor is not reduced below a minimum 750mm width at any point.



**Table 1.1 Minimum widths of corridors and passageways for a range of doorway widths**

Doorway clear opening width (mm)	Corridor clear passageway width (mm)
750 or wider	900 (when approached head on)
750	1200 (when approach is not head-on)
775	1050 (when approach is not head-on)
800	900 (when approach is not head on)

**NOTE:** A standard 826mm door leaf up to 44mm thick will be deemed to satisfy a requirement for a clear opening width of 775mm.

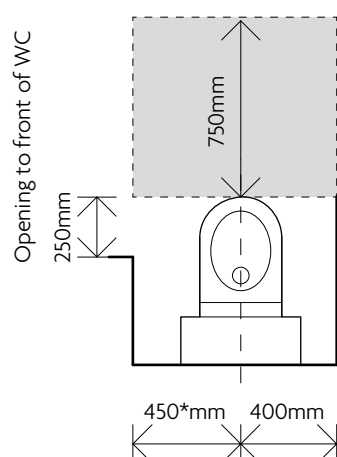
## Private stairs and changes of level within the entrance storey

- 1.16** To provide easy access between rooms on the entrance storey, a stepped change of level within the entrance storey should be avoided where possible. If internal steps or stairs on the entrance level are unavoidable, they should comply with the provisions of Part K.

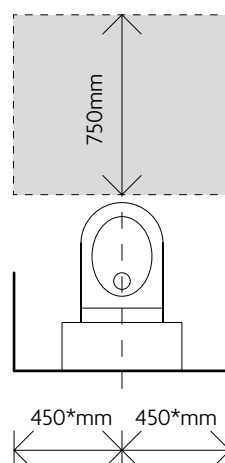
## Sanitary facilities

### WC facilities

- 1.17** To enable easy access to a WC, a dwelling should comply with all of the following.
- A room (which may be a WC/cloakroom or a bathroom) containing a WC is provided on the entrance storey or, where there are no habitable rooms on the entrance storey, on the principal storey or the entrance storey.
  - There is clear space to access the WC in accordance with Diagram 1.3.
  - Any basin is positioned to avoid impeding access.
  - The door to the room opens outwards and has a clear opening width in accordance with Table 1.1.



**Example 1.3A – Clear access for oblique transfer**

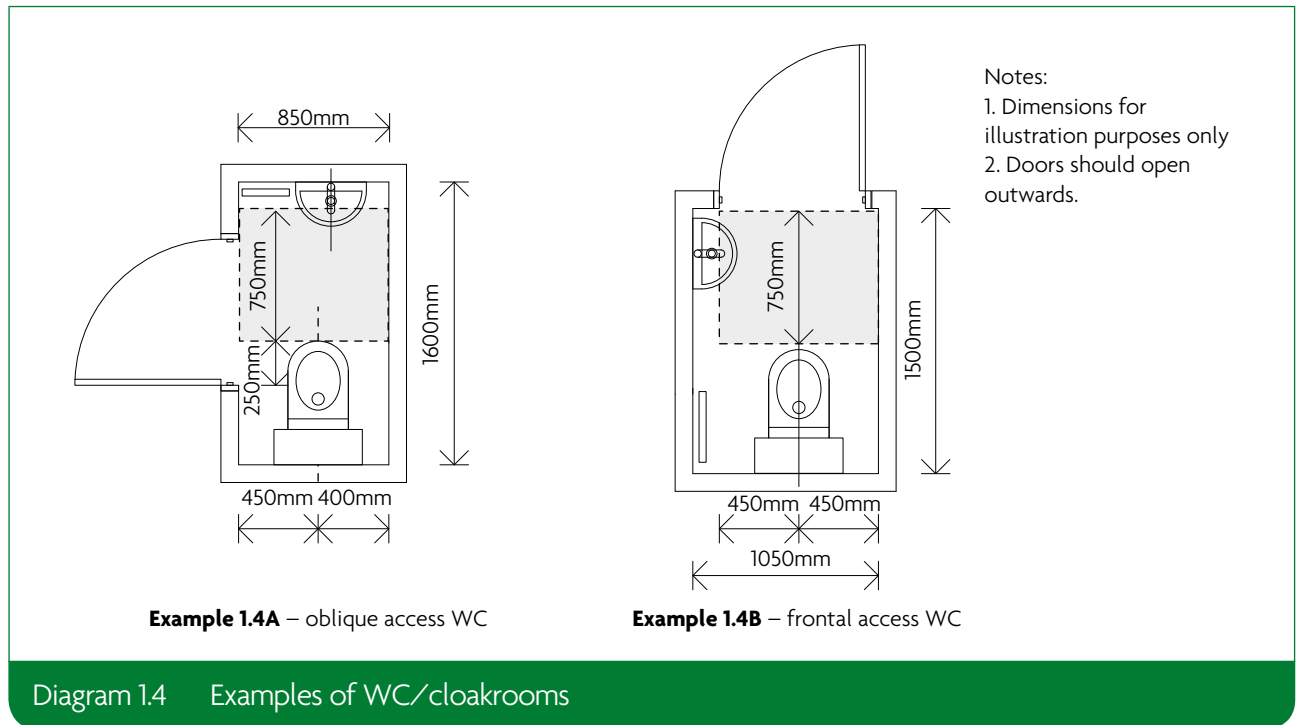


**Example 1.3A – Clear access for frontal transfer**

- Notes:**
1. All dimensions minimum unless otherwise stated.
  2. \* denotes minimum but 500mm preferred.
  3. Basins should not project into access zones in such a way as to impede access.

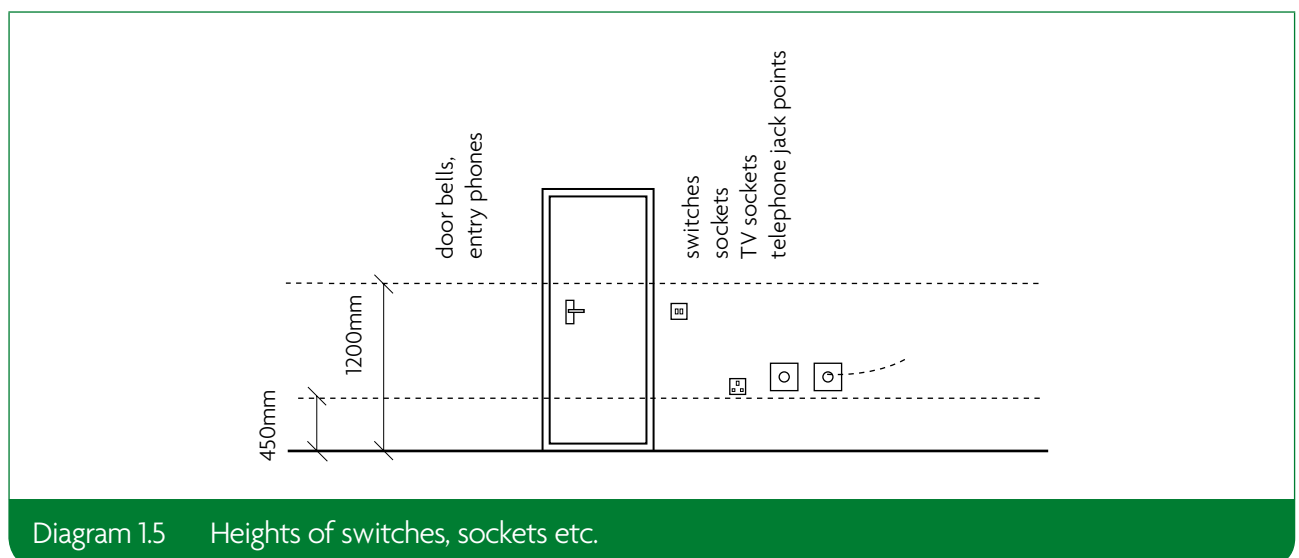
**Diagram 1.3 WC access zones**

**NOTE:** Examples of compliant WC/cloakrooms are shown in Diagram 1.4.



## Services and controls

- 1.18** To assist people who have reduced reach, services and controls should comply with all of the following.
- Switches and sockets, including door bells, entry phones, light switches, power sockets, TV aerials and telephone jacks, serving **habitable rooms** throughout the **dwelling** have their centre line 450–1200mm above floor level, as shown in Diagram 1.5.
  - Consumer units are mounted so that the switches are 1350–1450mm above floor level.



## Optional requirement M4(2): Category 2 – Accessible and adaptable dwellings

This section of the approved document deals with the following optional requirement from Part M of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Optional requirement</i>	<i>Limits on application</i>
<b>Part M access to and use of buildings</b>	
<b>Category 2 – accessible and adaptable dwellings</b>	
<b>M4(2) optional requirement</b>	Optional requirement M4(2)—
(1) Reasonable provision must be made for people to—	(a) may apply only in relation to a dwelling that is erected;
(a) gain access to; and	(b) will apply in substitution for requirement M4(1);
(b) use, the dwelling and its facilities.	(c) does not apply where optional requirement M4(3) applies;
(2) The provision made must be sufficient to—	(d) does not apply to any part of a building that is used solely to enable the building or any service or fitting in the building to be inspected, repaired or maintained.
(a) meet the needs of occupants with differing needs, including some older or disabled people; and	
(b) to allow adaptation of the dwelling to meet the changing needs of occupants over time.	

### Performance

In the Secretary of State's view, optional requirement M4(2) will be met where a new dwelling makes reasonable provision for most people to access the dwelling and incorporates features that make it potentially suitable for a wide range of occupants, including older people, those with reduced mobility and some wheelchair users. Reasonable provision is made if the dwelling complies with all of the following.

- Within the curtilage of the dwelling, or of the building containing the dwelling, it is possible to approach and gain step-free access to the dwelling and to any associated parking space and communal facilities intended for the occupants to use.
- There is step-free access to the WC and other accommodation within the entrance storey, and to any associated private outdoor space directly connected to the entrance storey.
- A wide range of people, including older and disabled people and some wheelchair users, are able to use the accommodation and its sanitary facilities.
- Features are provided to enable common adaptations to be carried out in future to increase the accessibility and functionality of the dwelling.
- Wall-mounted switches, socket outlets and other controls are reasonably accessible to people who have reduced reach.

## Section 2: Category 2 – Accessible and adaptable dwellings

### Section 2A: Approach to the dwelling

#### Application

- 2.1 The provisions of Section 2A apply only where a planning condition requires compliance with optional requirement M4(2) for accessible and adaptable dwellings (see paragraphs 0.3 to 0.6).
- 2.2 The provisions of Section 2A apply to external and internal areas and elements that form part of the **approach route** to the individual **dwelling** and fall within the plot (or curtilage) of the **dwelling** or the building containing the **dwelling**.
- 2.3 The provisions also apply to the **approach route** between the **dwelling** and the point, or points, at which an occupant or visitor, including a disabled person, would expect to get in and out of a car. This **point, or points, of access** may be within or outside the plot of the **dwelling** or the building containing the **dwelling** (typically a block of **flats**). These provisions do not apply beyond the curtilage of the development.
- 2.4 Reasonable provision should be made to ensure that the **approach route** to any **communal** facilities that serve the **dwelling** meets these provisions. **Communal** facilities include storage areas, such as those used for depositing refuse and recycling, but not plant rooms or other service areas unless occupants need regular access, for example for meter reading.
- 2.5 For a house (or other **dwelling** that sits within its own plot) the **approach route** will often only involve a driveway, or a gate and a path, but for a **dwelling** within a larger building (typically a block of **flats**) the **approach route** will usually involve one, or more, **communal** gates, paths, entrances, doors, lobbies, corridors and access decks, as well as **communal** lifts and stairs.

#### Approach routes

##### General

- 2.6 The **approach route** should be safe and convenient, adopt the shallowest gradient that can reasonably be achieved and be **step-free**, irrespective of the storey on which the **dwelling** is located.
- 2.7 Where it is not reasonable to achieve a **step-free approach route** to the **principal private entrance**, a **step-free approach route** should be provided to a suitable alternative **private** entrance instead. The provisions for **approach routes** (other than those relating specifically to **step-free** access) should still apply to both the route to the **principal private entrance** and the route to the alternative **private** entrance.
- 2.8 Where a **communal ramped approach route** is provided and has an overall rise of 300mm or more, an additional stepped route meeting the requirements of paragraph 2.11 should also be provided.

- 2.9** An **approach route** for a Category 2 **dwelling** should comply with all of the following.
- The **approach route** is **level**, **gently sloping** or, where necessary, **ramped**.
  - Private** parts of the **approach route** have a minimum **clear width** of 900mm or 750mm where there are **localised obstructions**.
  - Communal** parts of the **approach route** (except **communal stairs**) have a minimum **clear width** of 1200mm or 1050mm where there are **localised obstructions**.
  - Any **localised obstruction** does not occur opposite or close to a doorway, or at a change of direction, and is no longer than 2m in length.
  - All external parts of the **approach route** have a **suitable ground surface**.
  - Every gate (or gateway) along the **approach route** has both:
    - a minimum **clear opening width** of 850mm
    - a 300mm nib to the **leading edge** of the gate.

### External and internal ramps forming part of an approach route

- 2.10** To enable people to use a ramp safely, the ramp should comply with all of the following.
- The gradient is between 1:20 and 1:12.
  - The length of each flight at a given gradient meets the provisions of Diagram 2.1.
  - Flights within a **private approach route** have a minimum **clear width** of 900mm.
  - Flights within a **communal approach route** have a minimum **clear width** of 1200mm.

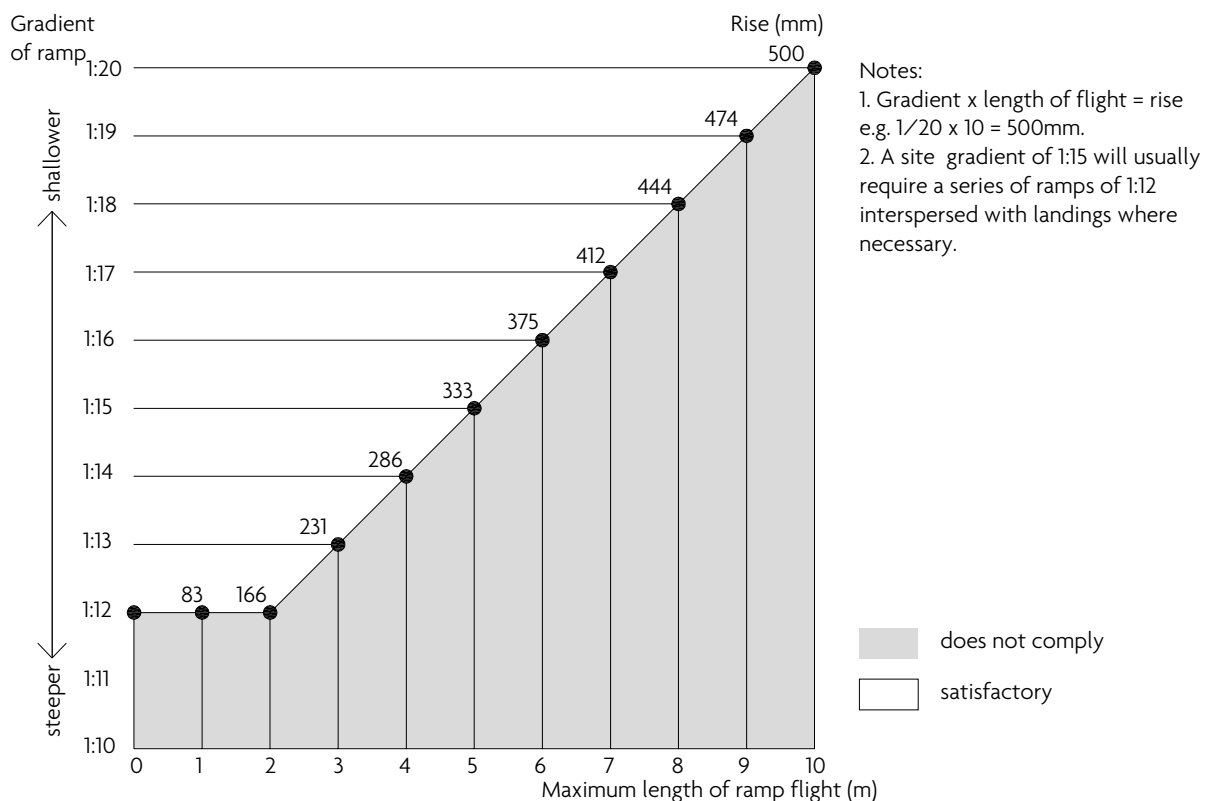


Diagram 2.1 Maximum length of ramp at a given gradient

- e. Every flight has a top and bottom landing.
- f. An intermediate landing is provided between individual flights and at any change of direction.
- g. Every landing is a minimum 1200mm long, clear of any door (or gate) swing.

### External steps forming part of an additional route

- 2.11** To enable a wide range of people to use steps safely, a stepped approach should comply with all of the following.
- a. Steps are uniform with a rise of between 150mm and 170mm and a going of between 280mm and 425mm (for tapered steps measured at a point 270mm from the 'inside' (narrow end) of the step).
  - b. Steps have **suitable tread nosings**.
  - c. No individual flight has a rise between landings of more than 1800mm.
  - d. Every flight has a minimum **clear width** of 900mm.
  - e. Top and bottom and, where necessary, intermediate landings are provided and every landing has a minimum length of 900mm.
  - f. Every flight with three or more risers has a suitable grippable handrail to one side, (or to both sides where the flight is wider than 1000mm). This grippable handrail is 850-1000mm above the pitch line of the flight and extends a minimum of 300mm beyond the top and bottom nosings.

## Car parking and drop-off

### Parking space

- 2.12** Where a parking space is provided for the **dwelling**, it should comply with all of the following.
- a. Where the parking is within the **private** curtilage of the **dwelling** (but not within a carport or garage) at least one space is a **standard parking bay** that can be widened to 3.3m.
  - b. Where **communal** parking is provided to blocks of **flats**, at least one **standard parking bay** is provided close to the **communal** entrance of each core of the block (or to the lift core where the parking bay is internal). The parking bay should have a minimum **clear access zone** of 900mm to one side and a dropped kerb in accordance with paragraph 2.13d.
  - c. Access between the parking bay and the **principal private entrance** or, where necessary, the alternative **private** entrance to the **dwelling** is step free.
  - d. The parking space is **level** or, where unavoidable, **gently sloping**.
  - e. The gradient is as shallow as the site permits.
  - f. The parking space has a **suitable ground surface**.

### Drop-off point

- 2.13** Where a drop-off point is provided for the **dwelling**, it should comply with all of the following.
- a. It is located close to the **principal communal entrance** of the building containing the **dwelling**.
  - b. It is **level** or, where unavoidable, **gently sloping**.
  - c. It has a **suitable ground surface**.

- d. Where a dropped kerb is provided, it is a minimum of 1000mm wide, reasonably flush with the adjoining ground and has a maximum gradient of 1:12.

## Communal entrances

### Principal communal entrance

**2.14** The **principal communal entrance** should comply with all of the following.

- There is a **level** landing a minimum of 1500mm wide and 1500mm long directly outside the entrance and clear of the swing of any door.
- The landing is covered to a minimum width of 1200mm and depth of 900mm.
- Lighting is provided which uses fully diffused luminaires activated automatically by a dusk to dawn timer or by detecting motion.
- The entrance door (or gate) has a minimum **clear opening width** of 850mm, when measured in accordance with Diagram 2.2.
- Where there are double doors (or gates), the main (or leading) leaf provides the required minimum **clear opening width**.
- A minimum 300mm nib is provided to the **leading edge** of the door (or gate) and the extra width created by this nib is maintained for a minimum distance of 1200mm beyond it.
- The reveal on the leading side of the door (usually the inside) has a maximum depth of 200mm.
- The threshold is an **accessible threshold**.
- Where there is a lobby or porch, the doors are a minimum of 1500mm apart and there is a minimum of 1500mm between door swings.
- The ground surface (or entrance flooring) does not impede wheelchair movement.
- Door entry controls, where provided, are mounted 900-1000mm above finished ground level, and at least 300mm away from any projecting corner.

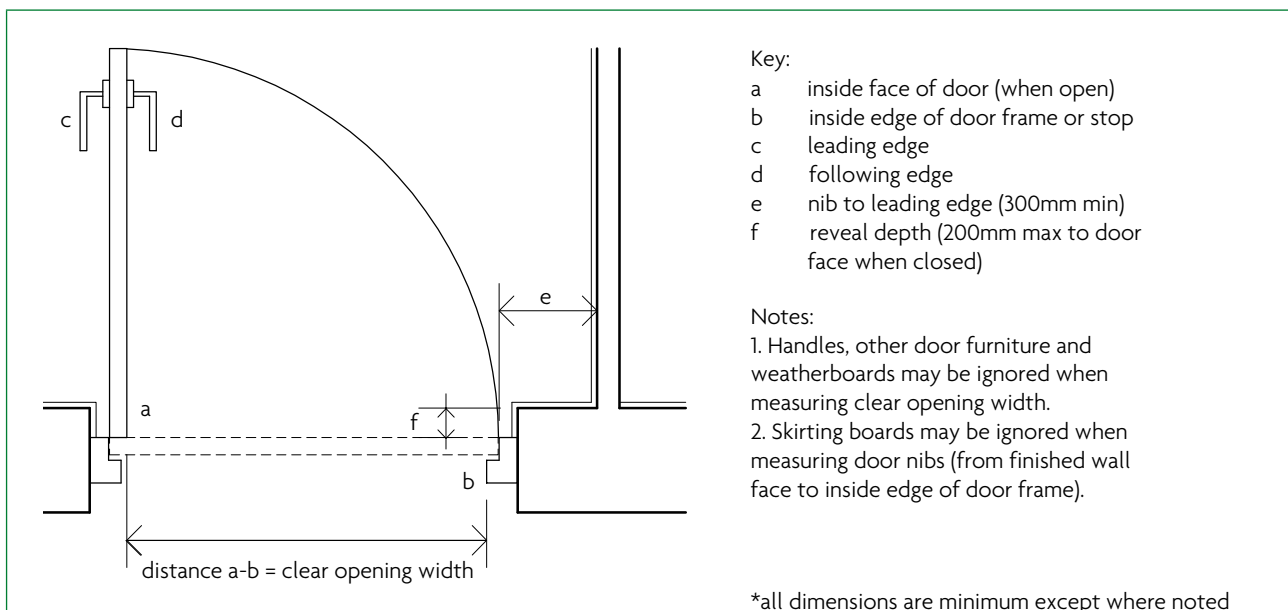


Diagram 2.2 Measurement of clear opening width and other features of external and internal doors

### Other communal doors

**2.15** Every communal door, or gate, along the approach route should comply with provisions d. to k. of paragraph 2.14.

## Communal lifts and stairs

### Communal lifts

- 2.16** A wide range of people, including accompanied wheelchair users, should be able to access and use the lift. Every passenger lift that gives access to the dwelling should comply with all of the following.
- a. There is a clear landing, a minimum of 1500mm long and 1500mm wide, directly in front of the lift door at every floor level.
  - b. The lift is equivalent to or meets the requirements of **BS EN 81-70:2003** for a type 2 lift.
  - c. The car is a minimum of 1100mm wide and 1400mm deep inside.
  - d. Doors have a minimum clear opening width of 800mm.
  - e. Landing and car controls are 900-1200mm above the car floor and a minimum of 400mm (measured horizontally) from the inside of the front wall.
  - f. The lift has an initial dwell time of five seconds before its doors begin to close after they are fully open.

### Communal stairs

**2.17** The principal communal stair that gives access to the dwelling should meet the requirements of Part K for a general access stair.

## Section 2B: Private entrances and spaces within the dwelling

### Application

- 2.18** The provisions of Section 2B apply only where a planning condition requires compliance with optional requirement M4(2) for accessible and adaptable dwellings (see paragraphs 0.3 to 0.6).
- 2.19** The provisions of Section 2B apply to private entrances, other external doors and key elements within the dwelling.

### Private entrances

#### Principal private entrance and alternative entrance

- 2.20** The principal private entrance, or the alternative private entrance where step-free access cannot be achieved to the principal private entrance, should comply with all of the following.
- There is a level external landing with a minimum width and depth of 1200mm.
  - The landing is covered for a minimum width of 900mm and a minimum depth of 600mm.
  - Lighting is provided which uses fully diffused luminaires activated automatically by a dusk to dawn timer or by detecting motion.
  - The door has a minimum clear opening width of 850mm when measured in accordance with Diagram 2.2.
  - Where there are double doors, the main (or leading) leaf provides the required minimum clear opening width.
  - A minimum 300mm nib is provided to the leading edge of the door and the extra width created by this nib is maintained for a minimum distance of 1200mm beyond it.
  - The depth of the reveal on the leading side of the door (usually the inside) is a maximum of 200mm.
  - The threshold is an accessible threshold.
  - Where there is a lobby or porch, the doors are a minimum of 1500mm apart and there is at least 1500mm between door swings.

#### Other external doors

- 2.21** All other external doors – including doors to and from a private garden, balcony, terrace, garage, carport, conservatory or storage area that is integral with, or connected to, the dwelling – should comply with provisions d. to i. of paragraph 2.20.

## Circulation areas and internal doorways

### Door and hall widths

- 2.22** To facilitate movement into, and between, rooms throughout the dwelling, doors and corridors should comply with all of the following (see Diagram 2.3).
- The minimum clear width of every hall or landing is 900mm.
  - Any localised obstruction, such as a radiator, does not occur opposite or close to a doorway or at a change of direction and is no longer than 2m in length; and the corridor is not reduced below a minimum 750mm width at any point.
  - Every door has a minimum clear opening width as set out in Table 2.1.
  - A minimum 300mm nib is provided to the leading edge of every door within the entrance storey.

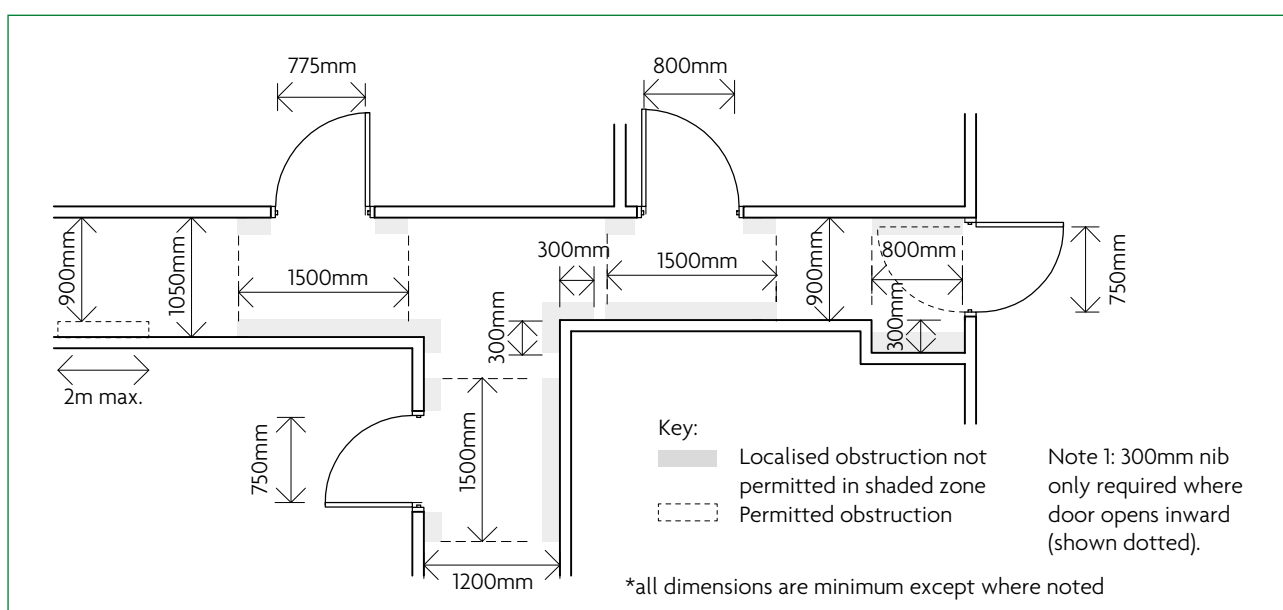


Diagram 2.3 Minimum door and hall widths and restrictions on localised obstructions

**Table 2.1 Minimum widths of corridors and passageways for a range of doorway widths**

Doorway clear opening width (mm)	Corridor clear passageway width
750 or wider	900 (when approached head on)
750	1200 (when approach is not head-on)
775	1050 (when approach is not head-on)
800	900 (when approach is not head-on)

**NOTE 1:** The provisions of paragraph 2.22 do not apply to:

- cupboards unless large enough to be entered, or
- en-suite bathrooms or showers that are additional to the provisions of paragraphs 2.26 to 2.29.

**NOTE 2:** Double doors effectively provide nibs where each leaf is at least 300mm wide.

**NOTE 3:** A standard 826mm door leaf up to 44mm thick will be deemed to satisfy a requirement for a **clear opening width** of 775mm.

## Private stairs and changes of level within the dwelling

- 2.23** To allow people to move between storeys, and to allow a stair-lift to be fitted to the stairs from the **entrance storey** to the storey above (or the storey below where this contains the bathroom required by the provisions of paragraph 2.29), stairs should comply with all of the following.
- Access to all rooms and facilities within the **entrance storey** is **step-free**.
  - Level changes within every other storey are avoided where possible.
  - The stair from the **entrance storey** to the storey above (or below) has a minimum **clear width** of 850mm when measured 450mm above the **pitch line** of the treads (ignoring any newel post).
  - All stairs meet the provisions of Part K for **private stairs**.

## Habitable rooms

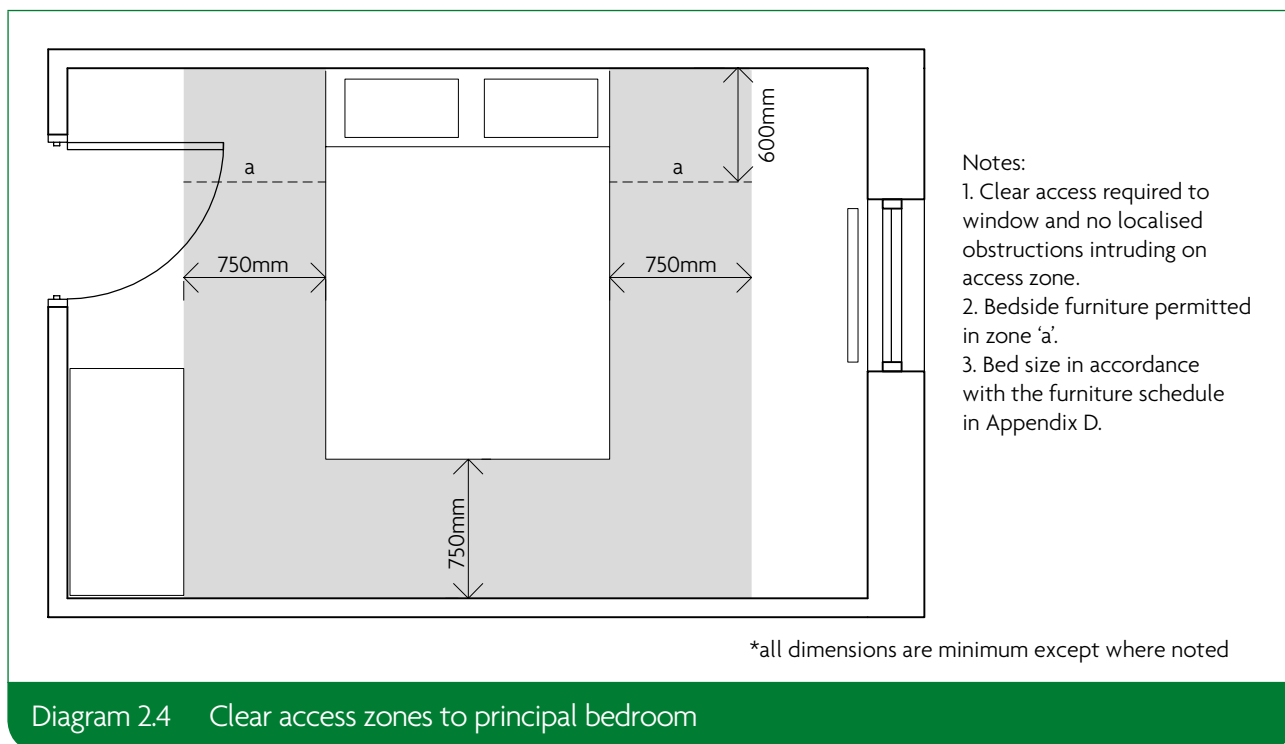
### Living, kitchen and eating areas

- 2.24** To provide usable living spaces and easy, **step-free** access between a living area, a WC and the **principal private entrance**, key accommodation should comply with all of the following.
- Within the **entrance storey** there is a living area (which may be a living room, dining room or a combined kitchen and dining room).
  - A minimum 1200mm clear space is provided in front of and between all kitchen units and appliances.
  - Glazing to the principal window of the principal living area starts a maximum of 850mm above floor level or at the minimum height necessary to comply with the requirements of Part K for guarding to windows.

### Bedrooms

- 2.25** To enable a wide range of people to access and use them, bedrooms should comply with all of the following.
- Every bedroom can provide a **clear access route** a minimum 750mm wide from the doorway to the window.
  - At least one double bedroom (the principal bedroom) can provide a **clear access zone** a minimum 750mm wide to both sides and the foot of the bed.
  - Every other double bedroom can provide a **clear access zone** a minimum 750mm wide to one side and the foot of the bed.
  - All single and twin bedrooms can provide a **clear access zone** a minimum 750mm wide to one side of each bed.
  - It can be demonstrated (for example by providing dimensioned bedroom layouts, similar to the example in Diagram 2.4) that the provisions above can be achieved.

**NOTE:** For the purpose of demonstrating compliance with these provisions, beds should be of the size set out in the furniture schedule in Appendix D.



## Sanitary facilities

### General provisions

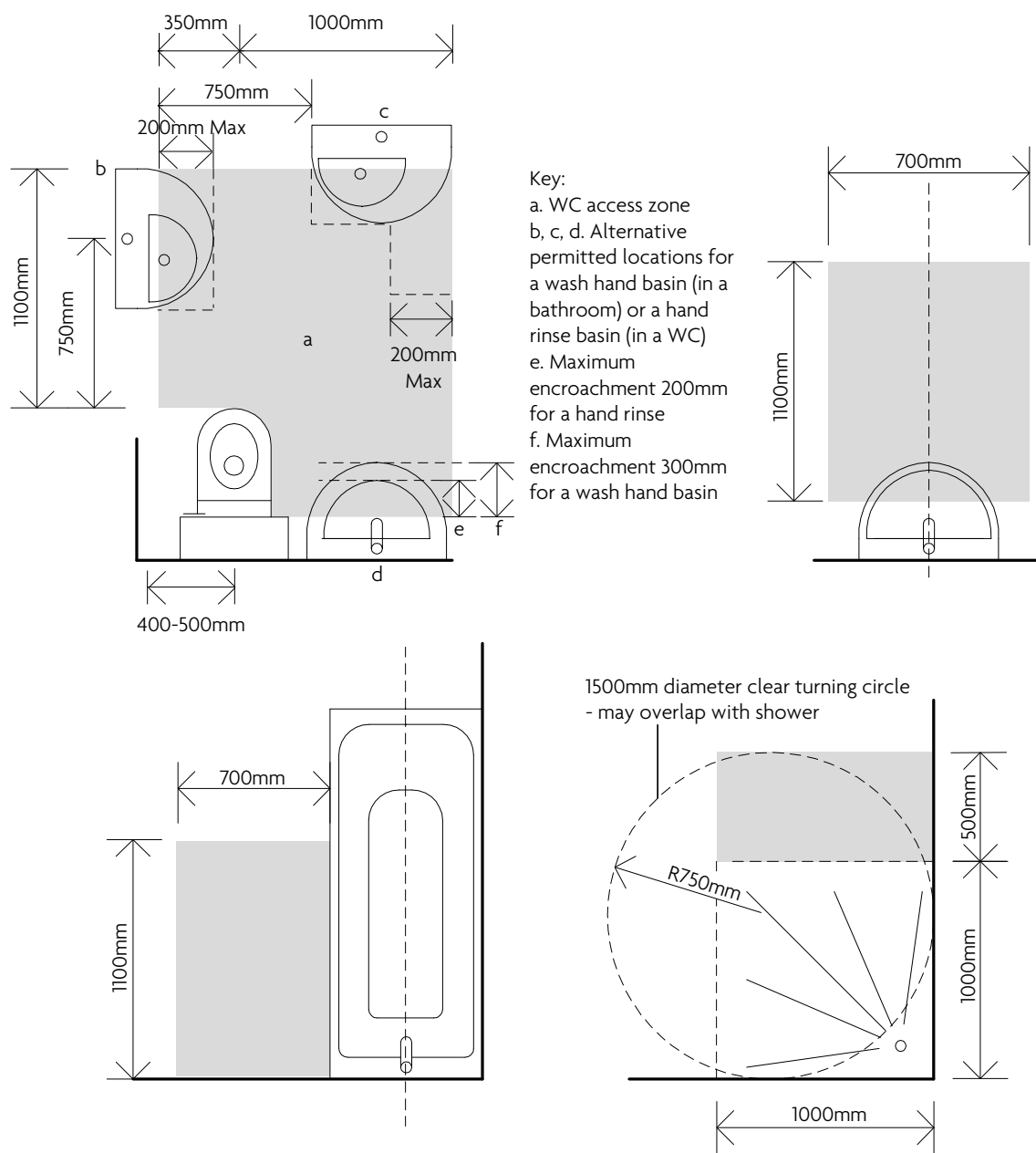
**2.26** All walls, ducts and boxings to the WC/cloakroom, bathroom and shower room should be strong enough to support grab rails, seats and other adaptations that could impose a load of up to 1.5kN/m<sup>2</sup>. Additional sanitary facilities beyond those required to comply with this guidance need not have strengthened walls.

**NOTE:** The loading for strengthened walls is considered suitable for many types of adaptations but additional localised strengthening may be required if adaptations are fitted that impose high point loads.

### WC facilities on the entrance storey

**2.27** To provide **step-free** access to a WC that is suitable and convenient for some wheelchair users and, where reasonable, to make provision for showering, dwellings should comply with all of the following.

- Every **dwelling** has a room within the **entrance storey** that provides a WC and basin (which may be within a WC/cloakroom or a bathroom).
- In a two or three storey **dwelling** with one or two bedrooms, the WC (together with its associated **clear access zone**) meets the provisions of Diagram 1.3 and the basin does not impede access to the WC.
- In a two or three storey **dwelling** with three or more bedrooms, the room with the WC and basin also provides an **installed level access shower** or a **potential level access shower**, and the shower, WC and basin (together with their associated **clear access zones**) meet the provisions of Diagram 2.5. Examples of compliant WC layouts are shown in Diagram 2.6.
- The door opens outwards.



## Notes:

1. Sizes of fittings are minima based on the furniture schedule in Appendix D. Other larger sizes may affect the overall size of a bathroom or WC/cloakroom.
2. Access zones may overlap except where noted.
3. The access zone to the basin may extend under it as far as any fixed obstruction, such as a vanity unit, pedestal or trap.
4. In WC/cloakrooms the basin and/or WC may encroach into the shower space but this should be minimised.
5. Any radiator or towel rail should be clear of all access zones.

Diagram 2.5 Sanitary fittings, associated clear access zones and permitted encroachment of basins

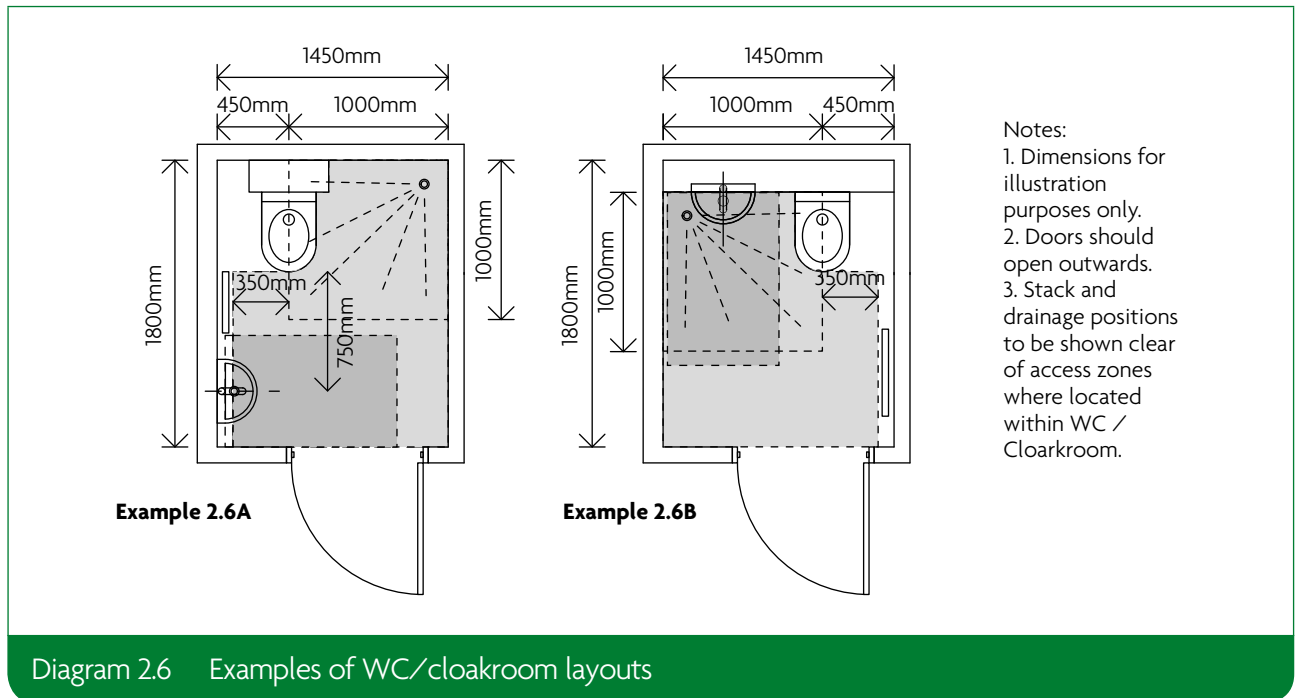


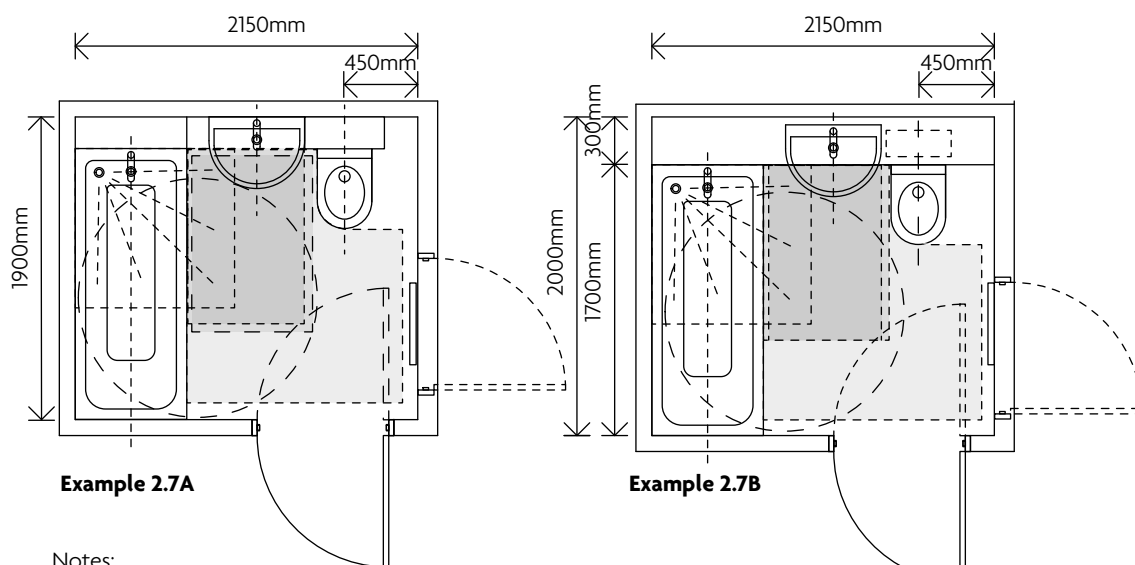
Diagram 2.6 Examples of WC/cloakroom layouts

**2.28** Where the dwelling provides both an accessible bathroom with a WC and a WC/cloakroom within the same storey, the WC/cloakroom may comply with the provisions of Diagram 1.3.

## Bathrooms

**2.29** To provide convenient access to a suitable bathroom, the dwelling should comply with all of the following.

- Every dwelling has a bathroom that contains a WC, a basin and a bath, that is located on the same floor as the double bedroom, described as the principal bedroom in paragraph 2.25b.
- The WC, basin and bath (together with their associated clear access zones) meet the provisions of Diagram 2.5. Examples of bathroom layouts are shown in Diagram 2.7.
- Provision for a potential level access shower is made within the bathroom if not provided elsewhere within the dwelling.



Notes:

1. Dimensions for illustration purposes only.
2. Stack and drainage positions to be shown clear of access zones where located within WC / Cloakroom.
3. Alternative door positions shown dotted.

Diagram 2.7 Examples of Category 2 bathrooms

## Services and controls

**2.30** To assist people who have reduced reach, services and controls should comply with all of the following.

- a. Consumer units are mounted so that the switches are between 1350mm and 1450mm above floor level.
- b. Switches, sockets, stopcocks and controls have their centre line between 450mm and 1200mm above floor level and a minimum of 300mm (measured horizontally) from an inside corner.
- c. The handle to at least one window in the principal living area is located between 450mm and 1200mm above floor level, unless the window is fitted with a remote opening device that is within this height range.
- d. Handles to all other windows are located between 450mm and 1400mm above floor level, unless fitted with a remote opening device that is within this height range.
- e. Either:
  - boiler timer controls and thermostats are mounted between 900mm and 1200mm above finished floor level on the boiler, or
  - separate controllers (wired or wireless) are mounted elsewhere in an accessible location within the same height range.

**NOTE:** Controls that are part of a radiator or cooker hood are exempt from these provisions.

## Optional requirement M4(3): Category 3 – Wheelchair user dwellings

This section of the approved document deals with the following optional requirement from Part M of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Optional requirement</i>	<i>Limits on application</i>
<b>Category 3 – wheelchair user dwellings</b>	
<b>M4(3) optional requirement</b>	Optional requirement M4(3)—
(1) Reasonable provision must be made for people to—	(a) may apply only in relation to a dwelling that is erected;
(a) gain access to, and	(b) will apply in substitution for requirement M4(1);
(b) use, the dwelling and its facilities.	(c) does not apply where optional requirement M4(2) applies;
(2) The provision made must be sufficient to—	(d) does not apply to any part of a building that is used solely to enable the building or any service or fitting in the building to be inspected, repaired or maintained.
(a) allow simple adaptation of the dwelling to meet the needs of occupants who use wheelchairs; or	
(b) meet the needs of occupants who use wheelchairs.	Optional requirement M4(3) (2)(b) applies only where the planning permission under which the building work is carried out specifies that it shall be complied with.

### Performance

In the Secretary of State's view, optional requirement M4(3) will be met where a new **dwelling** makes reasonable provision, either at completion or at a point following completion, for a wheelchair user to live in the **dwelling** and use any associated **private** outdoor space, parking and **communal** facilities that may be provided for the use of the occupants. Reasonable provision is made if the **dwelling** complies with all of the following.

- Within the curtilage of the **dwelling** or of the building containing the **dwelling**, a wheelchair user can approach and gain **step-free** access to every private entrance to the **dwelling** and to every associated **private** outdoor space, parking space and **communal** facility for occupants' use.
- Access to the WC and other accommodation within the **entrance storey** is **step-free** and the **dwelling** is designed to have the potential for **step-free** access to all other parts.
- There is sufficient internal space to make accommodation within the **dwelling** suitable for a wheelchair user.
- The dwelling is **wheelchair adaptable** such that key parts of the accommodation, including sanitary facilities and kitchens, could be easily altered to meet the needs of a wheelchair user or, where required by a local planning authority, the dwelling is **wheelchair accessible**.
- Wall-mounted switches, controls and socket outlets are accessible to people who have reduced reach.

## Section 3: Category 3 – Wheelchair user dwellings

### Section 3A: Approach to the dwelling

#### Application

- 3.1 The provisions of Section 3A apply only where a planning condition requires compliance with optional requirement M4(3) for a wheelchair user dwelling (see paragraphs 0.3 to 0.6).
- 3.2 The provisions of Section 3A apply to specific external and internal areas and elements that form part of the **approach route** to the **dwelling** and fall within the plot (or curtilage) of the individual **dwelling**, or the building containing the **dwelling**.
- 3.3 The provisions of Section 3A also apply to the **approach route** between the **dwelling** and the point, or points, at which a wheelchair user, or other disabled occupant or visitor, would expect to get in and out of a car. This **point, or points, of access** may be within or outside the plot of the **dwelling**, or the building containing the **dwelling**. These provisions do not apply beyond the curtilage of the development.
- 3.4 Reasonable provision should also be made to ensure that the **approach route** to any **communal** facilities intended to serve the **dwelling** meets these provisions. **Communal** facilities include storage areas, such as those used for depositing refuse and recycling, but not plant rooms or other service areas unless occupants need regular access to equipment within these spaces, for example for meter reading.
- 3.5 For a house (or other **dwelling** that sits within its own plot) the **approach route** will often only involve a driveway, or a gate and a path. For a **dwelling** within a larger building (typically a block of **flats**) the **approach route** usually involves one, or more, **communal** gates, paths, entrances, doors, lobbies, corridors and access decks, as well as **communal** lifts and stairs.
- 3.6 All the provisions of Section 3A apply to **wheelchair adaptable** and **wheelchair accessible dwellings**.

#### Approach routes

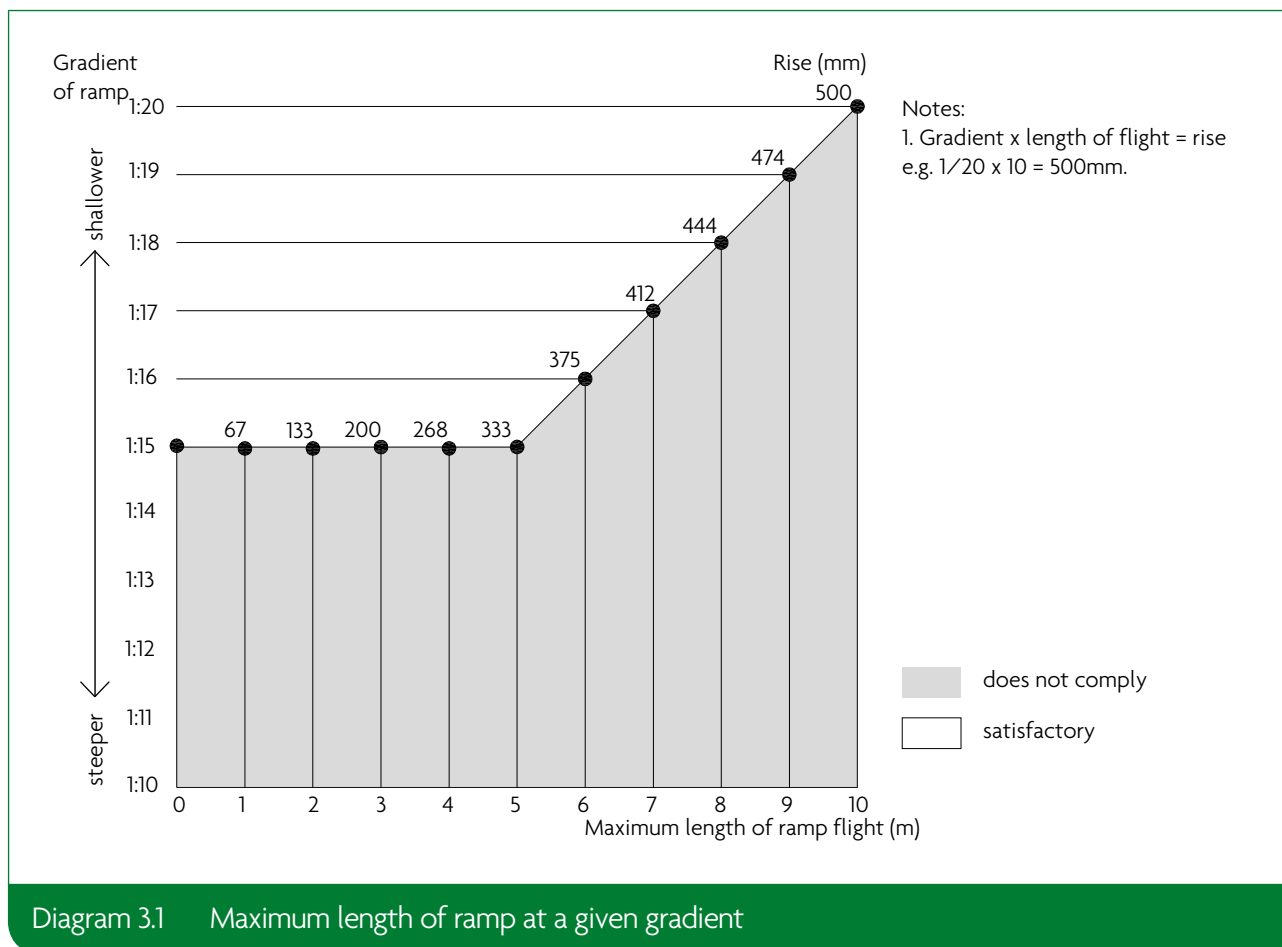
##### General provisions

- 3.7 The **approach route** should be safe and convenient for everyone, be at the shallowest gradient that can reasonably be achieved, and be **step-free**, irrespective of the storey on which the **dwelling** is located. Approach routes to dedicated storage for mobility scooters (where provided) should also be **step-free**.
- 3.8 A **step-free approach route** should be provided to all **private** entrances. Where a **communal ramped approach route** is provided and has an overall rise of 300mm or more, an additional stepped route meeting the requirements of paragraph 3.11 should also be provided.

- 3.9** An accessible **step-free approach route** that is specifically suitable for a wheelchair user should comply with all of the following.
- The **approach route** is **level, gently sloping or ramped**.
  - The **approach route** (whether **private** or **communal**) has a minimum **clear width** of 1200mm.
  - Any **localised obstruction** does not occur opposite or close to a doorway or at a change of direction and is no longer than 2m in length.
  - A **level** space with a minimum width and depth of 1500mm for passing or turning is provided at each end of the **approach route** and at maximum intervals of 10m.
  - External parts of the **approach route** have a **suitable ground surface**.
  - External parts of the **approach route** are illuminated by fully diffused lighting activated automatically by a dusk to dawn timer or by detecting motion.
  - Every gate (or gateway) between the footway and the main communal or private entrance has all of the following:
    - a minimum **clear opening width** of 850mm
    - a minimum 300mm nib to the **leading edge**
    - a minimum 200mm nib to the **following edge**.

#### **External and internal ramps forming part of an approach route**

- 3.10** External and internal ramps should comply with all of the following.
- The gradient is between 1:20 and 1:15.
  - The length of each flight at a given gradient meets the provisions of Diagram 3.1.
  - Flights (whether within a **private** or **communal approach route**) have a minimum **clear width** of 1200mm.
  - Top and bottom landings are provided to every flight.
  - An intermediate landing is provided between individual flights and at any change of direction.
  - Every landing is **level** and a minimum of 1200mm clear of any door (or gate) swing.



## External steps forming part of an additional route

- 3.11** To enable a wide range of people to use them safely, external steps should comply with all of the following.
- Steps are uniform with a rise of between 150mm and 170mm and a going of between 280mm and 425mm (for tapered steps measured at a point 270mm from the 'inside' (narrow end) of the step).
  - Steps have **suitable tread nosings**.
  - No individual flight has a rise of more than 1800mm between landings.
  - Every flight has a minimum **clear width** of 900mm.
  - Top, bottom and, where necessary, intermediate landings are provided and every landing is a minimum 900mm long.
  - Every flight with three or more risers has a suitable grippable handrail on one side of the flight (or to both sides where the flight is wider than 1000mm). This grippable handrail is 850-1000mm above the pitch line of the flight and extends at least 300mm beyond the top and bottom nosings.
  - Single steps are avoided.

## Car parking and drop-off

### Parking space

- 3.12** Where a dwelling has a parking space, to enable a wheelchair user to get into and out of a car from both sides and access the boot space, the parking space should comply with all of the following.
- Where the parking space is within the private curtilage of a dwelling (including a carport or garage) it is a standard parking bay with an additional minimum clear access zone of 1200mm to one side and to the rear.
  - Where it is within a communal parking area, it is a standard parking bay with an additional minimum clear access zone of 1200mm to both sides.
  - The parking space is level.
  - The parking space has a minimum clear headroom of 2200mm.
  - The parking space has a suitable ground surface.

**NOTE:** The side access zones in communal parking areas may be shared by two bays.

### Drop-off point

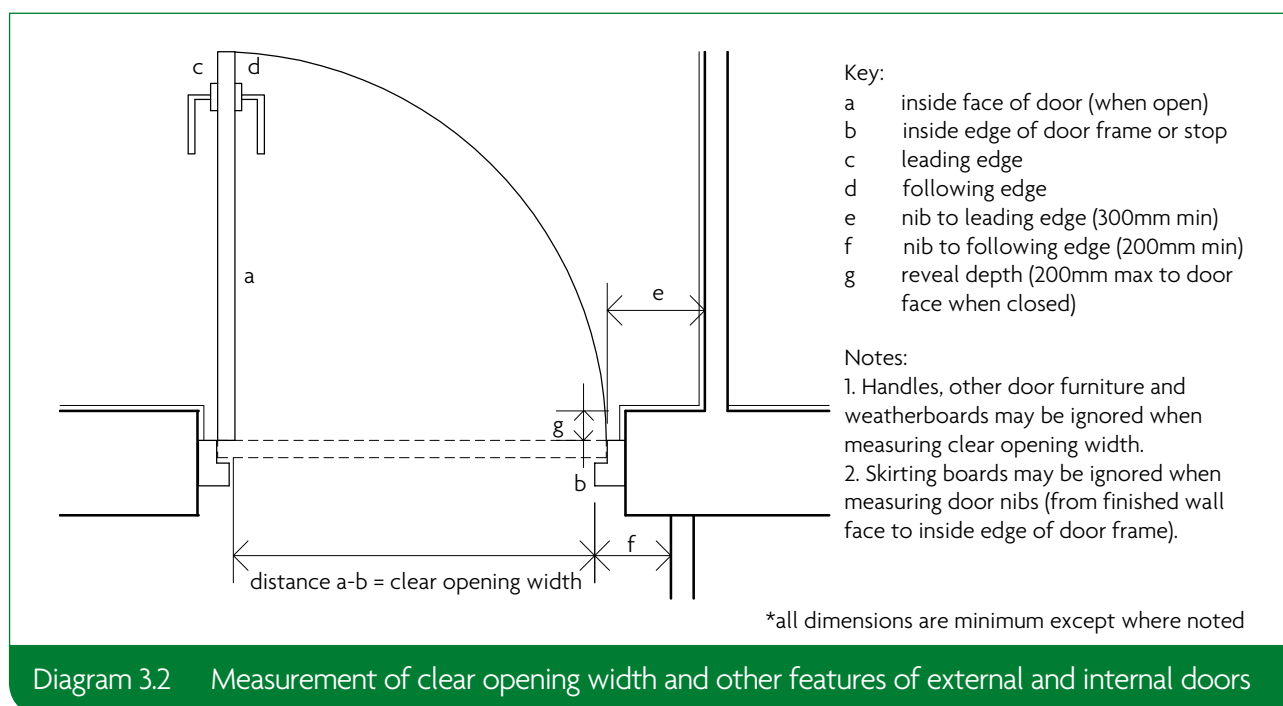
- 3.13** Where a drop-off point (or setting down point) is provided for the dwelling, it should comply with all of the following.
- The drop-off point is located close to the principal communal entrance of the core of the building that contains the dwelling.
  - The drop-off point is level.
  - The drop-off point has a suitable ground surface.
  - Where a dropped kerb is provided, it is a minimum of 1000mm wide, is reasonably flush with the adjoining ground and has a maximum gradient of 1:15.

## Communal entrances

### Principal communal entrance

- 3.14** To enable a wheelchair user to enter the principal communal entrance, it should comply with all of the following.
- There is a level landing with a minimum width and depth of 1500mm outside the entrance.
  - The landing is covered to a minimum width and depth of 1200mm.
  - Lighting is provided which uses fully diffused luminaires activated automatically by a dusk to dawn timer or by detecting motion.
  - A clear turning circle 1500mm in diameter is provided inside the entrance area, behind the entrance door when closed.
  - The entrance door (or gate) has a minimum clear opening width of 850mm when measured in accordance with Diagram 3.2.
  - Where double doors (or gates) are provided, the main leaf provides the required minimum clear opening width.
  - A minimum 300mm nib is provided to the leading edge of the door (or gate) and the extra width created by this nib is maintained for a minimum of 1800mm beyond it.

- h. A minimum 200mm nib is provided to the **following edge** of the door (or gate) and the extra width created by this nib is maintained for a distance of a minimum 1800mm beyond it.
- i. The door is located reasonably centrally within the thickness of the wall while ensuring that the depth of the reveal on the leading face of the door (usually the inside) is a maximum of 200mm.
- j. The threshold is an **accessible threshold**.
- k. Where there is a lobby or porch, the doors are a minimum of 1500mm apart and there is a minimum of 1500mm clear space between door swings.
- l. Power assisted opening is provided where the opening force of the door is more than 30N from 0° to 30° or more than 22.5N from 30° to 60° of the opening cycle.
- m. The ground surface (or entrance flooring) does not impede movement by wheelchair users.
- n. Door entry controls, where provided, are mounted 900-1000mm above finished ground level a minimum of 300mm away from any projecting corner.



## Other communal doors

- 3.15** Every **communal** door, or gate, along the **approach route** should comply with provisions e. to n. of paragraph 3.14.

## Communal lifts and stairs

### Communal lifts

- 3.16** To enable a wide range of people, including accompanied wheelchair users, to access and use the lift, every **communal** passenger lift that gives access to the **dwelling** should comply with all of the following.
- a. A clear landing, a minimum of 1500mm long and 1500mm wide, is directly in front of the lift door at every floor level.

- b. The lift is equivalent to or complies with requirements of **BS EN 81-70:2003** for a type 2 lift.
- c. The lift car is a minimum of 1100mm wide and 1400mm deep
- d. Doors have a minimum **clear opening width** of 800mm.
- e. Landing and car controls are located 900-1200mm above the car floor and a minimum of 400mm (measured horizontally) from the inside of the front wall.
- f. The lift has an initial dwell time of five seconds before its doors begin to close after they are fully open.

### **Communal stairs**

- 3.17** The principal **communal** stair that gives access to the **dwelling** should meet the provisions of Part K for a general access stair.

## Section 3B: Private entrances and spaces within, and connected to, the dwelling

### Application

- 3.18** The provisions of Section 3B apply only where a planning condition requires compliance with optional requirement M4(3) for a wheelchair user dwelling (see paragraphs 0.3 to 0.6).
- 3.19** The provisions of Section 3B apply to **private** entrances, other external doors and key elements within the **dwelling**. They also cover any associated **private** outdoor space, garden, balcony or **private** roof terrace.
- 3.20** In order to demonstrate that the **dwelling** is capable of meeting the functional and spatial provisions for a **wheelchair adaptable** or **wheelchair accessible dwelling**, furnished plan layouts that show the access zones and other provisions of Section 3B and the furniture of the furniture schedule included as Appendix D of this approved document should be provided to a scale of at least 1:100.
- 3.21** All the provisions of Section 3B apply to **wheelchair adaptable** and **wheelchair accessible dwellings**, except where noted otherwise.

### Private entrances

#### Principal private entrance

- 3.22** The **principal private entrance** to the individual **dwelling** should comply with all of the following (see Diagram 3.3).
- There is a **level** external landing with a minimum width and depth of 1500mm and clear of any door swing.
  - The landing area is covered for a minimum width and depth of 1200mm.
  - Lighting is provided which uses fully diffused luminaires activated automatically by a dusk to dawn timer or by detecting motion.
  - There is a minimum 1500mm **clear turning circle** inside the entrance area, in front of the door when closed.
  - A minimum 300mm nib is provided to the **leading edge** of the door and the extra width created by this nib is maintained for a minimum of 1800mm beyond it. A minimum 150mm nib is provided to the hinge side of the door (to allow for the fitting of a cage to the inside face of the letter box).
  - The door has a minimum **clear opening width** of 850mm, when measured in accordance with Diagram 3.2.
  - Where there are double doors, the main (or leading) leaf provides the required minimum **clear opening width**. A minimum 200mm nib is provided to the **following edge** of the door and the extra width created by the nib is maintained for a minimum of 1500mm beyond it.



- h. The door is located reasonably centrally within the thickness of the wall while ensuring that the depth of the reveal on the leading face of the door (usually the inside) is a maximum of 200mm.
- i. The threshold is an **accessible threshold**.
- j. Where there is a lobby or porch, the doors are a minimum of 1500mm apart and there is a minimum of 1500mm between door swings.
- k. Door entry controls, where provided, are mounted 900-1000mm above finished ground level a minimum of 300mm away from any external return corner.
- l. A fused spur, suitable for the fitting of a powered door opener, is provided on the hinge side of the door.

## Other external doors

**3.23** All other external doors – including doors to and from a **private** garden, balcony, terrace, garage, carport, conservatory or storage area that is integral with, or connected, the **dwelling** comply with provisions f. to k. of paragraph 3.22 and should have a minimum 300mm nib to the leading edge of the door with the extra width created by this nib extending for a minimum 1800mm beyond it.

## Circulation areas, internal doorways and storage

### Hall and door widths

- 3.24** To facilitate wheelchair movement into and between rooms, internal halls and doors should comply with all of the following (see Diagram 3.4).
- a. The minimum **clear width** of every hallway, approach or landing is 1050mm.
  - b. Where the approach to a doorway is not head-on, the minimum **clear width** of the hallway or approach is 1200mm.
  - c. Any **localised obstruction**, such as a radiator, does not occur opposite or close to a doorway or at a change of direction and is no longer than 2m in length, as shown in Diagram 3.4.
  - d. Every door has a minimum **clear opening width** of 850mm, irrespective of the direction of entry, when measured in accordance with Diagram 3.2.
  - e. Where an outward opening door is located close to a corner and another door is located on the return wall within 800mm of that corner, the **leading edge** of the outward opening door is a minimum of 800mm from the corner, as shown in Diagram 3.5, unless a 1500mm turning circle is provided immediately outside the door.
  - f. A minimum 300mm nib is provided to the **leading edge** of every door.
  - g. A minimum 200mm nib is provided to the **following edge** of every door.

**NOTE 1:** The provisions of paragraph 3.24 do not apply to:

- cupboards unless they are large enough to be entered, or
- en-suite bathrooms or showers that are additional to the provisions of paragraphs 3.41 to 3.43.

**NOTE 2:** Double doors effectively provide nibs where each leaf is a minimum of 300mm wide.

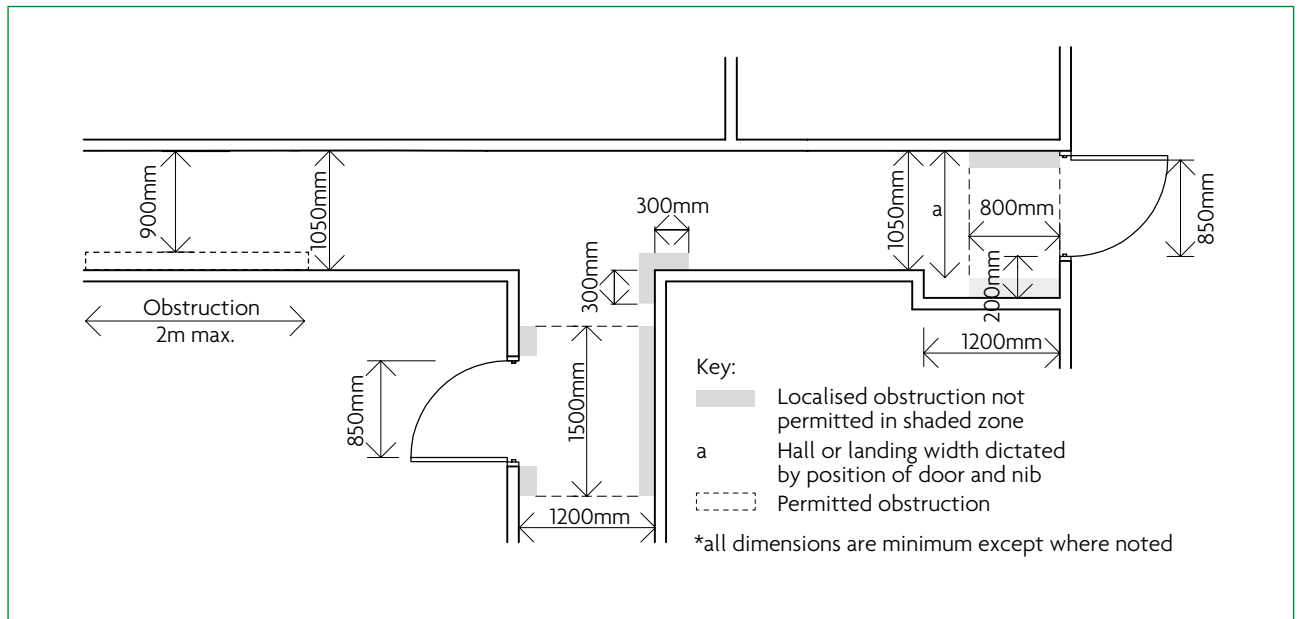


Diagram 3.4 Minimum door and hall widths and restrictions on localised obstructions

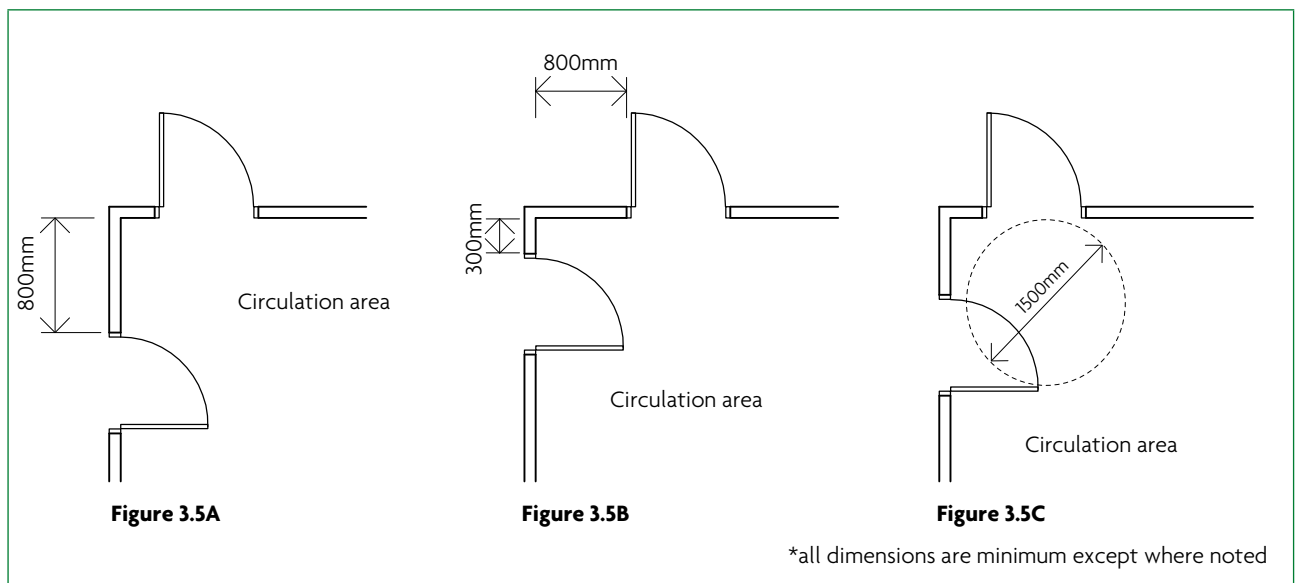


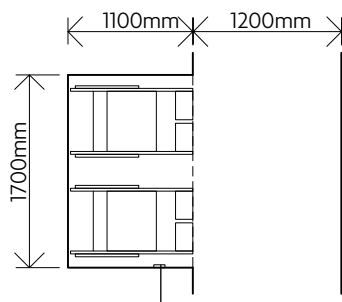
Diagram 3.5 Outward opening doors in a corner

## Wheelchair storage and transfer space

**3.25** To enable a person to charge and store up to two wheelchairs and transfer between an outdoor and an indoor wheelchair, a **dwelling** should have a storage and transfer space which complies with all of the following.

- A minimum 1100mm deep by 1700mm wide space is available on the **entrance storey**, preferably close to the **principal private entrance**.
- Is accessible from a space that has a minimum **clear width** of 1200mm, as shown in Diagram 3.6.
- A power socket is provided within the space.

- d. In **wheelchair adaptable** dwellings the storage and transfer space may be used for another purpose such as general storage (and doors fitted if required) provided that:
- the provisions of paragraph 3.25 can be met without alteration to structure or services, and
  - the space is additional to the minimum requirements for storage, living spaces and bedrooms set out in paragraphs 3.26, 3.31 and 3.35.



Power socket  
\*all dimensions are minimum except where noted

Diagram 3.6 Wheelchair storage and transfer space

## General storage space

**3.26** To make adequate provision for the storage of household items, general built-in storage space should comply with Table 3.1.

**Table 3.1 Minimum area of general built-in storage**

Number of bedrooms	1	2	3	4	5	6
Minimum storage area (m <sup>2</sup> )	1.5	2.0	2.5	3.0	3.5	4.0

**NOTE:** For the purposes of Table 3.1, include areas with reduced headroom as follows:

- headroom between 900mm and 1500mm: at 50% of its area
- lower than 900mm: do not count.

The full area under a stair that forms part of the storage provision should be counted as 1m<sup>2</sup>.

## Through-floor lifting device provision

**3.27** To ensure that provision can be made for a wheelchair user to access to all parts of a **dwelling** on more than one floor level, the **dwelling** should comply with either the requirements of paragraph 3.28 for a **wheelchair adaptable** dwelling or 3.29 for a **wheelchair accessible** dwelling.

**3.28** Where the **dwelling** is defined as **wheelchair adaptable**, it should be easy to install a lift. The space for the **liftway** can, however, be used for another purpose (such as storage or part of a habitable room) providing it is demonstrated that the **dwelling** complies with all of the following.

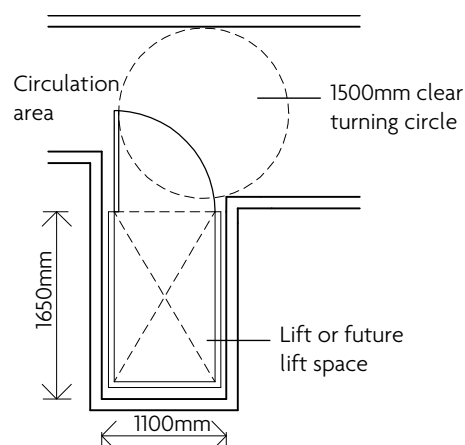
- Any floors, walls and doors that have been installed to allow the potential **liftway** to be used as storage or for other purposes could be easily removed without structural alteration.

- b. Future provision for the **liftway** is a minimum of 1100mm wide and 1650mm long internally linking circulation areas at every floor level of the **dwelling**.
- c. Where walls forming the **liftway** enclosure are not initially installed, they can be easily reinstated without the need for structural works and would not compromise compliance with this or any other part of the Building Regulations.
- d. Drawings demonstrate how all the provisions of paragraph 3.29 can be complied with if a suitable lifting device is fitted in the future.
- e. The space for the future lift installation is not used to meet other requirements and in particular is not included in the minimum living, kitchen and eating area set out in paragraph 3.31.

**3.29** Where the **dwelling** is defined as **wheelchair accessible**, a suitable through-floor lift or lifting platform should be installed and commissioned and the dwelling should comply with all of the following.

- a. There is a continuous **liftway** a minimum 1100mm wide and 1650mm long internally linking every floor level of the dwelling.
- b. The **liftway** can be entered from the same one of its narrower ends at every floor level.
- c. A minimum 1500mm **clear turning circle**, clear of the **liftway** door when open at 90 degrees, could be provided in front of the **liftway** door at every floor level, as shown in Diagram 3.7.
- d. A power socket, suitable for powering the lifting device, is provided close to the **liftway**.
- e. The shaft is positioned to allow the lift to run between the circulation areas in every storey of the **dwelling** (irrespective of the number of storeys).
- f. Lifting devices should be positioned with the end opposite to the entry point located against a wall at every floor level.
- g. Doors are power operated.

**NOTE:** In a two storey **dwelling** the requirement can typically be met by a home lift to **BS 5900** or lifting platforms to **BS EN 81-41**. A lifting platform may require a larger **liftway** than stated in paragraph 3.29 and may also require a three-phase power supply.



Notes:

- 1. All doors to be power operated.
- 2. Turning circle should be clear of top step of any adjacent flight of steps.\*

\*all dimensions are minimum except where noted

Diagram 3.7 Access to through floor lift

## Private stairs and changes of level within the dwelling

- 3.30** An ambulant disabled person should be able to move within, and between, storeys. It should also be possible to fit a stair-lift to the stairs from the **entrance storey** to the storey above (or the storey below where this contains the bathroom required by the provisions of paragraph 3.41). The **dwelling** should comply with all of the following.
- Access to all rooms and facilities within the **entrance storey** is **step-free**.
  - There are no changes of level within any other storey.
  - The stair from the **entrance storey** to the storey above (or below) and any stair within the storey above (or below) has a minimum **clear width** of 850mm when measured at 450mm above the **pitch line** of the treads (ignoring any newel post).
  - A power socket suitable for powering a stair-lift is provided close to the foot or head of any stair to which a stair lift may be fitted.
  - All stairs meet the provisions of Part K for **private stairs**.

## Habitable rooms

### Living areas

- 3.31** To provide usable living spaces that have a convenient, **step-free** relationship between the living space, WC and **principal private entrance**, living areas should comply with all of the following.
- The principal living area is within the **entrance storey**.
  - The minimum combined internal floor area of living, dining and kitchen space meets the provisions of Table 3.2.
  - Glazing to the principal window of this living area starts a maximum of 850mm above floor level or at the minimum height reasonable in achieving compliance with the provisions of Part K for guarding to windows.

**Table 3.2 Minimum combined floor area for living, dining, and kitchen space**

Number of bedspaces	2	3	4	5	6	7	8
Minimum floor area m <sup>2</sup>	25	27	29	31	33	35	37

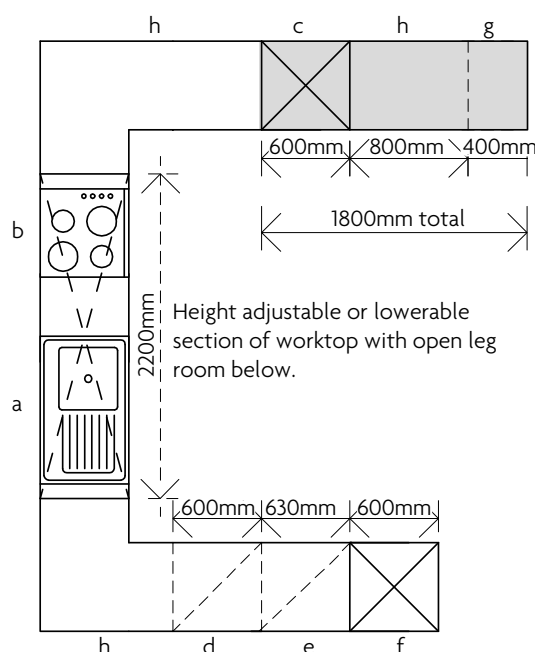
### Kitchen and eating areas

- 3.32** The relationship between the kitchen, dining and living areas should be convenient and **step-free**. Kitchen and eating areas should comply with all of the following.
- The kitchen and principal eating area are within the same room, or connected to each other, and located within the **entrance storey**.
  - There is a minimum **clear access zone** 1500mm wide in front of, and between, all kitchen units and appliances.
- 3.33** Where the **dwelling** is defined as **wheelchair adaptable**, in addition to the provisions of paragraph 3.32, the kitchen should comply with all of the following.
- The overall length of kitchen worktop meets at least the provisions of Table 3.3.

- b. Drawings demonstrate how the kitchen could be easily adapted to meet the provisions of paragraph 3.34 and Table 3.4 at a future date without compromising the space in any other part of the dwelling and without the need to move structural walls, stacks or concealed drainage.

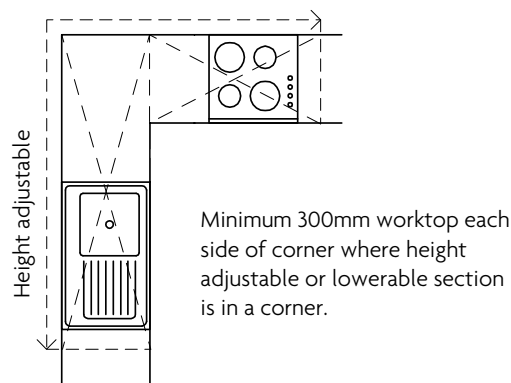
**Table 3.3 Minimum length of kitchen worktop, including fittings and appliances, to be fitted at completion for a wheelchair adaptable dwelling**

Number of bedspaces	2	3 & 4	5	6-8
Minimum worktop length (mm)	4330	4730	5630	6730



**Notes:**

1. Shaded units represent additional requirements for a wheelchair accessible layout over an equivalent wheelchair adaptable layout.
2. Unit length should be measured through mid-line of the worktop, not the front or rear edge.



**Wheelchair accessible layout**

**Key:**

- a sink and drainer
- b hob
- c suitable space for built-in oven (c/l 800-900mm)
- d dishwasher
- e washing machine
- f fridge freezer
- g recycling
- h storage base units (inc. corner units)

Allow for shallow, insulated sink bowl with swivel, mixer tap and flexible plumbing and provide a min. 400mm length of worktop to at least one side of the oven and fridge/freezer.

\*all dimensions are minimum except where noted

**Diagram 3.8 Example of a wheelchair accessible kitchen layout**

**3.34** Where the dwelling is defined as **wheelchair accessible**, in addition to the provisions of paragraph 3.32, the kitchen should comply with all of the following (see in Diagram 3.8).

- a. The overall length of kitchen worktop meets the provisions of Table 3.4.
- b. The worktop includes a continuous section that incorporates a combined sink and drainer unit and a hob, and all of the following.
  - The section of worktop is a minimum 2200mm long.
  - The section of worktop is either a height adjustable worktop, or is a fixed section capable of being refixed at alternate heights.
  - There are no fixed white goods (appliances) placed beneath this section of worktop.
  - This section of worktop provides clear and continuous open leg space underneath (capable of achieving a minimum of 700mm clearance above floor level).
- c. The sink is not more than 150mm deep with insulation to the underside to prevent scalding of a wheelchair user's legs.
- d. Taps should be lever operated and capable of easy operation.
- e. A suitable space has been identified for a built-in oven (with its centre line between 800mm and 900mm above floor level) to be installed.
- f. A pull out shelf is provided beneath the oven enclosure.
- g. There is a minimum of 400mm of worktop to at least one side of the oven and fridge or fridge freezer where this is taller than the worktop height (or to one side of a pair of tall appliances where they are located together at the end of a run).
- h. Water supply to sinks includes isolation valves and flexible tails.
- i. Drainage is either flexible, or is fixed but easily adaptable to suit worktop heights between 700mm and 950mm above finished floor level.

**Table 3.4 Minimum length of kitchen worktop, including fittings and appliances, to be fitted at completion for a wheelchair accessible dwelling**

Number of bedspaces	2	3 & 4	5	6–8
Minimum worktop length (mm)	6130	6530	7430	8530

## Bedrooms

**3.35** One bedroom should be close to an accessible bathroom suitable for a wheelchair user.

All other bedrooms should be accessible to a wheelchair user. Bedrooms should comply with all of the following.

- a. Every bedroom can provide a minimum **clear access route**, 750mm wide, from the doorway to the window.
- b. Every bedroom can provide a minimum 1200mm by 1200mm **manoeuvring space** inside the doorway, clear of the bed and the door (when the door is in the closed position).
- c. The ceiling structure to every bedroom is strong enough to allow for the fitting of an overhead hoist capable of carrying a load of 200kg.

- d. A principal double bedroom is located on the **entrance storey**, or the storey above (or below) the entrance storey, has a minimum floor area of 13.5m<sup>2</sup> and is a minimum of 3m wide clear of obstructions (e.g. radiators).
- e. The principal double bedroom can provide a minimum 1000mm wide **clear access zone** to both sides and the foot of the bed and in front of all furniture, and a minimum 1200mm by 1200mm **manoeuvring space** on both sides of the bed (see Diagram 3.9).
- f. Every other double (or twin) bedroom has a minimum floor area of 12.5m<sup>2</sup> and is a minimum of 3m wide.
- g. Every other double bedroom can provide a 1000mm wide **clear access zone** to one side and the foot of the bed, and in front of all furniture.
- h. All single and twin bedrooms provide a minimum 1000mm **clear access zone** to one side of each bed and in front of all furniture.
- i. Every single bedroom has a minimum floor area of 8.5m<sup>2</sup> and is at least 2.4m wide.

**NOTE 1:** When demonstrating compliance with these provisions, bed sizes and furniture should comply with the requirements of the furniture schedule in Appendix D.

**NOTE 2:** The loading for strengthened ceilings is considered suitable for many types of adaptations but additional localised strengthening may be required to support high point loads at the time that adaptations are fitted.

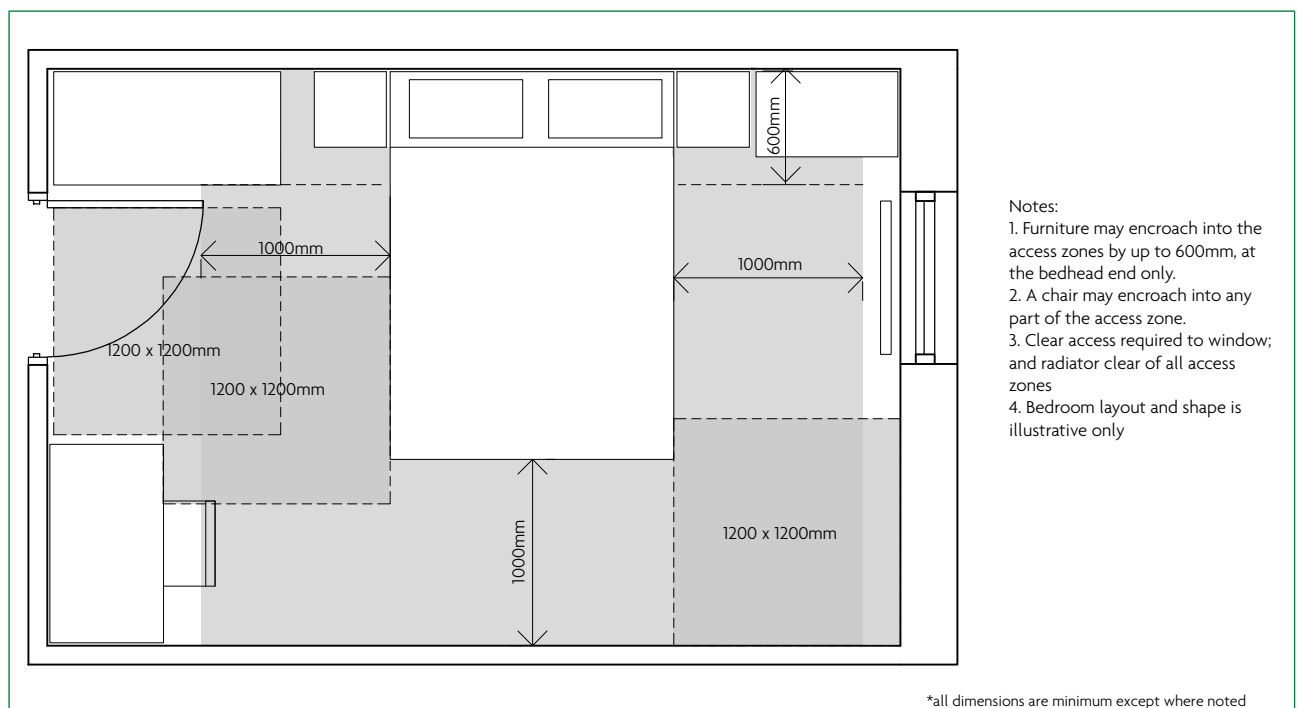


Diagram 3.9 Clear access zones and manoeuvring spaces to principal bedroom

## Sanitary facilities

### General provisions

- 3.36** Dwellings should provide suitable WC and washing facilities. Reasonable provision will vary depending on whether dwellings are **wheelchair adaptable** or **wheelchair accessible**. To provide suitable and convenient sanitary facilities, a **dwelling** should comply with all of the following.
- WC facilities are provided which comply with the relevant requirements of paragraphs 3.37 to 3.40, and bathroom facilities are provided which comply with the relevant requirements of paragraphs 3.41 to 3.43.
  - Any **dwelling** with four or more **bedspaces** provides access to a minimum of two WCs in separate bathrooms or WC/cloakrooms (see Table 3.5).
  - Every room that contains an **installed level access shower** is constructed as a **wet room**.
  - All walls, ducts and boxings to every WC/cloakroom, bath and shower room are strong enough to support grab rails, seats and other adaptations that could impose a load of 1.5kN/m<sup>2</sup>.
  - The ceiling structure to bathrooms and WC/cloakrooms required by paragraphs 3.36 to 3.40 is strong enough to allow for the fitting of an overhead hoist capable of carrying a load of 200kg.
  - Where sanitary facilities are **wheelchair accessible**, WC flush controls are positioned on the front of the cistern on the transfer side and can be easily gripped, e.g. a lever flush handle.
  - Where sanitary facilities are **wheelchair accessible**, WC pans should be a minimum of 400mm high.
  - Where sanitary facilities are **wheelchair accessible**, basins and sinks should be wall hung (typically with their rim 770-850mm above finished floor level) and the clear zone beneath basins, services and pedestals is maximised to enable wheelchair users to approach. Ideally this clear zone should be in the range 400-600mm from finished floor level.
  - Stacks or soil and vent pipes should only be positioned adjacent to WC where there is no practical alternative and should always be on the wall side of the WC.

**NOTE 1:** The loading for strengthened walls is considered suitable for many types of adaptations but additional localised strengthening may be required if adaptations are fitted that impose high point loads.

**NOTE 2:** The provisions of paragraph 3.36 do not apply to sanitary facilities that are additional to the provisions of paragraphs 3.36 to 3.40.

**NOTE 3:** For the purposes of establishing number of **bedspaces** relevant to these requirements, a bedroom at or above 8.5m<sup>2</sup> and below 12.5m<sup>2</sup> in size is counted as one **bedspaces**, and equal to or greater than 12.5m<sup>2</sup> as two **bedspaces**.

**Table 3.5 Summary of minimum requirements for sanitary provision in typical dwelling types** (dwellings should also comply with relevant detailed requirements set out in paragraphs 3.36-3.43)

Single storey dwelling (typically a flat or bungalow)	
Occupancy	Typical minimum sanitary provision
2 or 3 bedspaces	Bathroom with level access shower
4 bedspaces	Bathroom with level access shower and separate WC/cloakroom
5 bedspaces or more	Bathroom with level access shower and separate WC/cloakroom (or second bathroom). <b>Wheelchair accessible</b> dwellings must also provide both a level access shower and a bath
Two or three storey dwelling (typically a house or maisonette)	
Occupancy	Typical minimum sanitary provision
2 or 3 bedspaces	Bathroom with level access shower on same level as principal bedroom + <b>entrance storey</b> WC/cloakroom (where bathroom not on the <b>entrance storey</b> )
4 bedspaces	Bathroom with level access shower on same level as principal bedroom and <b>entrance storey</b> WC/cloakroom or second bathroom
5 bedspaces or more	Bathroom with level access shower on same level as principal bedroom and <b>entrance storey</b> WC/cloakroom or second bathroom. <b>Wheelchair accessible</b> dwellings must also provide both a level access shower and a bath

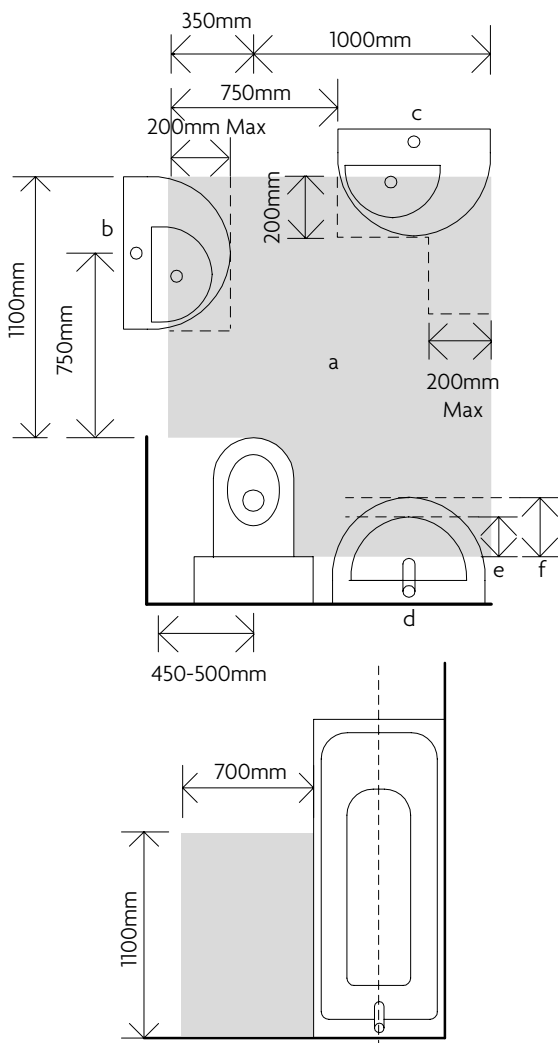
### WC facilities on the entrance storey

**3.37** To make suitable and convenient provision for a wheelchair user to use a WC, the **dwelling** should comply with all of the following.

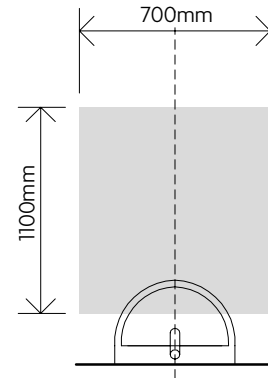
- Every **dwelling** has, on the **entrance storey**, a **wet room** (which may be a WC/cloakroom or a bathroom) that contains a WC, a basin and an **installed level access shower** and complies with the requirements of either paragraph 3.38 or 3.39.
- Where the **dwelling** provides both a bathroom and a WC/cloakroom on the same storey, the WC facility need only comply with the requirements of paragraph 3.40.
- The door to the WC facility opens outwards.

**3.38** Where the **dwelling** is defined as **wheelchair adaptable**, WC facilities should also comply with all of the following.

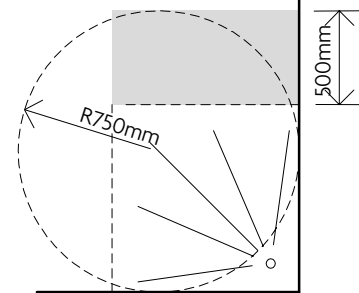
- The WC, basin and shower (and their associated **clear access zones**) meet the provisions in Diagram 3.10. An example of a compliant design is shown in Diagram 3.12.
- It is demonstrated how the WC/cloakroom could be easily adapted in future to meet the provisions of paragraph 3.39.



Key:  
a. WC access zone  
b, c, d. Alternative permitted locations for a wash hand basin (in a bathroom) or a hand rinse basin (in a WC)  
e. Maximum encroachment 200mm for a hand rinse basin  
f. Maximum encroachment 300mm for a wash hand basin



1500mm diameter clear turning circle  
- may overlap fully with shower



Level access shower within bathroom  
1200 x 1200mm (1000 x 1000mm permitted in WC/cloakroom)

\*all dimensions are minimum except where noted

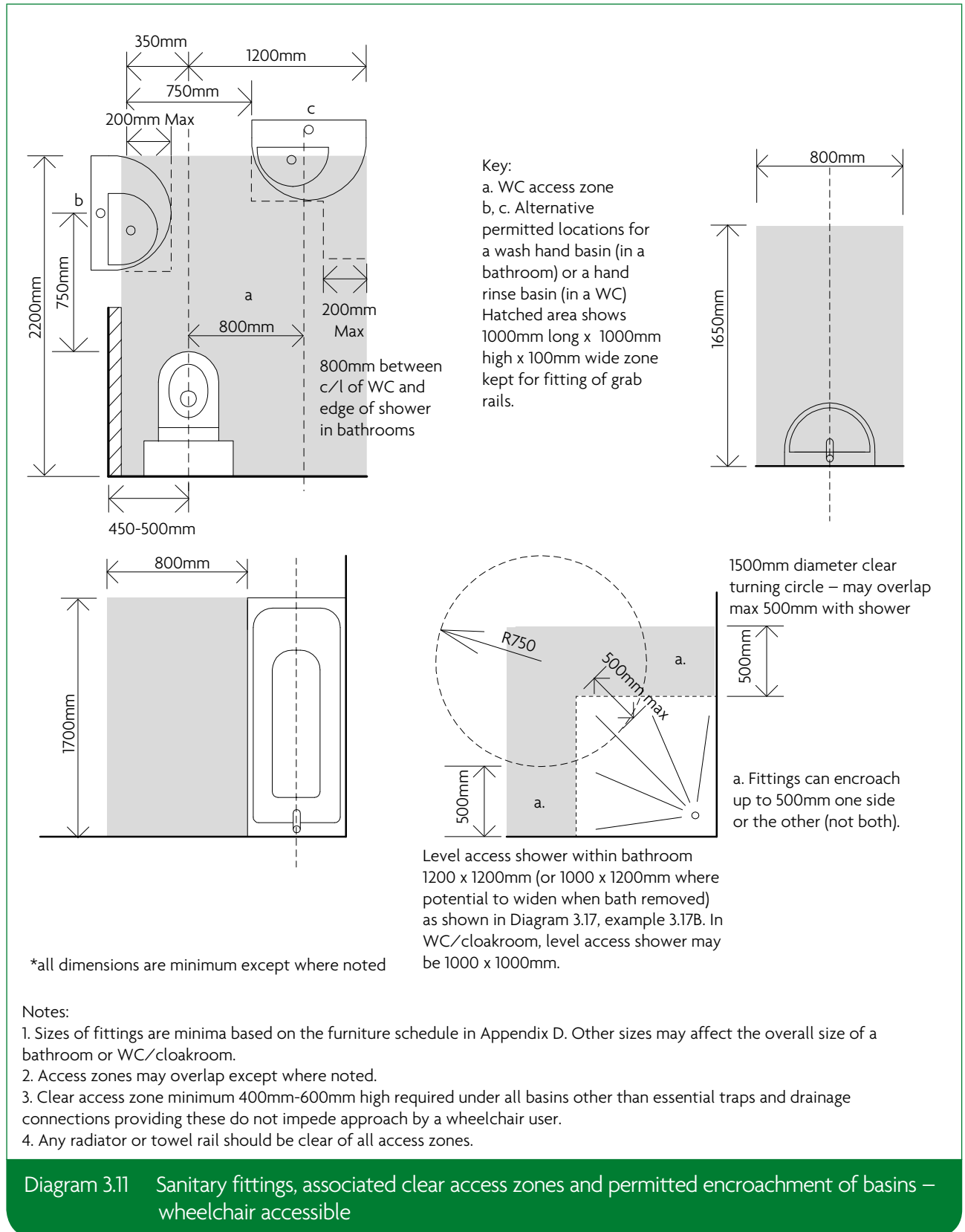
## Notes:

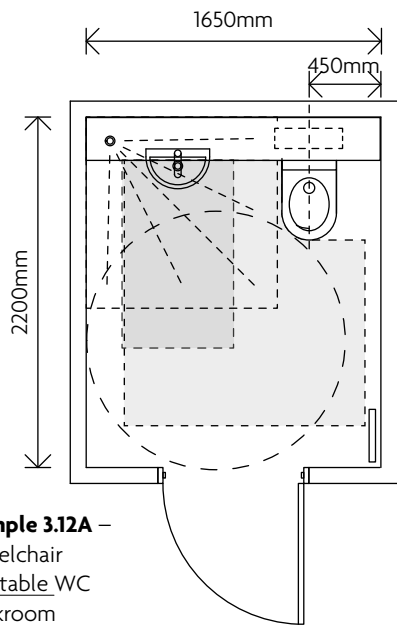
1. Sizes of fittings are minima based on the furniture schedule in Appendix D. Other sizes may affect the overall size of a bathroom or WC/cloakroom.
2. Access zones may overlap except where noted.
3. In WC/cloakrooms the basin and/or WC may encroach into the shower space but this should be minimised.
4. Any radiator or towel rail should be clear of all access zones.

Diagram 3.10 Sanitary fittings associated clear access zones and permitted encroachment of basins – wheelchair adaptable

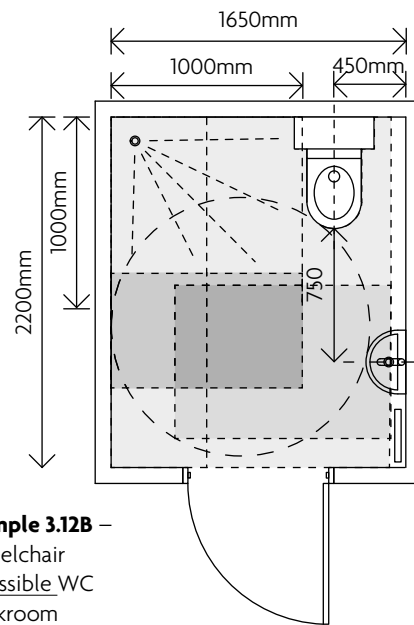
**3.39** Where the dwelling is defined as **wheelchair accessible**, WC facilities should also comply with all of the following.

- a. The WC, basin and shower (and their associated **clear access zones**) meet the provisions in Diagram 3.11. Examples of compliant designs are shown in Diagram 3.12.





**Example 3.12A –**  
Wheelchair  
adaptable WC  
cloakroom



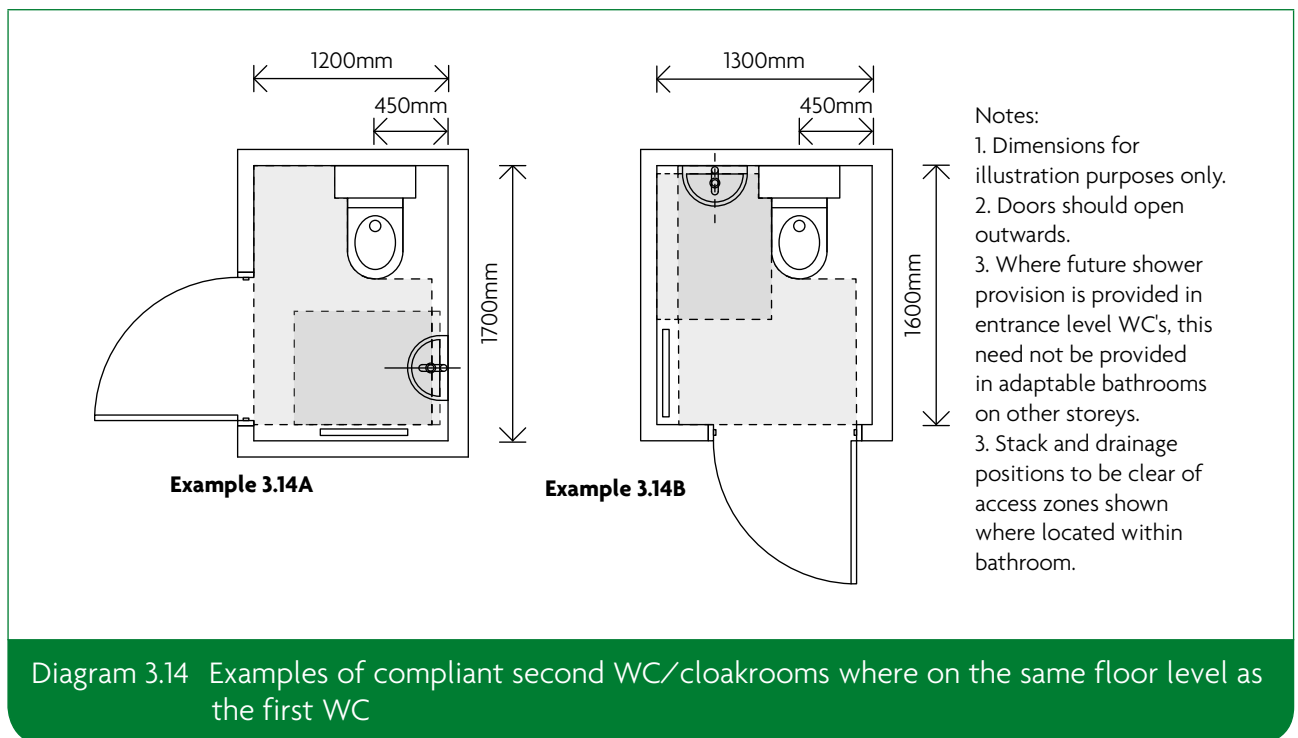
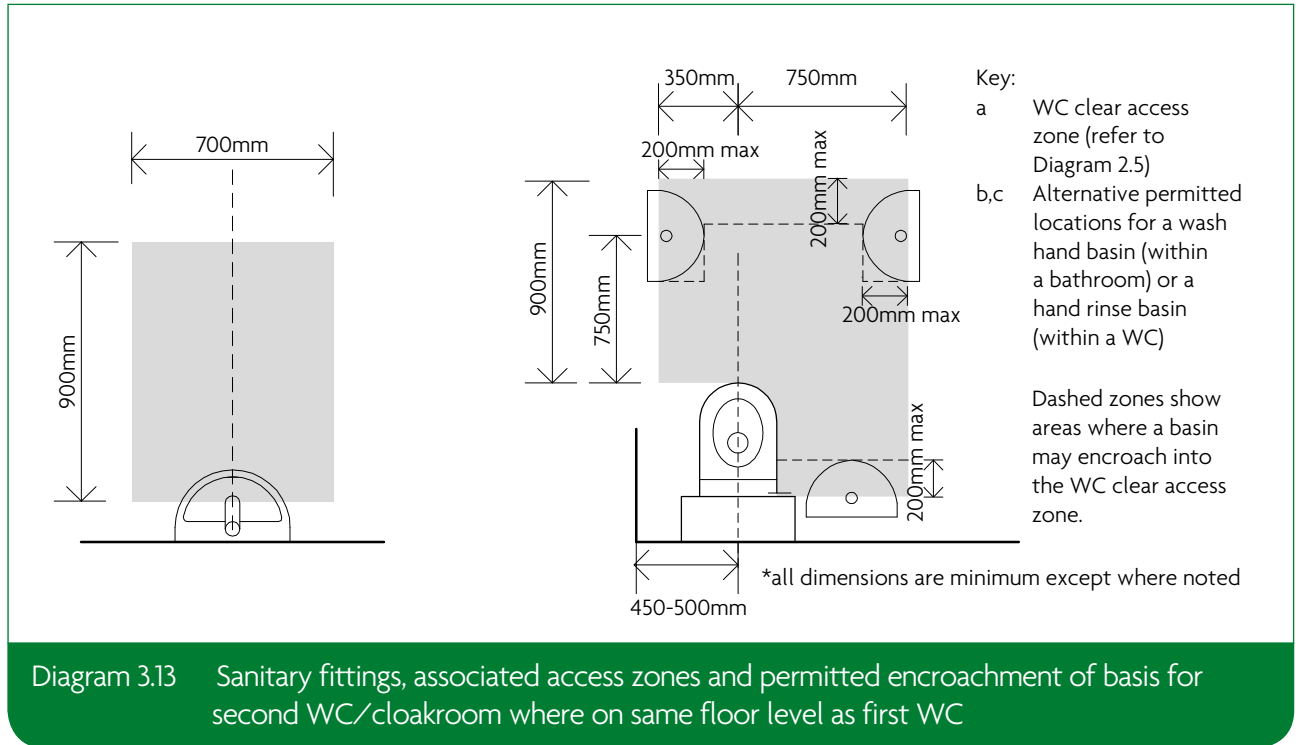
**Example 3.12B –**  
Wheelchair  
accessible WC  
cloakroom

**Notes:**

1. Dimensions for illustration purposes only.
2. Doors must be capable of opening outwards – in wheelchair adaptable bathrooms the door may open inwards providing that the door can be easily rehung to open outwards (e.g. door stops are planted and easily moved).
3. Stack and drainage positions to be shown clear of access zones where located within WC / Cloakroom.

**Diagram 3.12** Example of wheelchair adaptable WC/cloakroom layout with potential to be wheelchair accessible

**3.40** Where the dwelling provides both a bathroom and a WC/cloakroom on the same storey, the WC and basin in the WC/cloakroom (and their associated clear access zones) should as a minimum comply with the provisions shown in Diagram 3.13. Examples of compliant designs are shown in Diagram 3.14.



## Bathroom facilities

**3.41** To make suitable and convenient provision for a wheelchair user to bathe or use a wheelchair accessible shower, with assistance where necessary, the dwelling should comply with all of the following.

- a. Dwellings with up to four bedspaces should have as a minimum a bathroom that contains a WC, a basin and an installed level access shower with the potential for a bath to be installed above it (unless a bath is provided in addition to the installed level access shower within this bathroom or elsewhere on the same storey).
- b. The bathroom containing the installed level access shower should be located on the same storey as the principal double bedroom described in paragraph 3.35.

**NOTE 1:** In dwellings with five bedspaces or more, where the provisions of paragraphs 3.42 or 3.43 are satisfied by providing both a bathroom and a shower room, either room (but not both) may be an en-suite bathroom.

**NOTE 2:** Where there is a fully accessible shower room on the same storey as the principal bedroom, a separate room providing the bath need only comply with the requirements set out in paragraph 2.29 for a Category 2 bathroom.

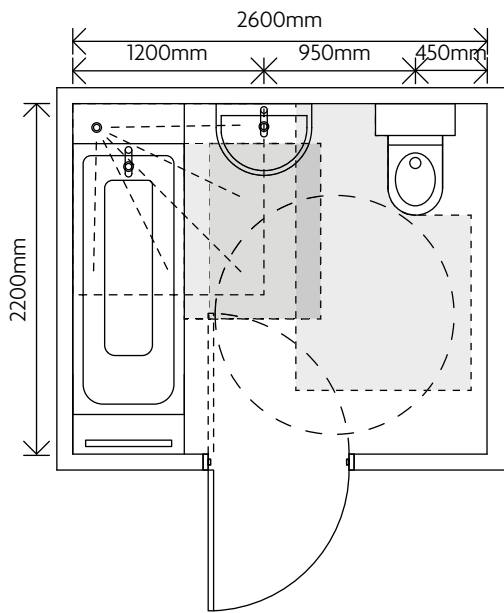
**NOTE 3:** In dwellings with up to four bedspaces it would be reasonable for a bath to be fitted above the installed level access shower at the point that the works are completed.

**3.42** Where the dwelling is defined as wheelchair adaptable, it is assumed that most commonly a bath will be installed over a useable level access shower, though this is not a requirement. Wheelchair adaptable bathrooms should also comply with all of the following.

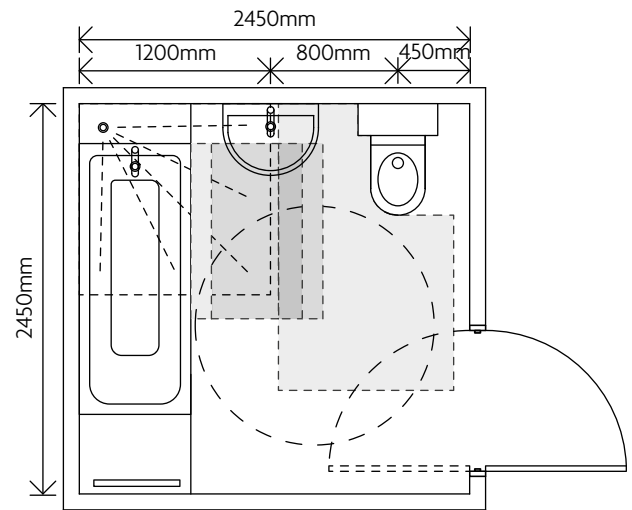
- a. The WC, basin, bath and shower (and their associated clear access zones) meet at least the provisions shown in Diagram 3.10. Examples of compliant designs are shown in Diagram 3.15.
- b. Drawings illustrate how the bathroom could be easily adapted in future to meet the provisions for a wheelchair accessible bathroom set out in paragraph 3.43 (but need only show either a bath or level access shower, not both).

**3.43** Where the dwelling is defined as wheelchair accessible, the bathroom should also comply with all of the following.

- a. The WC, basin, bath (where provided) and shower (and their associated clear access zones), meet the provisions in Diagram 3.11. Examples of compliant designs are shown in Diagram 3.16.
- b. In dwellings with up to four bedspaces, an installed level access shower is provided as the default but a bath can be accommodated as an alternative if required.
- c. In dwellings with five bedspaces or more, both a useable bath and an installed level access shower are provided (either in one bathroom or in more than one bathroom on the same storey as the principal bedroom). Examples of bathrooms with shower and bath are provided in Diagram 3.17.
- d. The level access shower is positioned in a corner to enable a shower seat to be fitted on one wall, with shower controls fitted on the adjacent wall.
- e. The bathroom (or bathrooms) provides a minimum 1500mm clear turning circle.



**Example 3.15A** – wheelchair adaptable bathroom (based on wheelchair accessible layout 3.16A)



**Example 3.15B** – wheelchair adaptable bathroom (based on wheelchair accessible layout 3.16B)

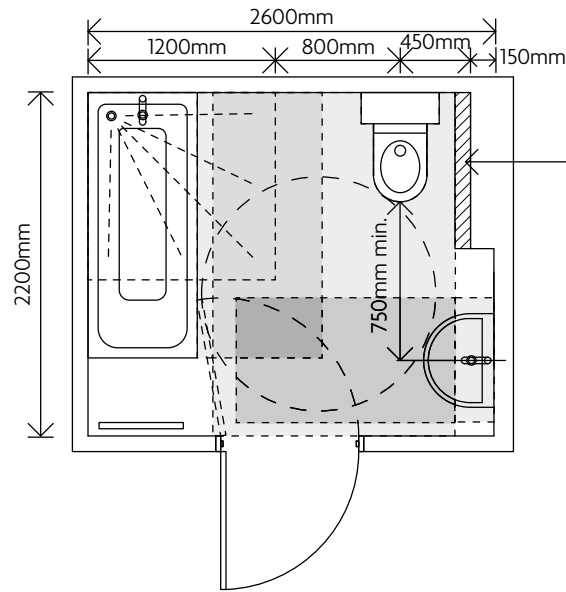
**Notes:**

1. Dimensions for illustration purposes only.
2. Doors must be capable of opening outwards – in wheelchair adaptable bathrooms the door may open inwards providing that the door can be easily rehung to open outwards (e.g. door stops are planted and easily moved).
3. Stack and drainage positions to be shown clear of access zones where located within bathroom.

**Diagram 3.15** Examples of wheelchair adaptable bathroom layouts with potential to be wheelchair accessible

## Example 3.16A

– wheelchair accessible bathroom with choice of bath or shower



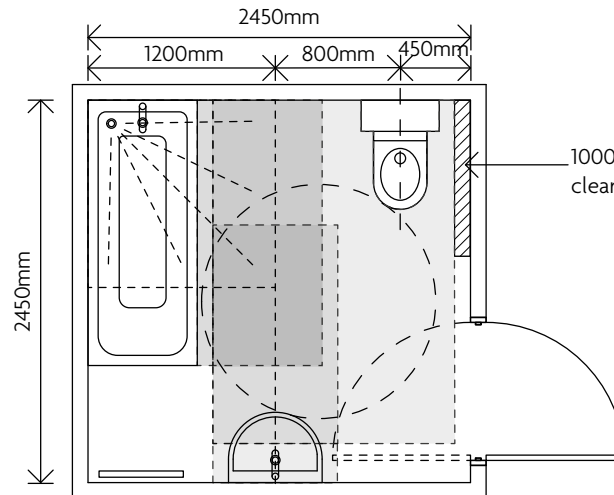
1000 x 1000 x 100mm zone kept clear to enable fitting of rails.

Notes for all diagrams:

1. Dimensions for illustration purposes only.
2. WC doors must be capable of opening outwards.
3. Stack and drainage positions to be shown clear of access zones where located within bathroom.

## Example 3.16B

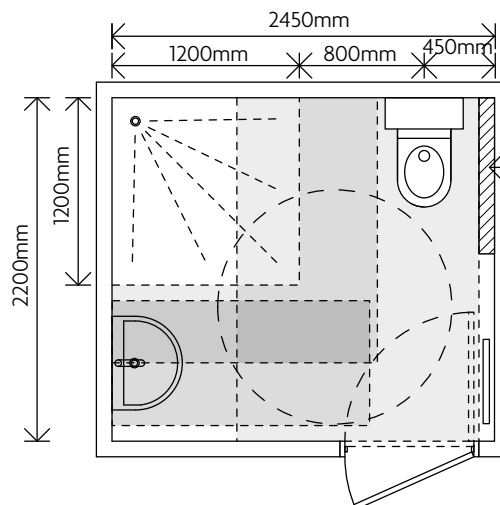
– wheelchair accessible bathroom with choice of bath or shower



1000 x 1000 x 100mm zone kept clear to enable fitting of rails.

## Example 3.16C

– wheelchair accessible bathroom with shower only – suitable where bath provided in wheelchair accessible bathroom elsewhere



1000 x 1000 x 100mm zone kept clear to enable fitting of rails.

Diagram 3.16 Examples of wheelchair accessible bathrooms

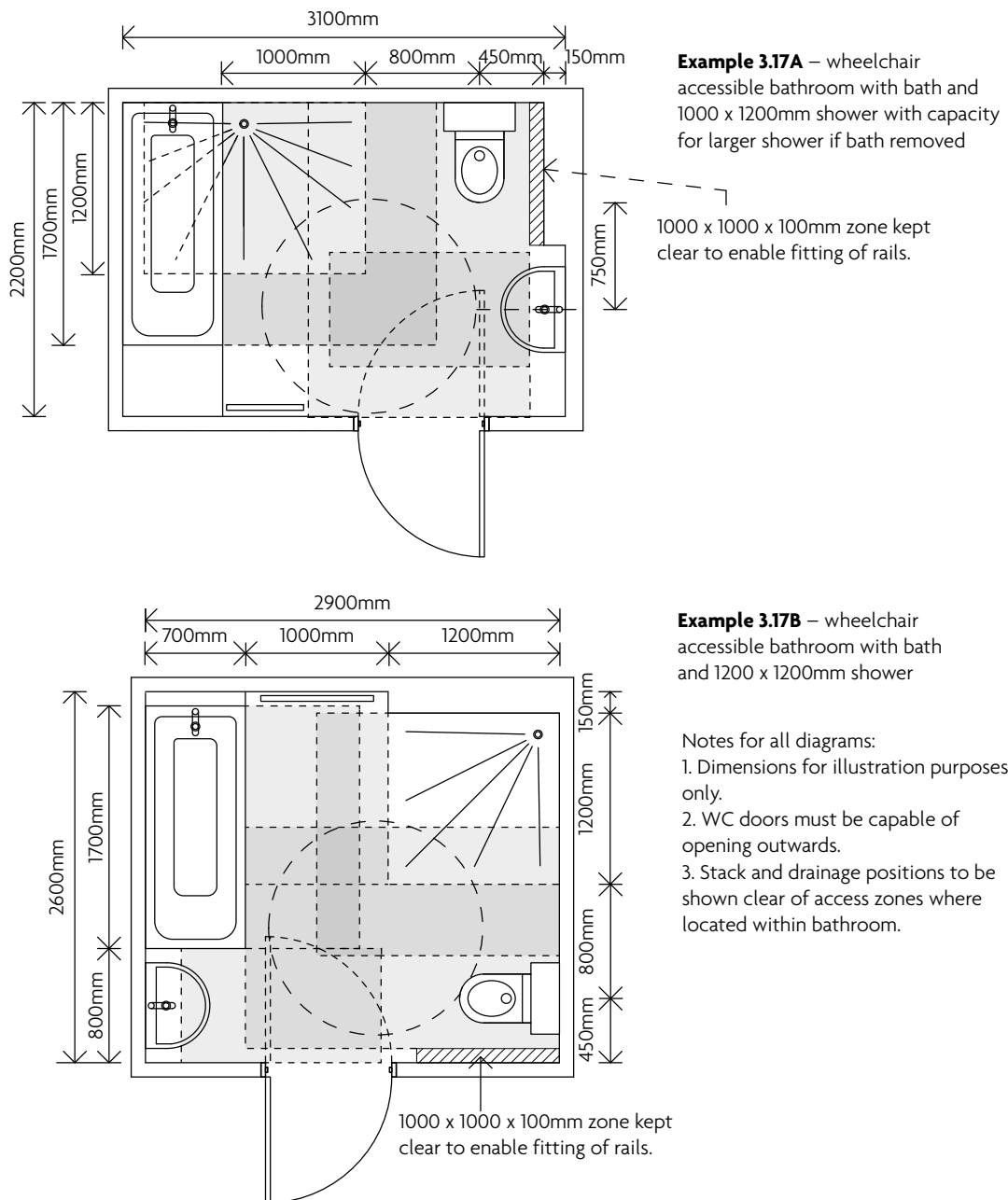


Diagram 3.17 Examples of wheelchair accessible bathrooms with both bath and shower

## Services and controls

**3.44** To assist wheelchair users who have reduced reach, services and controls should comply with all of the following.

- Consumer units should be mounted so that the switches are between 1350mm and 1450mm above floor level.
- Switches, sockets, stopcocks and controls, except controls to radiators, are located with their centre line 700-1000mm above floor level and a minimum of 700mm (measured horizontally) from an inside corner, and are not positioned behind appliances.

- c. Kitchen appliances in **wheelchair accessible** dwellings have isolators located within the same height range.
- d. The handle to at least one window in the principal living area is 700-1000mm above floor level, unless fitted with a remote opening device that is within this height range.
- e. Handles to all other windows are 450-1200mm above floor level, unless the window is fitted with a remote opening device that is within this height range.
- f. Door handles, locks, latches and catches are both:
  - easy to grip and use, and
  - fitted 850-1000mm above floor level.
- g. Light switches are on individual plates unless wide rocker or full plate fittings are provided.
- h. Switches to double socket outlets are located at the outer ends of the plate (rather than in the centre).
- i. A door entry phone with remote door release facility is provided in the main living space and the principal bedroom.
- j. Suitable provision is made in the principal bedroom to install bedhead controls in the future (comprising a 2-way light switch, telephone and broadband socket, TV aerial and power socket outlets, and the door entry phone provision described above, grouped adjacent to the head of the bed), for example, by providing blank sockets, conduit and draw wires.
- k. A main electrical power socket and a telephone point are provided together in the main living space.
- l. Taps and bathroom controls are suitable for a person with limited grip to operate and for single handed operation.
- m. Boiler timer controls and thermostats are either mounted 900-1200mm above finished floor level on the boiler, or separate controllers (wired or wireless) are mounted elsewhere in an accessible location within the same height range.
- n. In **wheelchair accessible** dwellings, radiator controls are mounted 450-1000mm above floor level.

## Private outdoor space

**3.45** To enable a wheelchair user to use every **private** outdoor space that is provided, whether a **private** garden, balcony or roof terrace, outdoor space should comply with all of the following.

- a. Every outdoor space both:
  - has a minimum **clear width** of 1500mm, and
  - provides a minimum 1500mm level **clear turning circle**, free of any door swing.
- b. There is a **level** or **gently sloping** path with a minimum **clear width** of 1050mm to every **private** refuse, recycling, cycle or other external store.
- c. Every path terminates in a **clear turning circle** a minimum of 1500mm in diameter.
- d. Every gate (or gateway) has a minimum **clear opening width** of 850mm, a minimum 300mm nib to the **leading edge** and a minimum 200mm nib to the **following edge**.
- e. The door to every **private** external store that is integral with, or connected to, the **dwelling** has a minimum **clear opening width** of 850mm.
- f. All paved areas have a **suitable ground surface**.

# Appendix A: Key terms

## The following are key terms used in this document:

Note: Terms shown with \* are defined in legislation, either in the Building Act 1984 or the Building Regulations 2010, where the definition may be fuller than the definition given here.

### Accessible threshold

A threshold that is **level** or, if raised, has a total height of not more than 15mm, a minimum number of upstands and slopes and with any upstands higher than 5mm chamfered. Other acceptable solutions are described in *Accessible thresholds in new housing – Guidance for house builders and developers*, The Stationery Office Ltd. ISBN 0 11 702333 3. 1999.

### Approach route

Internal or external path or corridor usually leading to the **principal private entrance** of a **dwelling** from a defined starting point (typically the pavement immediately outside of the curtilage or plot boundary).

### Bedspace

A suitable sleeping area for one person. (A single bedroom provides one **bedspace** and a double or twin bedroom provides two **bedspaces** where these rooms also meet any other requirements for the relevant category of **dwelling**).

### Clear access route

Clear, unobstructed 'pathway' to access a window or other feature. **Localised obstructions** are not permitted unless specifically stated.

### Clear access zone

Clear, unobstructed space for access or manoeuvring. **Localised obstructions** are not permitted unless specifically stated.

### Clear opening width

Clear distance measured between the inside face of the doorframe (or door stop) and the face of the door when open at 90 degrees. Door furniture and ironmongery may be disregarded when measuring the **clear opening width**.

### Clear turning circle

Clear floor space, represented by a circle, or an ellipse, that allows a wheelchair user to turn independently in a single movement. A door swing is permitted within a clear turning space unless stated otherwise.

### Clear width

Clear distance measured between walls or other fixed obstructions (except permitted **localised obstructions**) or across a path. Skirtings totalling up to 50mm total thickness and shallow projecting ducts or casings above 1800mm may be discounted when measuring **clear width**.

### Communal or common (area, facilities or entrances)

Shared area accessed by, or intended for the use of, more than one **dwelling**.

### Dwelling\*

A house or **flat**. Student accommodation is treated as hotel/motel accommodation.

### Entrance storey

The floor level (of the dwelling) on which the **principal private entrance** is located.

### Flat\*

Separate and self-contained premises constructed or adapted for residential purposes and forming part of a building from which it is divided horizontally.

**Following edge (of door)**

The surface of a door which follows into (or faces away from) the room or space into which the door is being opened – sometimes referred to as ‘the push side’.

**Gently sloping**

Gradient between 1:60 and 1:20

**Habitable room**

A room used, or intended to be used, for **dwelling** purposes, including a kitchen but not a bathroom or utility room.

**Installed level access shower**

**Step-free** area with no lips or upstands, suitable for showering, with a floor laid to shallow falls towards a floor gulley connected to the drainage system.

**Leading edge (of door)**

The surface of a door which leads into (or faces) the room or space into which the door is being opened – sometimes referred to as ‘the pull side’.

**Level**

Gradient not exceeding 1:60

**Liftway**

Vertical route linking all floors of a dwelling accommodating (or capable of accommodating) a lift or lifting platform.

**Localised obstruction**

Short, fixed element, such as a bollard lighting column or radiator, not more than 150mm deep that may intrude into a path, route, or corridor, that does not unduly restrict the passage of a wheelchair user.

**Manoeuvring space**

Clear floor space, represented by a rectangle which allows a wheelchair user to turn independently in a series of manoeuvres. A door swing is permitted within a clear **manoeuvring space** unless stated otherwise

**Pitch Line**

A line that connects the nosing of the treads of a stair.

**Plot gradient**

The gradient measured between the **entrance storey** finished floor level of the **dwelling** and the **point of access**.

**Point of access**

The point at which a person visiting a **dwelling** would normally get out of a car before approaching the **dwelling**. The **point of access** may be within or outside the plot.

**Potential level access shower**

Space capable of providing a level access shower without the need to move walls, remove screed or other solid flooring. It should include a capped-off floor gulley, set at an appropriate level and connected to the drainage system. (Usually provided within a **wet room**).

**Principal communal entrance**

The **communal** entrance (to the core of the building containing the **dwelling**) which a visitor not familiar with the building would normally expect to approach (usually the common entrance to the core of a block of **flats**).

**Principal private entrance**

The entrance to the individual **dwelling** that a visitor not familiar with the **dwelling** would normally approach (usually the ‘front door’ to a house or ground floor **flat**).

**Principal storey**

The floor level (of the **dwelling**) on which the main living space is located, where this is not the **entrance storey**.

**Private (area, facilities or entrances)**

Area belonging to an individual **dwelling**.

**Ramped**

Gradient between 1:20 and 1:12

**Standard parking bay**

A parking bay 2.4m wide x 4.8m long

**Steeply sloping plot**

A plot where the gradient exceeds 1:15.

**Step-free**

Route without steps but that may include a ramp or a lift suitable for a wheelchair user.

**Suitable ground surface**

External ground surface that is firm, even, smooth enough to be wheeled over, is not covered with loose laid materials such as gravel and shingle, and has a maximum crossfall of 1:40.

**Suitable tread nosings**

Nosings that conform with one of the options shown in Diagram 1.2 of Approved Document K.

**Wheelchair accessible**

Category 3 **dwelling** constructed to be suitable for immediate occupation by a wheelchair user where the planning authority specifies that optional requirement M4(3)(2)(b) applies.

**Wheelchair adaptable**

Category 3 **dwelling** constructed with the potential to be adapted for occupation by a wheelchair user where optional requirement M4(3)(2)(a) applies.

**Wet room**

WC or bathroom compartment with tanking and drainage laid to fall to a connected gulley capable of draining the floor area when used as a shower.

## Appendix B: Standards referred to

### **BS EN 81-70**

Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts. Accessibility to lifts for persons including persons with disability [2003]

### **BS 5900**

Powered home-lifts with partially enclosed carriers and no liftway enclosures. Specification [2012]

# Appendix C: Other documents referred to

## Legislation

Building Regulations 2010 (SI 2010/2214)(as amended)

Equality Act 2010 (2010 c.15)

Equality Act 2010 (Disability) Regulations (SI 2010/2128)

The Workplace (Health, Safety and Welfare) Regulations (SI 1992/3004)(as amended).

## Other documents

*Accessible thresholds in new housing – Guidance for house builders and developers*, The Stationery Office Ltd. ISBN 0 11 702333 3. 1999.

## Appendix D: Furniture schedule

Space	Furniture to be shown	Furniture size (mm)	Number bedspaces / number furniture items required						
			2	3	4	5	6	7	8
<b>Living space</b>	Arm chair (or number sofa seats in addition to minimum sofa provision)	850x850	2	3	1	2	3	4	1
	2 seat settee (optional)	850x1300							
	3 seat settee	850x1850			1	1	1	1	
	TV	220x650	1	1	1	1	1	1	1
	coffee table	500x1050 or 750 diameter							
	occasional table	450x450							
	storage units	500 x length shown (1 only required)	1000	1000	1500	2000	2000	2000	
<b>Dining space</b>	dining chair		2	3	4	5	6	7	+
	dining table	800 x length shown (1 only required)	800	1000	1200	1350	1500	1650	
<b>Bedrooms</b>									
<b>Double Bedroom</b>	Principal bedroom double bed; or	2000x1500	1	1	1	1	1	1	1
	Other double bedroom double bed; or	1900x1350	1	1	1	1	1	1	1
	single bed (2 number in twin)	1900x900	2	2	2	2	2	2	2
	bedside table	400x400	2	2	2	2	2	2	2
	desk and chair	500x1050	1	1	1	1	1	1	1
	chest of drawers	450x750	1	1	1	1	1	1	1
	double Wardrobe	600x1200	1	1	1	1	1	1	1
<b>Twin bedroom</b>	single bed (2 number in twin)	1900x900			2	2	2	2	2
	bedside table	400x400			2	2	2	2	2
	chest of drawers	450x750			1	1	1	1	1
	table and chair	500x1050			1	1	1	1	1
	double wardrobe	600x1200			1	1	1	1	1
<b>Single Bedroom</b>	single bed	1900x900		1	1	1	1	1	1
	bedside table	400x400		1	1	1	1	1	1
	chest of drawers	450x750		1	1	1	1	1	1
	table and chair	500x1050		1	1	1	1	1	1
	double wardrobe	600x1200		1	1	1	1	1	1
<b>Bathrooms</b>	WC + cistern	500x700							
	Bath	700x1700							
	Wash hand basin	600x450							
	Hand rinse basin	350x200							
<b>Manoeuvring zone</b>									
Bedrooms	Manoeuvring square as per requirements	1200x1200							
Living rooms	Turning circle; or	1500x1500							
	Turning ellipse	1400x1700							

# Index

## Note:

Category 1 – Visitable dwellings

Category 2 – Accessible and adaptable dwellings

Category 3 – Wheelchair user dwellings

## A

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### access zones

bathrooms 2.29, 3.42, 3.43; Diagrams 2.5, 2.7, 3.15–3.17

bedrooms 2.25, 3.35; Diagrams 2.4, 3.9

kitchens 3.32

parking spaces 2.12, 3.12

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## **Access to and use of buildings**

### **APPROVED DOCUMENT**

**M**

### **VOLUME 2 – BUILDINGS OTHER THAN DWELLINGS**

- M1**      **Access and use of buildings other  
than dwellings**
- M2**      **Access to extensions to buildings  
other than dwellings**
- M3**      **Sanitary conveniences in extensions  
to buildings other than dwellings**

## **MAIN CHANGES IN THE 2015 EDITION**

This volume of this approved document supports requirements M1, M2 and M3 of Schedule 1 to the Building Regulations 2010. It takes effect on 1 October 2015 for use in England\*. The 2004 edition of Approved Document M with 2010 and 2013 amendments will continue to apply to work started before 1 October 2015 or work subject to a building notice, full plans application or initial notice submitted before that date.

The main changes are:

- Approved Document M has been split into two parts:
  - Volume 1: Dwellings
  - Volume 2: Buildings other than dwellings.
- The following sections of the previous version of Approved Document M have been deleted and replaced by Volume 1 of this approved document:
  - Section 6: Means of access to and into the dwelling
  - Section 7: Circulation within the entrance storey of the dwelling
  - Section 8: Accessible switches and sockets in the dwelling
  - Section 9: Passenger lifts and common stairs in blocks of flats
  - Section 10: WC provision in the entrance storey of the dwelling.

## **MAIN CHANGES MADE BY THE 2020 AMENDMENTS**

The guidance in paragraphs 5.6 and 5.7 has been amended to mandate for the provision of changing places toilets within appropriately sized, publicly accessible buildings. Clarification is also provided on how the capacities should be derived in these buildings.

\*This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No 2) Order 2009.

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Note: Diagrams 27 to 29 deleted – refer to Approved Document M: Volume 1

Note: Diagram 30 has been moved to Approved Document K, Section 1, all other numbering remains the same

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# Use of guidance

## THE APPROVED DOCUMENTS

This document is one of a series that has been approved and issued by the Secretary of State for the purpose of providing practical guidance with respect to the requirements of Schedule 1 to and Regulation 7 of the Building Regulations 2010 for England and Wales (SI 2010/2214).

**At the back of this document is a list of all the documents that have been approved and issued by the Secretary of State for this purpose.**

Approved Documents are intended to provide guidance for some of the more common building situations. However, there may well be alternative ways of achieving compliance with the requirements. **Thus there is no obligation to adopt any particular solution contained in an Approved Document if you prefer to meet the relevant requirement in some other way.**

### Other requirements

The guidance contained in an Approved Document relates only to the particular requirements of the Regulations which the document addresses. The building work will also have to comply with the requirements of any other relevant paragraphs in Schedule 1 to the Regulations.

There are Approved Documents which give guidance on each of the Parts of Schedule 1 and on Regulation 7.

## LIMITATION ON REQUIREMENTS

In accordance with regulation 8, the requirements in Parts A to D, F to K (except for paragraphs H2 and J7) of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings). This is one of the categories of purpose for which building regulations may be made.

Paragraphs H2 and J7 are excluded from Regulation 8 because they deal directly with prevention of the contamination of water. Parts E and M (which deal, respectively, with resistance to the passage of sound, and access to and use of buildings) are excluded from Regulation 8 because they address the welfare and convenience of building users. Part L is excluded from Regulation 8 because it addresses the conservation of fuel and power. All these matters are amongst the purposes, other than health and safety, that may be addressed by Building Regulations.

## MATERIALS AND WORKMANSHIP

Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations shall be carried out in accordance with regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in Approved Document 7.

Building Regulations are made for specific purposes, primarily the health and safety, welfare and convenience of people and for energy conservation. Standards and other technical specifications may provide relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance or matters which, although they relate to health and safety etc., are not covered by the Building Regulations.

When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

## **MIXED USE DEVELOPMENT**

In mixed use developments part of a building may be used as a dwelling while another part has a non-domestic use. In such cases, if the requirements of the Regulations for dwellings and non-domestic use differ, the requirements for non-domestic use should apply in any shared parts of the building.

## **THE WORKPLACE (HEALTH, SAFETY AND WELFARE) REGULATIONS 1992**

The Workplace (Health, Safety and Welfare) Regulations 1992 as amended by The Health and Safety (Miscellaneous Amendments) Regulations 2002 (SI 2002/2174) contain some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see: 'Workplace health, safety and welfare. Workplace (Health, Safety and Welfare) Regulations 1992, Approved Code of Practice' L24. Published by HSE Books 1992 (ISBN 0 7176 0413 6).

The Workplace (Health, Safety and Welfare) Regulations 1992 apply to the common parts of flats and similar buildings if people such as cleaners and caretakers are employed to work in these common parts. Where the requirements of the Building Regulations that are covered by this Part do not apply to dwellings, the provisions may still be required in the situations described above in order to satisfy the Workplace Regulations.

## **THE EQUALITY ACT 2010 AND THE EQUALITY ACT 2010 (DISABILITY) REGULATIONS 2010**

The Equality Act 2010 (the EA) brings together existing equalities legislation, including the Disability Discrimination Act 1995, with the aims of strengthening and also harmonising existing provisions into a single streamlined framework of equalities legislation to deliver better outcomes for the protected groups listed.

The EA (<http://www.legislation.gov.uk/ukpga/2010/15/contents>) imposes a duty to make reasonable adjustments to a physical feature in order to comply with the requirements set out in section 20 of the EA. The duty is set out in Schedule 2 (in relation to public functions and service providers); Schedule 8 (in relation to employers) and Schedule 15 (in relation to associations) of the EA.

Although the guidance in this Approved Document, if followed, tends to demonstrate compliance with Part M of the Building Regulations, this does not necessarily equate to compliance with the obligations and duties set out in the EA. This is because service providers and employers are required by the EA to make reasonable adjustment to any physical feature which might put a disabled person at a substantial disadvantage compared to a non-disabled person. In some instances this will include designing features or making reasonable adjustments to features which are outside the scope of Approved Document M. It remains for the persons undertaking building works to consider if further provision, beyond that described in Approved Document M, is appropriate.

## **10 Year Exemption for service providers, local authorities and associations**

An exemption setting out when an adjustment is not reasonable in relation to design standards is provided in regulation 9 (Reasonableness and design standards) of and the Schedule to the Equality Act 2010 (Disability) Regulations 2010 (the Regulations).

Regulation 9 prescribes circumstances in which it is not reasonable for a provider of services, a public authority carrying out its functions, or an association to remove or alter a physical feature which has been provided to assist access to the building or its facilities and which accords with the relevant design standard. The Schedule to the Regulations provides that a physical feature satisfies the relevant design standard if it complied with the objectives, design considerations and provisions set out in the edition of Approved Document M that applied at the time the building works were carried out.

This provision will not apply where more than 10 years have elapsed since:

- the day on which construction or installation of the feature was completed; or
- in the case of a physical feature provided as part of a larger building project, the day on which the works in relation to that project were completed.

Applicants should be aware that this is not a blanket exemption from duties under the EA, and relates only to the duty to make reasonable adjustments to physical features built in strict accordance with the guidance provided in the relevant approved document. As with all other types of building work, service providers will still need to consider the needs of disabled people which are outside the scope of Approved Document M. It is for applicants, not building control bodies, to consider how these obligations are to be met.

## **RELATIONSHIP WITH GUIDANCE IN APPROVED DOCUMENT K (PROTECTION FROM FALLING COLLISION AND IMPACT)**

Where applicable, parts of this Approved Document state that the requirements of Part M will be satisfied by compliance with the applicable parts of the guidance within Approved Document K (Protection from falling, collision and impact). Compliance with these applicable requirements set out in Approved Document K in these circumstances will be regarded as compliance with a relevant design standard for the purposes of regulation 9 and the Schedule to the Regulations.

# The Requirements

This Approved Document deals with requirements M1, M2 and M3 of Part M of Schedule 1 to the Building Regulations 2010.

<i>Requirement</i>	<i>Limits on application</i>
<b>PART M ACCESS TO AND USE OF BUILDINGS</b>	
<b>Access to and use of buildings other than dwellings</b>	
<b>M1.</b> Reasonable provision must be made for people to— (a) gain access to; and (b) use, the building and its facilities.	Requirement M1 does not apply to any part of a building that is used solely to enable the building or any service or fitting in the building to be inspected, repaired or maintained.
<b>Access to extensions to buildings other than dwellings</b>	
<b>M2.</b> Suitable independent access must be provided to the extension where reasonably practicable.	Requirement M2 does not apply where suitable access to the extension is provided through the building that is extended.
<b>Sanitary conveniences in extensions to buildings other than dwellings</b>	
<b>M3.</b> If sanitary conveniences are provided in any building that is to be extended, reasonable provision shall be made within the extension for sanitary conveniences.	Requirement M3 does not apply where there is reasonable provision for sanitary conveniences elsewhere in the building, such that people occupied in, or otherwise having occasion to enter the extension, can gain access to and use those sanitary conveniences.

## Notes

**Means of escape in case of fire:** the scope of Part M and AD M is limited to matters of access to, into and use of a building. It does not extend to means of escape in the event of fire, for which reference should be made to Approved Document B – ‘Fire Safety’.

**Stairs and ramps:** Approved Document K (Protection from falling, collision and impact) contains guidance on internal and external steps, stairs and ramps when they are part of the building. Additional guidance is provided in this Approved Document when external stepped and ramped access also form part of the principal entrances and alternative accessible entrances, and when they form part of the access route to the building from the boundary of the site and car parking.

**Manifestation on glazed doors and glazed screens:** Approved Document K (Protection from falling, collision and impact) contains guidance on manifestation.

**BS 8300:2001 Design of buildings and their approaches to meet the needs of disabled people. Code of Practice:** this supersedes BS 5619:1978 and BS 5810:1979. BS 8300 provides guidance on good practice in the design of domestic and non-domestic buildings and their approaches so that they are convenient to use by disabled people. The design recommendations are based on user trials and validated desk studies which formed part of a research project commissioned in 1997 and 2001 by DETR. The guidance in this Approved Document is based on and is complementary to the BS, although the BS contains much additional material that is not apt for, or not considered appropriate for, inclusion in guidance accompanying regulation. Also, in a few cases, the guidance in AD M differs from the recommendation in BS 8300. Compliance with the recommendations in the BS, therefore, while ensuring good practice, is not necessarily equivalent to compliance with the guidance in AD M.

Attention is drawn to the following extracts from The Building Regulations 2010.

## Interpretation (Regulation 2)

Regulation 2 contains the following definition:

**‘independent access’** means in relation to a part of a building (including any extension to that building) a route of access to that part which does not require the user to pass through any other part of the building.

The meanings of the expressions ‘institution’, ‘public building’ and ‘shop’ used in Regulation 5 are explained in Regulation 2.

## Meaning of material change of use (regulation 5)

For the purposes of paragraph 8 (1)(e) of Schedule 1 to the Act and for the purposes of these Regulations, there is a material change of use where there is a change in the purposes for which or the circumstances in which a building is used, so that after the change:

- a. the building is used as a dwelling, where previously it was not;
- b. the building contains a flat, where previously it did not;
- c. the building is used as an hotel or a boarding house, where previously it was not;
- d. the building is used as an institution, where previously it was not;
- e. the building is used as a public building, where previously it was not;
- f. the building is not a building described in Classes 1 to 6 in Schedule 2, where previously it was;
- g. the building, which contains at least one dwelling, contains a greater or lesser number of dwellings than it did previously;
- h. the building contains a room for residential purposes, where previously it did not;
- i. the building, which contains at least one room for residential purposes, contains a greater or lesser number of such rooms than it did previously; or

- j. the building is used as a shop, where previously it was not.

### **Requirements relating to material change of use (Regulation 6)**

1. Where there is a material change of use of the whole of a building, such work, if any, shall be carried out as is necessary to ensure that the building complies with the applicable requirements of the following paragraphs of Schedule 1:

- a. in all cases,
  - B1 (means of warning and escape)
  - B2 (internal fire spread – linings)
  - B3 (internal fire spread – structure)
  - B4(2) (external fire spread – roofs)
  - B5 (access and facilities for the fire service)
  - C2(c) (interstitial and surface condensation)
  - F1 (means of ventilation)
  - G3(1) to (3) (hot water supply and systems)
  - G4 (sanitary conveniences and washing facilities)
  - G5 (bathrooms)
  - G6 (kitchen and food preparation areas)
  - H1 (foul water drainage)
  - H6 (solid waste storage)
  - J1 to J4 (combustion appliances)
  - L1 (conservation of fuel and power – dwellings)
  - P1 (electrical safety);
- b. in the case of a material change of use described in Regulations 5(c), (d), (e) or (f), A1 to A3 (structure);
- c. in the case of a building exceeding 15m in height, B4(1) (external fire spread – walls);
- d. in the case of material change of use described in regulation 5(a), (b), (c), (d), (g), (h), (i) or, where the material change provides new residential accommodation, (f), C1(2) (resistance to contaminants);
- e. in the case of material change of use described in Regulation 5(a), C4 (resistance to weather and ground moisture);

- f. in the case of a material change of use described in Regulation 5(a), (b), (c), (g), (h) or (i), E1 to E3 (resistance to the passage of sound);

- g. in the case of a material change of use described in Regulation 5(e), where the public building consists of or contains a school, E4 (acoustic conditions in schools);

- h. in the case of a material change of use described in Regulation 5(c), (d), (e) or (j), M1 (access and use).

2. Where there is a material change of use of part only of a building, such work, if any, shall be carried out as is necessary to ensure that:

- a. that part complies in all cases with any applicable requirements referred to in paragraph (1)(a);
- b. in a case to which sub-paragraphs (b), (d), (e) or (f) of paragraph (1) apply, that part complies with the requirements referred to in the relevant sub-paragraph;
- c. in a case to which sub-paragraph (c) of paragraph (1) applies, the whole building complies with the requirement referred to in that sub-paragraph; and
- d. in a case to which sub-paragraph (i) of paragraph (1) applies:
  - i. that part and any sanitary conveniences provided in or in connection with that part comply with the requirements referred to in that sub-paragraph; and
  - ii. the building complies with requirement M1(a) of Schedule 1 to the extent that reasonable provision is made to provide either suitable independent access to that part or suitable access through the building to that part.

## Section 0: General guidance

### PERFORMANCE

In the Secretary of State's view Requirements M1, M2 and M3 will be met by making reasonable provision to ensure that buildings are accessible and usable.

People, regardless of disability, age or gender, should be able to:

- gain access to buildings and to gain access within buildings and use their facilities, both as visitors and as people who live or work in them.

### Where the requirements apply

#### Application of Part M

**0.1** Requirements M1, M2 and M3 apply if:

- a non-domestic building is newly erected;
- an existing non-domestic building is extended, or undergoes a material alteration; or
- an existing building or part of an existing building undergoes a material change of use to a hotel or boarding house, institution, public building or shop.

The terms 'institution', 'public building' and 'shop' are explained in regulation 2.

It should be noted that, regardless of compliance with Building Regulations, there will be obligations under the Equality Act 2010 for service providers and employers to consider barriers created by physical features in buildings.

**0.2-0.4** Text deleted.

#### Extensions of non-domestic buildings

**0.5** An extension to a non-domestic building should be treated in the same manner as a new building, as regards its own compliance with Part M. Under Requirement M2 there must be suitable independent access to the extension where reasonably practicable. Under the Limits on Application, Requirement M2 does not apply where the building that is extended complies with Requirement M1(a)

so as to provide suitable access through the building to the extension. The concept of access encompasses access from the boundary of the site and from on-site car parking where provided.

**0.6** If the owners of a building prefer not to provide independent access to a planned extension, it is open to them either to demonstrate that the existing building and the approach to it already comply with Requirement M1(a), so that the Limit on Application of Requirement M2 applies, or to modify the existing building and/or the approach to it so that the Limit on Application applies. Such modification work would be a material alteration. The extensions and the alterations of the existing building could be planned and carried out as a single project.

**0.7** In judging whether access provision relying on the existing building is sufficient for the Limit on Application of Requirement M2 to apply, and in judging whether it is reasonably practicable for suitable independent access to be provided, practical constraints and cost considerations will be relevant – see also 'Access Strategies' paragraphs 0.20 and 0.25 below.

**0.8** Under Requirement M3, if sanitary conveniences are provided in any building that is to be extended, reasonable provision must be made within the extension for sanitary conveniences. However, under the Limit on Application of Requirement M3, this requirement does not apply if there is reasonable provision for people using the extension to gain access to and to use sanitary conveniences in the existing building. As in the case of access to an extension, it is open to building owners preferring not to make provisions for sanitary conveniences in a planned extension either to demonstrate that reasonable provision already exists in, or to modify, the existing building so that the Limit on Application of Requirement M3 applies. In this case, too, the extension and the modifications to the existing building

could be planned and carried out as a single project.

### **Material alterations of non-domestic buildings**

**0.9** Under regulation 4, where an alteration of a non-domestic building is a material alteration, the work itself must comply, where relevant, with Requirement M1. This means that alterations to features relevant to the compliance of a building with Part M, such as entrances or arrangements for people to get from one level to another within the building, must result in features that comply with Requirement M1. Where new features relevant to the compliance of a building with Part M are provided, these must also comply with Requirement M1. Reasonable provision must be made for people to gain access to and to use new or altered sanitary conveniences. The building as a whole, including access to it from the site boundary and from on-site car parking where provided, must be no less compliant with Requirement M1 following a material alteration of a building. In the context of a material alteration of a building, it is not necessary, as regards the Building Regulations, to upgrade access to the building entrance from the site boundary and from on-site car parking where provided. However, attention is drawn to the note in paragraph 1, above about the Equality Act.

### **Material changes of use**

**0.10** Under regulation 6, as amended, where there is a material change of use of the whole of a building to a hotel or boarding house, an institution, a public building or a shop, the building must be upgraded, if necessary, so as to comply with M1 (Access and use). The terms ‘institution’, ‘public building’ and ‘shop’ are explained in regulation 2. In particular, it should be noted that ‘shop’ includes use as a restaurant, bar or public house.

**0.11** Under regulation 6, as amended, if an existing building undergoes a change of use such that *part* is used as a hotel or boarding house, an institution, a public

building or a shop, such work if any shall be carried out as is necessary to ensure that:

- there is reasonable provision for people to gain access to that part from the site boundary and from on-site car parking where provided, either by means of an independent access or by means of a route to and through the building;
- that part itself complies with M1 (access and use); and
- any sanitary conveniences provided in, or in connection with, that part comply with Requirement M1: if users of that part have the use of sanitary conveniences elsewhere in the building, there must be reasonable provision for people to gain access to and use that sanitary accommodation, upgraded if need be.

Developers will need to agree how they have assessed what is reasonable provision with the relevant building control body as set out in paragraphs 0.20 to 0.25.

**0.12** Where a material change of use results in a building being used in part as a hotel or boarding house, institution, public building or shop, and in part as a dwelling, regard should be had to the guidance in Sections 1 to 5 of this Approved Document in relation to the relevant non-domestic accommodation and to the common parts (see also MIXED USE DEVELOPMENT under Use of Guidance).

### **Car parking and setting down**

**0.13** Part M applies to those features, outside the building, which are needed to provide access to the building from the edge of the site and from car parking and setting down points within the site.

### **What requirements apply**

**0.14** If Part M applies, reasonable provision should be made:

- a. so that people, regardless of disability, age or gender, can reach the principal entrance to the building and other entrances described in this Approved Document from the site boundary,

from car parking within the site, and from other buildings on the same site (such as a university campus, a school or a hospital);

- b. so that elements of the building do not constitute a hazard to users, especially people with impaired sight, but rather assist in wayfinding;
- c. so that people, regardless of disability, age or gender, can have access into, and within, any storey of the building and to the building's facilities, subject to the usual gender-related conventions regarding sanitary accommodation;
- d. for suitable accommodation for people in wheelchairs, or people with other disabilities, in audience or spectator seating;
- e. for aids to communication for people with an impairment of hearing or sight in auditoria, meeting rooms, reception areas, ticket offices and at information points; and
- f. for sanitary accommodation for the users of the building.

### Educational establishments

**0.15** From 1 April 2001, maintained schools ceased to have exemption from the Building Regulations. Certain school-specific standards relating to Parts K and M contained in the DfES 1997 Constructional Standards as described in Circular DfES/0142/2001 are subsumed in this revision to AD M (see 1.33 – Note re: (l) and (m), 1.36, 1.37 (b)).

**0.16** Purpose-built student living accommodation, including that in the form of flats as defined in regulation 2(1), should be treated as hotel/motel accommodation in respect of space requirements and internal facilities (see 4.17 to 4.24).

### Historic buildings

**0.17** Historic buildings include:

- a. listed buildings,
- b. buildings situated in conservation areas,
- c. buildings which are of architectural and

historical interest and which are referred to as a material consideration in a local authority's development plan,

- d. buildings of architectural and historic interest within national parks, areas of outstanding natural beauty and world heritage sites,
- e. vernacular buildings of traditional form and construction.

**0.18** The need to conserve the special characteristics of such historic buildings must be recognised. They are a finite resource with cultural importance. In such work the aim should be to improve accessibility where and to the extent that it is practically possible, always provided that the work does not prejudice the character of the historic building, or increase the risk of long-term deterioration to the building fabric or fittings. In arriving at an appropriate balance between historic building conservation and accessibility, it would be appropriate to take into account the advice of the local authority's conservation and access officers, and English Heritage, as well as the views of local access groups, in order to make the building as accessible as possible.

**0.19** Particular issues relating to work in historic buildings that warrant sympathetic treatment and where advice from others could therefore be beneficial include:

- a. restoring the historic character of a building that had been subject to previous inappropriate alteration, e.g. replacement windows, doors and rooflights;
- b. rebuilding a former historic building (e.g. following a fire or filling in a gap site in a terrace);
- c. the choice of appropriate construction materials and techniques, e.g. making provisions enabling the fabric to 'breathe' to control moisture and potential long-term decay problems: see Information Sheet No. 4 from The Society for the Protection of Ancient Buildings (SPAB).

## Access strategy

**0.20** It is important that applicants clearly communicate to the building control body how their chosen approach to meeting the accessibility needs of the likely end-users of a building and its facilities demonstrates compliance with the requirements of Part M of the Building Regulations. The guidance in this Approved Document is designed to indicate only one way in which those requirements may be met. Whilst alternative, equally satisfactory ways of meeting the requirements can be adopted depending on the size, scale, nature and intended use of the building they must still demonstrate compliance with the relevant functional requirement.

**0.21** Where alternative solutions are proposed, the onus remains with the applicant to demonstrate that those solutions are appropriate and meet the requirements, for example by showing that it is equivalent to the provisions set out in this Approved Document. This should include the use of appropriate research evidence or reference to recognised British Standards as necessary to support the chosen approach. It is advisable to ensure that the appropriate level of provision is agreed with the building control body prior to commencing building work, as retrospective alterations can be costly and disruptive.

**0.22** Applicants should therefore seek to engage with building control bodies at the earliest possible stage to identify key issues and risks, and to discuss the best way to demonstrate the access strategy for the building work taking place. To ensure satisfactory outcomes, communication between applicants and building control bodies should focus on areas where proposals diverge from the guidance in this Approved Document rather than providing an exhaustive explanation where features are in accordance with the guidance.

**0.23** Provision of a written Access strategy is not required to accompany a building control application though it may be useful in some circumstances. The key

focus should be on ensuring that applicants and building control bodies are agreed as to the appropriate level of provision in the completed building work.

**0.24** In smaller or simpler works this could be achieved by having a conversation to review the proposals and recording the outcome of discussions by correspondence. In large, complex works or where there are significant constraints imposed by an existing site, this might involve a written document setting out key aspects of the access approach, supported by annotated drawings as well as face to face meetings to resolve key issues. It is for the building control body and applicant to agree which, if any of these proposed approaches should be used on a case by case basis to ensure that the functional requirements of Part M of the Building Regulations are satisfied. Whichever approach is adopted, the agreed level of provision should be clearly recorded.

**0.25** It should be noted that approval of proposed works by a building control body does not by necessity indicate compliance with duties under the Equalities Act 2010. Applicants need to consider these wider equality obligations when undertaking building work and whether provision in some circumstances should exceed that set out within this Approved Document. The relationship between Part M of the Building Regulations and the Equality Act 2010 is set out on page 7 of this Approved Document.

## Definitions

**0.26** The following meanings apply to terms throughout this Approved Document.

**Access**, approach, entry or exit.

**Accessible**, with respect to buildings or parts of buildings, means that people, regardless of disability, age or gender, are able to gain access.

**Contrast visually**, when used to indicate the visual perception of one element of the building, or fitting within the building, against another means that the difference

in light reflectance value between the two surfaces is greater than 30 points. Where illuminance on surfaces is greater than 200 lux, a difference in light reflectance value should be a minimum of 20 points. Where door opening furniture projects beyond the face of the door or otherwise creates enhanced differentiation and shade, a minimum difference in light reflectance value of 15 points is considered adequate. For further information, reference should be made to Colour, contrast and perception – Design guidance for internal built environments – Reading University.

**Dwelling**, means a house or a flat ('flat' is defined in regulation 2(1)). However, new blocks of flats built as student accommodation are to be treated as though they are hotel/motel accommodation in respect of space requirements and internal facilities (see 4.17 to 4.24).

**General access stair**, a stair intended for all users of a building on a day-to day-basis, as a normal route between levels.

**Illuminance**, the amount of light falling on a surface, measured in lumens per square metre ( $\text{lm/m}^2$ ) or lux (lx).

**Level**, with respect to the surfaces of a level approach, access routes and landings associated with steps, stairs and ramps means predominantly level, but with a maximum gradient along the direction of travel of 1:60.

**Light reflectance value (LRV)**, the total quantity of visible light reflected by a surface at all wavelengths and directions when illuminated by a light source.

**Principal entrance**, the entrance which a visitor not familiar with the building would normally expect to approach.

**Suitable**, with respect to means of access and facilities, means that they are designed for use by people regardless of disability, age or gender, but subject to the usual gender-related conventions regarding sanitary accommodation.

**Usable**, with respect to buildings or parts of buildings, means that they are convenient for independent use.

**Utility stair**, a stair used for escape, access for maintenance, or purposes other than as a usual route for moving between levels on a day-to-day basis.

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# Section 1: Access to buildings other than dwellings

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## OBJECTIVES

**1.1** The aim is to provide a suitable means of access for people from the entrance point at the boundary of the site, and from any car parking that is provided on the site, to the building. It is also important that routes between buildings within a complex are also accessible.

**1.2** In designing an approach to the building, it should be recognised that changes in level are difficult for many people to negotiate, including wheelchair users, people who need to use walking aids and people with impaired sight. Access routes that are too narrow can also make it difficult for people to pass each other.

**1.3** It is important to be aware that people's capabilities vary. For example, for some people, a stair is easier to use than a ramp.

**1.4** The building should be designed, within the overall constraints of space, so that the difference in level between the entrance storey and the site entry point is minimised.

**1.5** It is also important that potential hazards on access routes adjacent to buildings, e.g. open windows, are avoided so that people, particularly children and those with impaired sight or hearing, are not injured.

**Note:** The publication 'Inclusive Mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure' gives detailed guidance on designing the external environment.

### Level approach from the boundary of the site and car parking

#### Design considerations

**1.6** As far as possible, access should be level from the boundary of the site, and from any car parking designated for disabled people, to the principal entrance and any entrance used exclusively for staff

or, if either of these is not accessible, to any alternative accessible entrances. If access is generally required between entrances, or between alternative accessible entrances outside the building, this access should as far as possible be level. The site level of accessible entrances should be determined accordingly.

**1.7** Where a difference in level between the boundary of the site or car parking designated for disabled people and the building is unavoidable due to site constraints, the approach may have a gentle gradient over a long distance (for all or part/s of the approach) or it may incorporate a number of shorter parts at a steeper gradient, with level landings at intervals as rest points. Generally, gradients within the approach should be as gentle as possible.

**1.8** Where the gradient of the approach, whether over its whole length or in part, is 1:20 or steeper, that part of the approach should be designed as ramped access.

**1.9** All access routes to principal, or alternative accessible, entrances should be surfaced so that people are able to travel along them easily, without excessive effort and without the risk of tripping or falling.

**1.10** There should be sufficient space for people to approach the building, pass others who are travelling in the opposite direction and carry out all necessary manoeuvres.

**1.11** A surface width of 1800mm can accommodate any amount of non-vehicular traffic without the need for passing places. A surface width of 1200mm may be acceptable on restricted sites, subject to agreement with the building control body.

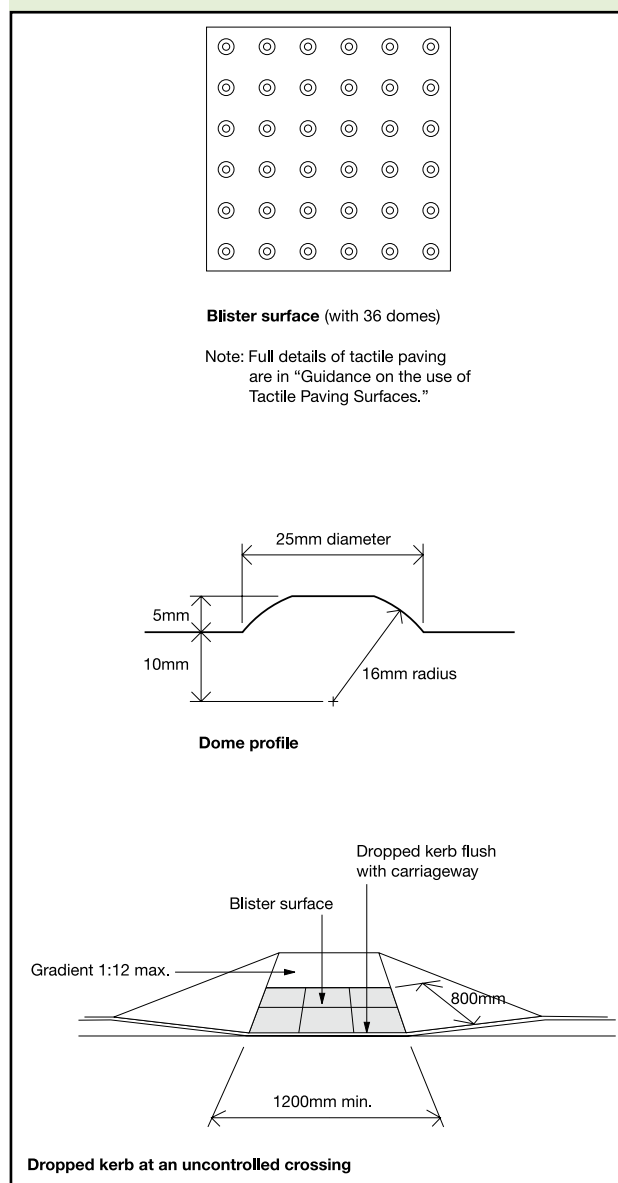
**1.12** It is important to reduce the risks to people, particularly people with impaired sight, when approaching and passing around the perimeter of the building under all lighting conditions.

## Provisions

**1.13** A 'level approach' (from the boundary of the site and from car parking spaces designated for disabled people to the principal entrance, to a staff entrance or to an alternative accessible entrance) will satisfy Requirement M1 or M2 if:

- a. it has a surface width of at least 1.5m, with passing places, free of obstructions to a height of 2.1m;
- b. passing places at least 1.8m wide and at least 2m long are provided within sight of each other (the width of the passing place may be included in the width of the level approach), but in any case spaced at a distance no greater than 50m;
- c. the gradient along its length is either no steeper than 1:60 along its whole length, or less steep than 1:20 with level landings (see 1.26(k)) introduced for each 500mm rise of the access (where necessary, between landings), in all cases with a cross-fall gradient no steeper than 1:40;
- d. its surface is firm, durable and slip resistant, with undulations not exceeding 3mm under a 1m straight edge for formless materials. Inappropriate materials might be loose sand or gravel;
- e. where there are different materials along the access route, they have similar frictional characteristics;
- f. the difference in level at joints between paving units is no greater than 5mm, with joints filled flush or, if recessed, no deeper than 5mm and no wider than 10mm or, if unfilled, no wider than 5mm;
- g. the route to the principal entrance (or alternative accessible entrance) is clearly identified and well lit;
- h. the danger of inadvertently walking into a vehicular access route is minimised by providing a separate pedestrian route and, where there is an uncontrolled crossing point across the vehicular route, this is identified by a buff coloured blister surface (see Diagram 1, and 'Guidance on the use of Tactile Paving Surfaces').

**Diagram 1 Tactile paving and an example of its use at an uncontrolled crossing**



## On-site car parking and setting down

### Design considerations

**1.14** People who need to travel to buildings by car need to be able to park, have sufficient space to enter and leave their vehicle, on occasions move to the rear of their vehicle, then walk, travel in a wheelchair or with pushchairs or luggage, etc. to the principal entrance, the staff entrance or any alternative accessible entrance of the building.

**1.15** The surface of a parking bay designated for disabled people, in particular the area surrounding the bay, should allow the safe transfer of a passenger or driver to a wheelchair and transfer from the parking bay to the access route to the building without undue effort, barriers to wheelchairs or hazards from tripping.

**1.16** If people need to obtain tickets for pay and display parking, the ticket dispensing machines should be located in a way that allows a person in a wheelchair, or a person of short stature, to gain access close to the machine and reach the payment and ticket dispensing functions.

**1.17** People with mobility impairments who arrive as passengers should be able to alight from a vehicle close to the principal entrance, or alternative accessible entrance, of the building in a way that is convenient for entry into the building.

**Note:** Guidance is available in BS 8300 on:

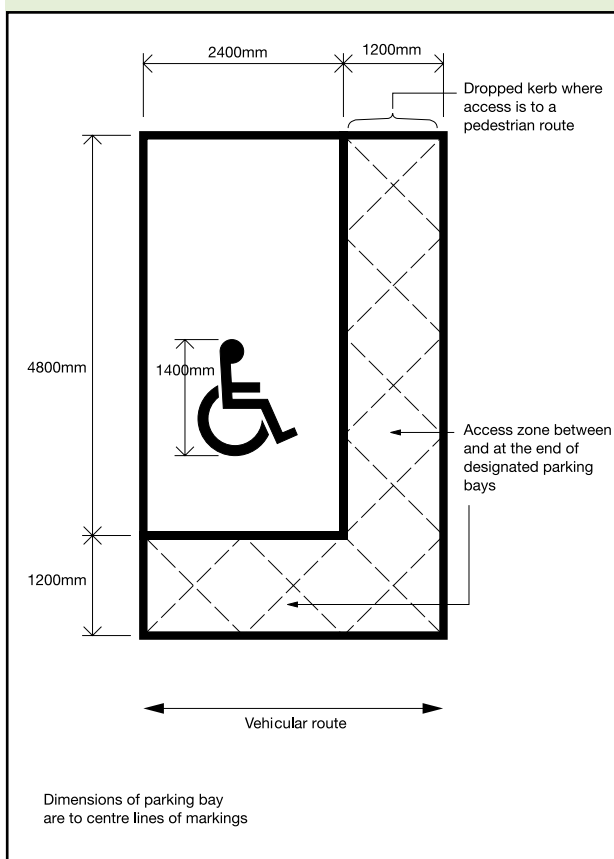
- the provision of parking bays designated for disabled people in different building types;
- ticket dispensing machines;
- vehicular control barriers; and
- multi-storey car parks.

## Provisions

**1.18** Car parking and setting down will satisfy Requirement M1 or M2 if:

- a. at least one parking bay designated for disabled people is provided on firm and level ground as close as feasible to the principal entrance of the building;
- b. the dimensions of the designated parking bays are as shown in Diagram 2 (with a 1200mm accessibility zone between, and a 1200mm safety zone on the vehicular side of, the parking bays, and with a dropped kerb when there is a pedestrian route at the other side of the parking bay);

### Diagram 2 **Parking bay designated for disabled people**



- c. the surface of the accessibility zone is firm, durable and slip resistant, with undulations not exceeding 3mm under a 1m straight edge for formless materials. Inappropriate materials might be loose sand or gravel;
- d. ticket machines, where necessary for wheelchair users and people of short stature, are adjacent to the designated parking bays for disabled people and have controls between 750mm and 1200mm above the ground and a plinth which does not project in front of the face of the machine in a way that prevents its convenient use;
- e. a clearly sign-posted setting down point is located on firm and level ground as close as practicable to the principal or alternative accessible entrance with its surface level with the carriageway at that point to allow convenient access to and from the entrance for people with walking difficulties or people using a wheelchair.

## Ramped access

**Note:** Where there appears to be a conflict between the guidance in Part M and Part K, Part M takes precedence; see the Notes to the Requirements.

### Design considerations

**1.19** If site constraints necessitate an approach of 1:20 or steeper, an approach incorporating ramped access should be provided. Ramps are beneficial for wheelchair users and people pushing prams, pushchairs and bicycles.

**1.20** Gradients should be as shallow as practicable, as steep gradients create difficulties for some wheelchair users who lack the strength to propel themselves up a slope or have difficulty in slowing down or stopping when descending.

**1.21** Ramps are also not necessarily safe and convenient for ambulant disabled people. For example, some people who can walk but have restricted mobility find it more difficult to negotiate a ramp than a stair. In addition, adverse weather conditions increase the risk of slipping on a ramp. It is therefore beneficial to have steps as well as a ramp.

**1.22** Some people need to be able to stop frequently; for instance to regain strength or breath, or to ease pain.

**1.23** Wheelchair users need adequate space to stop on landings, to open and pass through doors without having to reverse into circulation routes or to face the risk of rolling back down slopes.

**1.24** Some people have a weakness on one side. This leads to a requirement for support at both sides of ramps.

**1.25** If the total rise of a ramped approach is too high, it can be unacceptably tiring for wheelchair users and some people with walking difficulties, even if a number of rest landings are provided.

**Note:** Guidance is given in BS 8300 on:

- lighting ramped access.

## Provisions

**1.26** A ramped access will satisfy Requirement M1 or M2 if:

- either it is readily apparent or the approach to it is clearly sign-posted;
- the gradient of a ramp flight and its going between landings are in accordance with Table 1 and Diagram 3;
- no flight has a going greater than 10m, or a rise of more than 500mm;

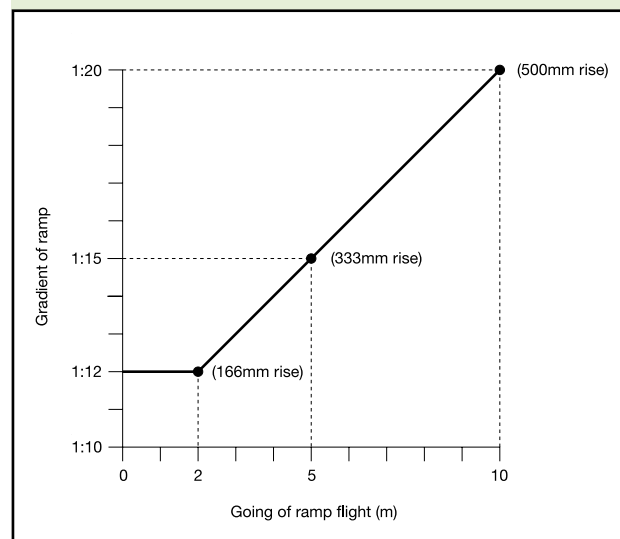
**Table 1 Limits for ramp gradients**

Going of a flight	Maximum gradient	Maximum rise
10m	1:20	500mm
5m	1:15	333mm
2m	1:12	166mm

**Note:**

For goings between 2m and 10m, it is acceptable to interpolate between the maximum gradients, i.e. 1:14 for a 4m going or 1:19 for a 9m going (see Diagram 3).

**Diagram 3 Relationship of ramp gradient to the going of a flight**



- there is an alternative means of access for wheelchair users, e.g. a lift, when the total rise is greater than 2m;
- it has a surface width between walls, upstands or kerbs of at least 1.5m;

- f. the ramp surface is slip resistant, especially when wet, and of a colour that contrasts visually with that of the landings;
- g. the frictional characteristics of the ramp and landing surfaces are similar;
- h. there is a landing at the foot and head of the ramp at least 1.2m long and clear of any door swings or other obstructions;
- i. any intermediate landings are at least 1.5m long and clear of any door swings or other obstructions;
- j. intermediate landings at least 1800mm wide and 1800mm long are provided as passing places when it is not possible for a wheelchair user to see from one end of the ramp to the other or the ramp has three flights or more;
- k. all landings are level, subject to a maximum gradient of 1:60 along their length and a maximum cross-fall gradient of 1:40;
- l. there is a handrail on both sides;
- m. there is a kerb on the open side of any ramp or landing at least 100mm high, which contrasts visually with the ramp or landing in addition to any guarding required under Part K;
- n. clearly sign-posted steps are provided, in addition, when the rise of the ramp is greater than 300mm (equivalent to 2 x 150mm steps).

### Stepped access

**Note:** Where there appears to be a conflict between the guidance in Part M and Part K, Part M takes precedence; see the Notes to the Requirements.

### Design considerations

**1.27** People with impaired sight risk tripping or losing their balance if there is no warning that steps provide a change in level. The risk is most hazardous at the head of a flight of steps when a person is descending.

**1.28** The warning should be placed sufficiently in advance of the hazard to allow time to stop and not be so narrow that it might be missed in a single stride.

**1.29** Materials for treads should not present a slip hazard, especially when the surface is wet.

**1.30** People should be able to appreciate easily where to place their feet by highlighting nosings and avoiding open rises.

**1.31** People who wear callipers or who have stiffness in hip or knee joints are particularly at risk of tripping or catching their feet beneath nosings. People with a weakness on one side or with a sight impairment need the dimensions of the tread to be sufficient for them to be able to place their feet square onto it. If the going is towards the upper end of the dimensional range, the flight may rise to a greater height without the need for an intermediate landing, as the tread is sufficiently deep to allow a person to stand and rest at any point within the flight. It should be noted that excessive rounding of nosings reduces the effective going.

**1.32** Many ambulant disabled people find it easier to negotiate a flight of steps than a ramp and, for these people, the presence of handrails for support is essential.

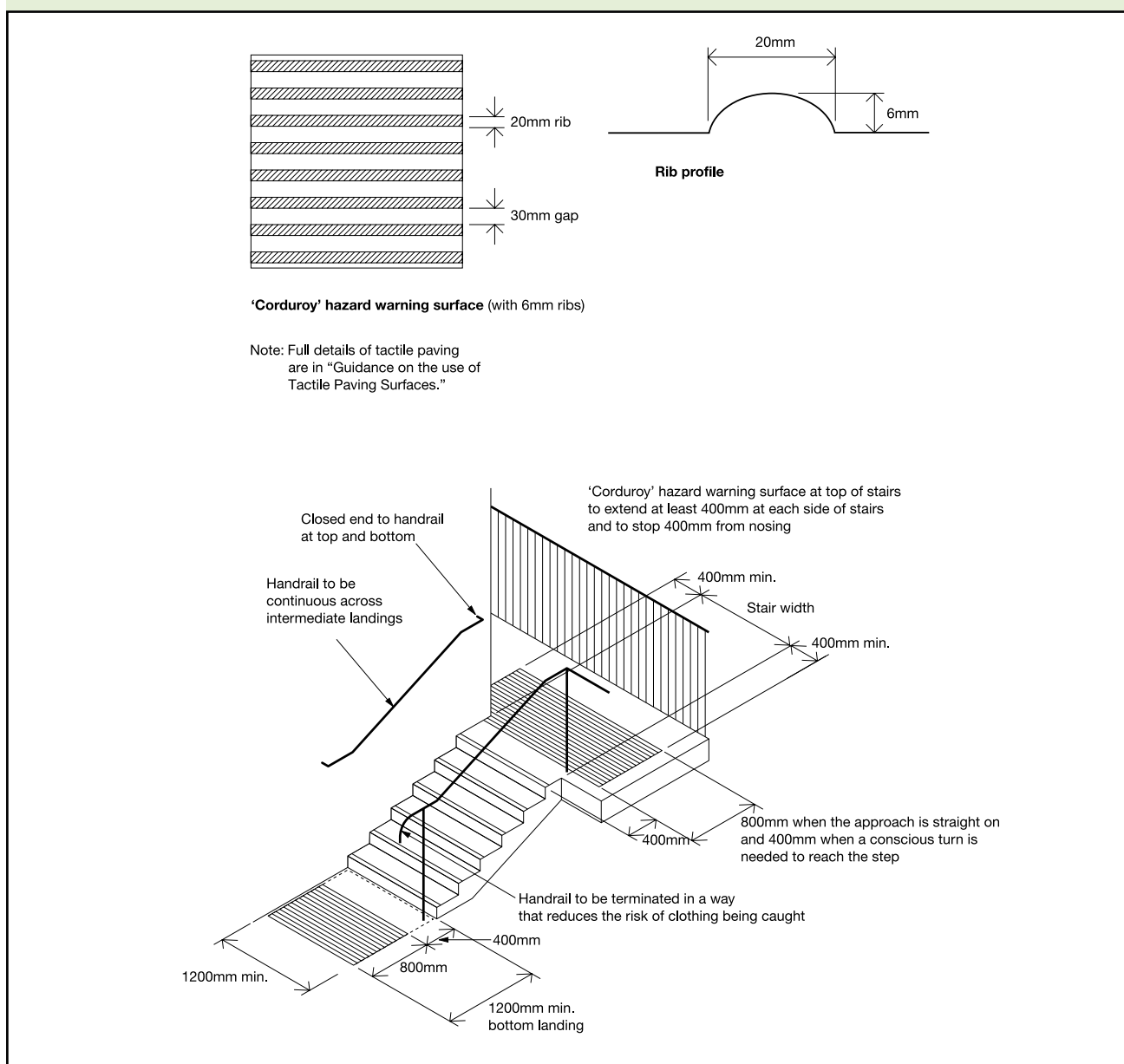
**Note:** Guidance is given in BS 8300 on:

- lighting stepped access; and
- slip resistance (Annex C).

### Provisions

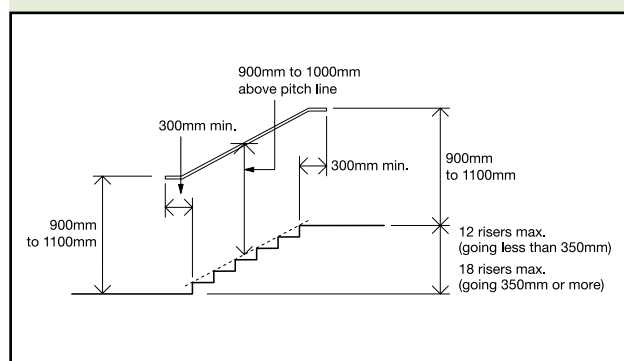
**1.33** A stepped access will satisfy Requirement M1 or M2 if:

- a. a level landing is provided at the top and bottom of each flight;
- b. the unobstructed length of each landing is not less than 1200mm;
- c. a 'corduroy' hazard warning surface is provided at top and bottom landings of a series of flights to give advance warning of a change in level in accordance with Diagram 4;

Diagram 4 **Stepped access – key dimensions and use of hazard warning surface**

- d. where there is side access onto an intermediate landing, a 'corduroy' hazard warning surface 400mm deep is provided either on the intermediate landing 400mm from both upper and lower flights, if there is sufficient space to accommodate the surface outside the line of the side access, or within the side access 400mm from the intermediate landing if there is a continuous handrail opposite the side access;
- e. no doors swing across landings;
- f. it has flights whose surface width between enclosing walls, strings or upstands is not less than 1.2m;
- g. there are no single steps;
- h. the rise of a flight between landings contains no more than 12 risers for a going of less than 350mm and no more than 18 risers for a going of 350mm or greater (see Diagram 5);
- i. all nosings are made apparent by means of a permanently contrasting material 55mm wide on both the tread and the riser;
- j. the projection of a step nosing over the tread below is avoided but, if necessary, not more than 25mm (see Diagram 6);

**Diagram 5 External steps and stairs – key dimensions**



- k. the rise and going of each step is consistent throughout a flight;
- l. the rise of each step is between 150mm and 170mm, except adjacent to existing buildings where, due to dimensional constraints, the case for a different rise is agreed with the building control body;
- m. the going of each step is between 280mm and 425mm;
- n. rises are not open;
- o. there is a continuous handrail on each side of a flight and landings;
- p. additional handrails divide the flight into channels not less than 1m wide and not more than 1.8m wide where the overall unobstructed width is more than 1.8m.

**Note:** In respect of 1.33(l) and (m), for school buildings, the preferred dimensions are a rise of 150mm, and a going of 280mm.

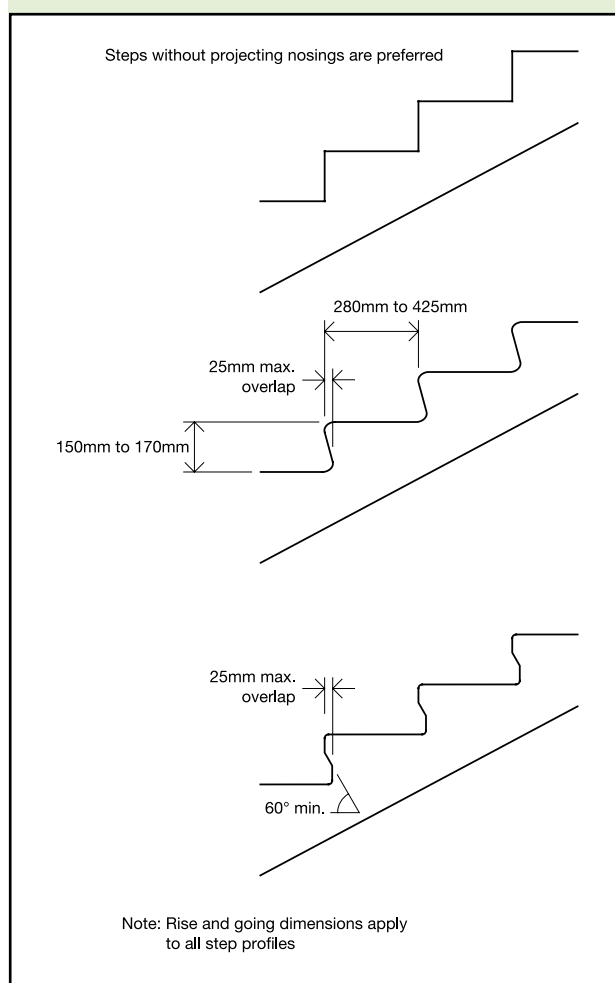
## Handrails to external stepped and ramped access

### Design considerations

**1.34** People who have physical difficulty in negotiating changes of level need the help of a handrail that can be gripped easily, is comfortable to touch and, preferably, provides good forearm support.

**1.35** Handrails should be spaced away from the wall and rigidly supported in a way that avoids impeding finger grip.

**Diagram 6 Examples of acceptable step profiles and key dimensions for external stairs**



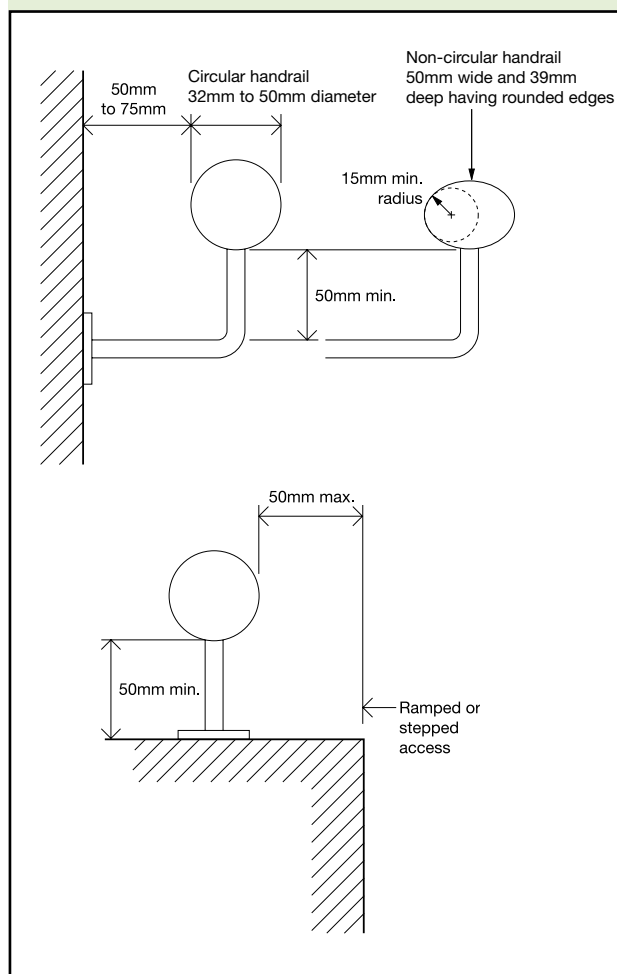
**1.36** Handrails should be set at heights that are convenient for all users of the building and should extend safely beyond the top and bottom of a flight of steps, or a ramp, to give both stability and warning of the presence of a change in level. Consideration should be given to the provision of a second handrail on stairs in a wide range of building types, and particularly in schools, for use by children and people of short stature.

### Provisions

**1.37** Handrailing to external ramped and stepped access will satisfy Requirement M1 or M2 if:

- a. the vertical height to the top of the upper handrail from the pitch line of the surface of a ramp, or a flight of steps, is between 900mm and 1000mm, and from the surface of a landing is between 900 and 1100mm (see Diagram 5);
- b. where there is full height structural guarding, the vertical height to the top of a second lower handrail from the pitch line of the surface of a ramp, or a flight of steps, is 600mm, where provided;
- c. it is continuous across the flights and landings of ramped or stepped access;
- d. it extends at least 300mm horizontally beyond the top and bottom of a ramped access, or the top and bottom nosing of a flight or flights of steps, while not projecting into an access route;
- e. it contrasts visually with the background against which it is seen, without being highly reflective;
- f. its surface is slip resistant and not cold to the touch, in areas where resistance to vandalism or low maintenance are key factors, use of metals with relatively low thermal conductivity may be appropriate;
- g. it terminates in a way that reduces the risk of clothing being caught;
- h. its profile is either circular with a diameter between 32 and 50mm, or non-circular, 50mm wide and 39mm deep having rounded edges with a radius a minimum of 15mm (see Diagram 7);
- i. it protrudes no more than 100mm into the surface width of the ramped or stepped access where this would impinge on the stair width requirement of Part B1;
- j. there is a clearance of between 50 and 75mm between the handrail and any adjacent wall surface;
- k. there is a clearance of at least 50mm between a cranked support and the underside of the handrail;
- l. its inner face is located no more than 50mm beyond the surface width of the ramped or stepped access.

Diagram 7 Handrail design



## Hazards on access routes

### Design considerations

**1.38** Features of a building that occasionally obstruct an access route, particularly if they are partially transparent and therefore indistinct, or cause a danger overhead, should not present a hazard to building users.

### Provisions

**1.39** Requirement M1 or M2 will be satisfied in relation to hazards on access routes where Approved Document K, sections 6 and 10 are complied with.

**Note:** Diagram 8 has been moved to Approved Document K, Section 10, all other numbering remains the same.

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## Section 2: Access into buildings other than dwellings

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### OBJECTIVES

**2.1** The aim for all new buildings is for the principal entrance or entrances and any main staff entrance, and any lobbies, to be accessible.

**2.2** Where it is not possible, e.g. in an existing building, for the principal or main staff entrance or entrances to be accessible, an alternative accessible entrance should be provided.

**2.3** It is important to reduce the risks to people when entering the building.

### Accessible entrances

#### Design considerations

**2.4** Steeply sloping or restricted sites sometimes make it impossible for the principal or main staff entrance to be accessible, in which case an alternative accessible entrance may be necessary.

**2.5** Accessible entrances should be clearly sign-posted and easily recognisable. Any structural elements, for example supports for a canopy, are useful in identifying the entrance, but should not present a hazard.

**2.6** The route from the exterior across the threshold should provide weather protection, and not present a barrier for wheelchair users or a trip hazard for other people. A level threshold is preferred, especially for doors in frequent use.

**Note:** Guidance on sign-posting is given in BS 8300, Inclusive mobility and the Sign design guide.

#### Provisions

**2.7** Accessible entrances will satisfy Requirement M1 or M2 if:

- a. they are clearly sign-posted, incorporating the International Symbol of Access, from the edge of the site and from the principal entrance (if this is not accessible);
- b. they are easily identified among the other elements of the building and the

immediate environment, e.g. by lighting and/or visual contrast;

- c. any structural supports at the entrance do not present a hazard for visually impaired people;
- d. there is a level landing at least 1500 x 1500mm, clear of any door swings, immediately in front of the entrance and of a material that does not impede the movement of wheelchairs;
- e. the threshold is level or, if a raised threshold is unavoidable, it has a total height of not more than 15mm, a minimum number of upstands and slopes, with any upstands higher than 5mm chamfered or rounded;
- f. any door entry systems are accessible to deaf and hard of hearing people, and people who cannot speak;
- g. weather protection is provided at manual non-powered entrance doors;
- h. internal floor surfaces adjacent to the threshold are of materials that do not impede the movement of wheelchairs, e.g. not coir matting, and changes in floor materials do not create a potential trip hazard;
- i. where mat wells are provided, the surface of the mat is level with the surface of the adjacent floor finish;
- j. where provided as an alternative accessible entrance, an accessible internal route is provided to the spaces served by the principal or main staff entrances.

### Doors to accessible entrances

#### Design considerations

**2.8** Doors to the principal, or alternative accessible, entrance should be accessible to all, particularly wheelchair users and people with limited physical dexterity. Entrance doors may be manually operated without powered assistance, or power operated under manual or automatic

control. Entrance doors should be capable of being held closed when not in use.

**2.9** A non-powered manually operated entrance door, fitted with a self-closing device capable of closing the door against wind forces and the resistance of draught seals is unlikely to be openable by many people, particularly those who are wheelchair users or who have limited strength.

**2.10** A powered door opening and closing system, either manually controlled or automatically operated by sensors, is the most satisfactory solution for most people. An automatic sliding door arrangement is particularly beneficial as it avoids the risks associated with automatic swing doors and its use can make it possible to reduce the length of any entrance lobby.

**2.11** Once open, all doors to accessible entrances should be wide enough to allow unrestricted passage for a variety of users, including wheelchair users, people carrying luggage, people with assistance dogs, and parents with pushchairs and small children. It should be noted that double buggies are wider than wheelchairs and that, where relevant to the building type, this should be borne in mind when determining an appropriate effective clear width for an entrance door. There may be circumstances in existing buildings where it is not practicable or cost-effective to adopt the preferred effective clear widths for new buildings.

**2.12** People should be able to see other people approaching from the opposite direction, thereby allowing sufficient reaction time for both parties to avoid a collision. Exceptions may be acceptable for reasons of privacy or security.

### Provisions

**2.13** Doors to accessible entrances will satisfy Requirement M1 or M2 if:

- where required to be self-closing, a power-operated door opening and closing system is used when through calculation and experience it appears that it will not be possible otherwise for a person to open the door using a force not more than 30N at the leading edge from 0° (the door in the closed position)

to 30° open, and not more than 22.5N at the leading edge from 30° to 60° of the opening cycle;

- the effective clear width through a single leaf door, or one leaf of a double leaf door, is in accordance with Table 2, and the rules for measurement are in accordance with Diagram 9;
- they are installed in accordance with Approved Document K, section 10.

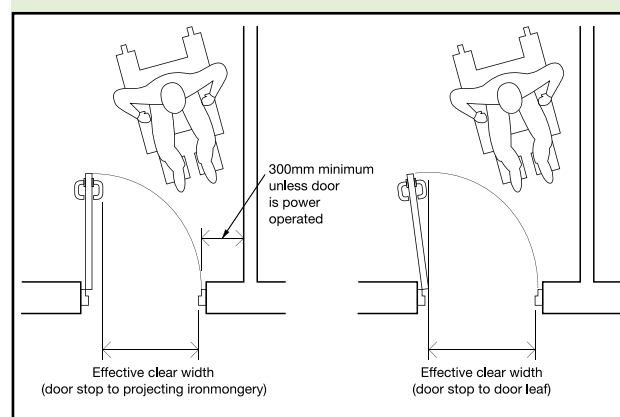
**Table 2 Minimum effective clear widths of doors**

Direction and width of approach	New buildings (mm)	Existing buildings (mm)
Straight-on (without a turn or oblique approach)	800	750
At right angles to an access route at least 1500mm wide	800	750
At right angles to an access route at least 1200mm wide	825	775
External doors to buildings used by the general public	1000	775

**Note:**

The effective clear width is the width of the opening measured at right angles to the wall in which the door is situated from the outside of the door stop on the door closing side to any obstruction on the hinge side, whether this be projecting door opening furniture, a weather board, the door or the door stop (see Diagram 9). For specific guidance on the effective clear widths of doors in sports accommodation, refer to 'accessible sports facilities'.

**Diagram 9 Effective clear width of doors**



## Manually operated non-powered entrance doors

### Design considerations

**2.14** Self-closing devices on manually operated non-powered swing doors disadvantage many people who have limited upper body strength, are pushing

prams or are carrying heavy objects.

**2.15** A space alongside the leading edge of a door should be provided to enable a wheelchair user to reach and grip the door handle, then open the door without releasing hold on the handle and without the footrest colliding with the return wall.

**2.16** Door furniture on manually operated non-powered doors should be easy to operate by people with limited manual dexterity, and be readily apparent against the background of the door.

### Provisions

**2.17** Manually operated non-powered entrance doors will satisfy Requirement M1 or M2 if:

- a. the opening force at the leading edge of the door is not more than 30N at the leading edge from 0° (the door in the closed position) to 30° open, and not more than 22.5N at the leading edge from 30° to 60° of the opening cycle;
- b. there is an unobstructed space of at least 300mm on the pull side of the door between the leading edge of the door and any return wall, unless the door is a powered entrance door (see Diagram 9);
- c. where fitted with a latch, the door opening furniture can be operated with one hand using a closed fist, e.g. a lever handle;
- d. all door opening furniture contrasts visually with the surface of the door and is not cold to the touch.

### Powered entrance doors

#### Design considerations

**2.18** Activation (e.g. motion sensors and push buttons), safety features and the time-lapse allowed for entry and exit through powered door systems should be carefully considered to suit the needs of people who cannot react quickly.

**2.19** Manual controls for powered entrance doors should be clearly distinguishable against the background and not located so that a person, having used the control,

needs to move to avoid contact with the door as it opens.

**2.20** Revolving doors are not considered accessible. They create particular difficulties, and risk of injury, for people with assistance dogs, people with visual impairment or mobility problems and for parents with children and/or pushchairs. If a revolving door is used, an entrance door complying with 2.17 or 2.21 should be provided immediately adjacent to it and signed to show that it is accessible.

### Provisions

**2.21** Powered entrance doors will satisfy Requirement M1 or M2 if:

- a. they have a sliding, swinging or folding action controlled:
  - manually by a push pad, card swipe, coded entry or remote control, or
  - automatically by a motion sensor or other proximity sensor, e.g. a contact mat;
- b. when installed, automatic sensors are set so that automatically operated doors open early enough, and stay open long enough, to permit safe entry and exit;
- c. when they are swing doors that open towards people approaching the doors, visual and audible warnings are provided to warn people of their automatic operation when both opening and shutting;
- d. they incorporate a safety stop that is activated if the doors begin to close when a person is passing through;
- e. they revert to manual control or fail safe in the open position in the event of a power failure;
- f. when open, they do not project into any adjacent access route;
- g. any manual controls for powered door systems are located between 750mm and 1000mm above floor level, operable with a closed fist and, when on the opening side of the door, are set back 1400mm from the leading edge of the door when fully open and contrast visually with the background against which they are seen.

## Glass doors and glazed screens

### Design considerations

**2.22** People with visual impairment should be in no doubt as to the location of glass doors, especially when they are within a glazed screen. The choice of a different style of manifestation for the door and the glazed screen can help to differentiate between them.

**2.23** The presence of the door should be apparent not only when it is shut but also when it is open. Where it can be held open, steps should be taken to avoid people being harmed by walking into the door.

### Provisions

**2.24** Glass doors and glazed screens will satisfy Requirement M1 or M2 if they comply with Approved Document K, Section 7.

## Entrance lobbies

### Design considerations

**2.25** There are a number of reasons for providing a lobby:

- to limit air infiltration
- to maintain comfort by controlling draughts
- to increase security
- to provide transitional lighting.

**2.26** The provision of a lobby may make it possible for an external door to have a self-closing device with a lower power size rating than might otherwise be the case. However, even in these circumstances, it may not be possible for the entrance door to meet the opening force criterion of 30N at the leading edge from 0° (the door in the closed position) to 30° open, and not more than 22.5N at the leading edge from 30° to 60° of the opening cycle (see 2.9).

**2.27** The lobby should be large enough and of a shape to allow a wheelchair user or a person pushing a pram to move clear of one door before opening the second door. The lobby should also be capable of accommodating a companion helping a wheelchair user to open doors and guide the wheelchair through. The minimum length of the lobby is related to the chosen

door size, the swing of each door, the projection of the door into the lobby and the size of an occupied wheelchair with a companion pushing. Where both doors of a lobby are automatic sliding doors, the length can be reduced as no door swings are involved, nor is space required for manual operation. Similarly, if 'reduced swing' door sets are used, the length can be reduced because the projection of the door into the lobby is reduced.

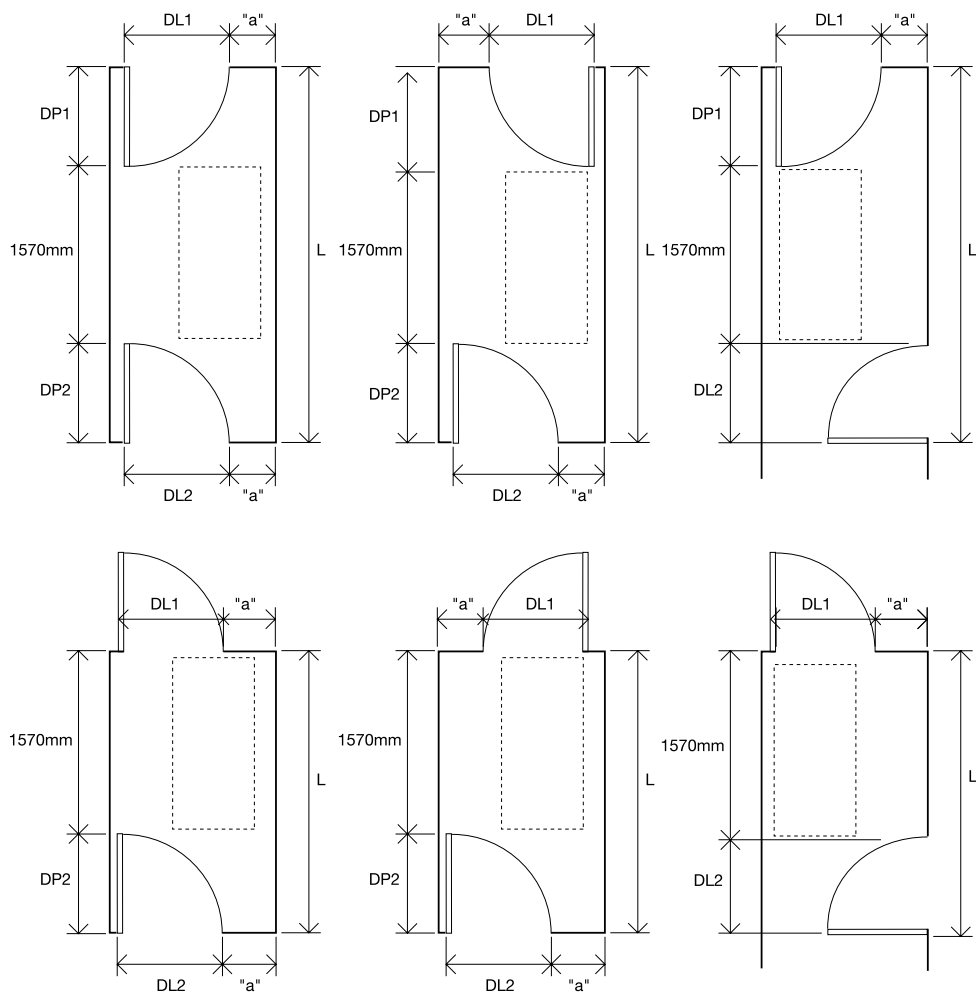
**2.28** The aim should be to reduce potential hazards from local obstructions within the lobby and minimise distracting reflections from glazing. It is also desirable if rainwater from shoes or the wheels of wheelchairs is not taken into the building where it becomes a potential slip hazard, e.g. by the use of cleaning mats.

### Provisions

**2.29** Entrance lobbies will satisfy Requirement M1 or M2 if:

- a. their length with single swing doors is in accordance with Diagram 10;
- b. their length with double swing doors is at least (DP1 + DP2 + 1570mm);
- c. their width (excluding any projections into the space) is at least 1200mm (or (DL1 or DL2) + 300mm) whichever is the greater when single leaf doors are used, and at least 1800mm when double leaf doors are used;
- d. glazing within the lobby does not create distracting reflections;
- e. floor surface materials within the lobby do not impede the movement of wheelchairs, e.g. not coir matting, and changes in floor materials do not create a potential trip hazard;
- f. the floor surface helps to remove rainwater from shoes and wheelchairs;
- g. where mat wells are provided, the surface of the mat is level with the surface of the adjacent floor finish;
- h. any columns, ducts and similar full height elements that project into the lobby by more than 100mm are protected by a visually contrasting guard rail.

**Diagram 10 Key dimensions for lobbies with single leaf doors**



DL1 and DL2 = door leaf dimensions of the doors to the lobby  
 DP1 and DP2 = door projection into the lobby (normally door leaf size)  
 L = minimum length of lobby, or length up to door leaf for side entry lobby  
 "a" = at least 300mm wheelchair access space (can be increased to reduce L)  
 1570mm = length of occupied wheelchair with a companion pushing (or a large scooter)

NB: For every 100mm increase above 300mm in the dimension "a" (which gives a greater overlap of the wheelchair footprint over the door swing), there can be a corresponding reduction of 100mm in the dimension L, up to a maximum of 600mm reduction.

## Section 3: Horizontal and vertical circulation in buildings other than dwellings

### OBJECTIVE

**3.1** The objective is for all people to travel vertically and horizontally within buildings conveniently and without discomfort in order to make use of all relevant facilities. This objective relates in the main, but not exclusively, to the provision of sufficient space for wheelchair manoeuvre and design features that make it possible for people to travel independently within buildings.

### Entrance hall and reception area

#### Design considerations

**3.2** As the entrance hall is the first point of contact with a building's activities and resources, the reception area in particular should not only be easily accessible but also convenient to use.

**3.3** Where a service building has a reception or sales counter, there should be convenient access to it and part of it should be at a level suitable for a wheelchair user or a seated person. Any lower section should also be wheelchair-accessible on the reception side.

**3.4** Designers should also be aware that glazed screens in front of the reception point, or light sources or reflective wall surfaces, such as glazed screens, located behind the reception point, could compromise the ability of a person with a hearing impairment to lip read or follow sign language.

**3.5** It should be possible for information about the building to be easily obtained from a reception point or gathered from notice boards and signs.

**Note:** Guidance on aids to communication is available in BS 8300, and on the use of signs in the Sign design guide.

#### Provisions

**3.6** An entrance hall and reception area will satisfy Requirement M1 or M2 if:

- a. any reception point is located away from the principal entrance (while still providing a view of it) where there is a risk that external noise will be a problem;
- b. any reception point is easily identifiable from the entrance doors or lobby, and the approach to it is direct and free from obstructions;
- c. the design of the approach to any reception point allows space for wheelchair users to gain access to the reception point;
- d. the clear manoeuvring space in front of any reception desk or counter is 1200mm deep and 1800mm wide if there is a knee recess at least 500mm deep, or 1400mm deep and 2200mm wide if there is no knee recess;
- e. any reception desk or counter is designed to accommodate both standing and seated visitors such that at least one section of the counter is at least 1500mm wide, with its surface no higher than 760mm, and a knee recess, not less than 700mm, above floor level;
- f. any reception point is provided with a hearing enhancement system, e.g. an induction loop;
- g. the floor surface is slip resistant.

### Internal doors

#### Design considerations

**3.7** Since doors are potential barriers, their use should be avoided whenever appropriate. If doors are required, the use of self-closing devices should be minimised (particularly in parts of buildings used by the general public) since, as described in 2.14, they disadvantage many people who have limited upper body strength, are pushing prams or are carrying heavy objects. Where closing devices are needed for fire control, electrically powered hold-open devices or swing-free closing devices should be used as appropriate. These are

devices whose closing mechanism is only activated in case of emergency. Low energy powered door systems may be used in locations not subject to frequent use or heavy traffic as the opening and closing action is relatively slow.

**3.8** The presence of doors, whether open or closed, should be apparent to visually impaired people through the careful choice of colour and material for the door and its surroundings. For example, when a door is open, people with impaired sight should be able to identify the door opening within the wall, as well as the leading edge of the door.

**3.9** Other design considerations for internal doors are as set out in 2.14 to 2.16 under 'Manually operated non-powered entrance doors' and should be referred to for guidance.

**Note:** Guidance is available in BS 8300 on:

- electrically powered hold-open devices
- swing-free systems
- low energy powered door systems.

## Provisions

**3.10** Internal doors will satisfy Requirement M1 or M2 if:

- a. where needing to be opened manually, the opening force at the leading edge of the door is not more than 30N from 0° (the door in the closed position) to 30° open, and not more than 22.5N from 30° to 60° of the opening cycle;
- b. the effective clear width through a single leaf door, or one leaf of a double leaf door, is in accordance with Table 2 and Diagram 9;
- c. there is an unobstructed space of at least 300mm on the pull side of the door between the leading edge of the door and any return wall, unless the door has power-controlled opening or it provides access to a standard hotel bedroom;
- d. where fitted with a latch, the door opening furniture can be operated with one hand using a closed fist, e.g. a lever handle;
- e. all door opening furniture contrasts visually with the surface of the door;
- f. the door frames contrast visually with the surrounding wall;
- g. the surface of the leading edge of any door that is not self-closing, or is likely to be held open, contrasts visually with the other door surfaces and its surroundings;
- h. where appropriate in door leaves or side panels wider than 450mm, vision panels towards the leading edge of the door have vertical dimensions which include at least the minimum zone, or zones, of visibility between 500mm and 1500mm from the floor, if necessary interrupted between 800mm and 1150mm above the floor, e.g. to accommodate an intermediate horizontal rail (see Approved Document K, Section 10);
- i. when of glass, they are clearly defined with manifestation on the glass that complies with Approved Document K, section 7;
- j. when of glass or fully glazed, they are clearly differentiated from any adjacent glazed wall or partition by the provision of a high-contrast strip at the top and on both sides;
- k. fire doors, particularly those in corridors, are held open with an electro-magnetic device, but self-close when:
  - activated by smoke detectors linked to the door individually, or to a main fire/smoke alarm system;
  - the power supply fails;
  - activated by a hand-operated switch;
- l. fire doors, particularly to individual rooms, are fitted with swing-free devices that close when activated by smoke detectors or the building's fire alarm system, or when the power supply fails;
- m. any low energy powered swing door system is capable of being operated in manual mode, in powered mode or in power-assisted mode.

## Corridors and passageways

### Design considerations

**3.11** Corridors and passageways should be wide enough to allow people with buggies, people carrying cases or people on crutches to pass others on the access route. Wheelchair users should also have access to adjacent rooms and spaces, be able to pass other people and, where necessary, turn through 180°. Corridors narrower than indicated in this guidance, or localised narrowing (e.g. at archways), might be reasonable in some locations, such as in existing buildings or in some extensions.

**3.12** In order to help people with visual impairment to appreciate the size of a space they have entered, or to find their way around, there should be a visual contrast between the wall and the ceiling, and between the wall and the floor. Such attention to surface finishes should be coupled with good natural and artificial lighting design.

**3.13** Good acoustic design should be employed to achieve an acoustic environment that is neither too reverberant nor too absorbent so that announcements and conversations can be heard clearly.

### Provisions

**3.14** Corridors and passageways will satisfy Requirement M1 or M2 if:

- a. elements such as columns, radiators and fire hoses do not project into the corridor, or where this is unavoidable, a means of directing people around them, such as a visually contrasting guard rail, is provided;
- b. they have an unobstructed width (excluding any projections into the space) along their length of at least 1200mm;
- c. where they have an unobstructed width of less than 1800mm, they have passing places at least 1800mm long and with an unobstructed width of at least 1800mm at reasonable intervals, e.g. at corridor junctions, to allow wheelchair users to pass each other;
- d. the floor is level or predominantly level (with a gradient no steeper than 1:60), with any section with a gradient of 1:20 or steeper designed as an internal ramp and in accordance with Table 1 and Diagram 3;
- e. where a section of the floor has a gradient, in the direction of travel, steeper than 1:60, but less steep than 1:20, it rises no more than 500mm without a level rest area at least 1500mm long (with a gradient no steeper than 1:60);
- f. any sloping section extends the full width of the corridor or, if not, the exposed edge is clearly identified by visual contrast and, where necessary, protected by guarding;
- g. any door opening towards a corridor, which is a major access route or an escape route, should be recessed so that, when fully open, it does not project into the corridor space, except where the doors are to minor utility facilities, such as small store rooms and locked duct cupboards;
- h. any door from a unisex wheelchair-accessible toilet projects when open into a corridor that is not a major access route or an escape route, provided the corridor is at least 1800mm wide at that point;
- i. on a major access route or an escape route, the wider leaf of a series of double doors with leaves of unequal width is on the same side of the corridor throughout the length of the corridor;
- j. floor surface finishes with patterns that could be mistaken for steps or changes of level are avoided;
- k. floor finishes are slip resistant;
- l. any glazed screens alongside a corridor are clearly defined with manifestation on the glass that complies with Approved Document K, section 7.

**Note:** In respect of 3.14(b), for school buildings, the preferred corridor width dimension is 2700mm where there are lockers within the corridor.

## **Internal lobbies**

### **Design considerations**

**3.15** An internal lobby should allow a wheelchair user, with or without a companion, or a person pushing a pram or buggy to move clear of one door before attempting to open the second door, as indicated in 2.27, under 'External lobbies'.

### **Provisions**

**3.16** Internal lobbies will satisfy Requirement M1 or M2 if:

- a. their length with single swing doors is in accordance with Diagram 10;
- b. their length with double swing doors is at least (DP1 + DP2 + 1570mm);
- c. their width (excluding any projections into the space) is at least 1200mm (or (DL1 or DL2) + 300mm) whichever is the greater when single leaf doors are used, and at least 1800mm when double leaf doors are used;
- d. glazing within the lobby does not create distracting reflections;
- e. any junctions of floor surface materials at the entrance to the lobby area do not create a potential trip hazard;
- f. any columns, ducts and similar full height elements that project into the lobby by more than 100mm are protected by a visually contrasting guard rail.

## **Vertical circulation within the building**

### **Design considerations**

**3.17** A passenger lift is the most suitable means of vertical access and should be provided wherever possible. However, given the space constraints in some buildings, it may not always be possible to install the type and size of passenger lift that would be suitable for use by all, and other options may need to be considered to provide for users with mobility impairments.

**3.18** Signs indicating the location of a lifting device accessible by mobility-impaired people should be clearly visible from the building entrance. Additionally, a sign identifying the floor reached should be provided on each landing in a location that can be easily seen from the lifting device and is designed so that it contrasts visually with its surrounding.

**3.19** Whatever lifting device is chosen, internal stairs should always be provided as an alternative means of vertical access, and designed to suit ambulant disabled people and those with impaired sight.

**3.20** A ramp may also be provided on an internal circulation route to a suitable lifting device, if a change of level is unavoidable.

## **Provision of lifting devices**

### **Design considerations**

**3.21** For all buildings, a passenger lift is the most suitable form of access for people moving from one storey to another.

**3.22** For existing buildings, and in exceptional circumstances for new developments with particular constraints (e.g. a listed building or an infill site in a historic town centre), where a passenger lift cannot be accommodated, a vertical lifting platform (platform lift), although not equivalent to a passenger lift, may be considered as an alternative option to provide access for persons with impaired mobility.

**3.23** In exceptional circumstances in an existing building, a wheelchair platform stairlift may be considered, provided its installation does not conflict with requirements for means of escape.

### **Provisions**

**3.24** The provision of lifting devices will satisfy Requirement M1 or M2 if:

- a. new developments have a passenger lift serving all storeys;

- b. new developments, where due to site constraints a passenger lift cannot be accommodated to provide access to persons with impaired mobility, have a lifting platform, of a type designed for the vertical height to be travelled;
- c. existing buildings have a passenger lift serving all storeys or, if a passenger lift cannot reasonably be accommodated to provide access to persons with impaired mobility, they have a lifting platform, of a type designed for the vertical height to be travelled;
- d. existing buildings have a wheelchair platform stairlift serving an intermediate level or a single storey, only in exceptional circumstances.

## General requirements for lifting devices

### Design considerations

**3.25** In selecting the appropriate lifting device care should be taken to ensure it is fit for purpose. Relevant legislation includes the Lift Regulations 1997 SI 1997/831, the Lifting Operations and Lifting Equipment Regulations 1998 SI 1998/2307, the Provision and Use of Work Equipment Regulations 1998 SI 1998/2306 and the Management of Health and Safety at Work Regulations 1999 SI 1999/3242.

**3.26** The illumination in the passenger lift car, on the lifting platform or on the wheelchair platform stairlift should minimise glare, reflection, confusing shadows or pools of light and dark.

**3.27** All users including wheelchair users should be able to reach and use the controls that summon and direct the lifting device.

**Note:** Further guidance is available in BS 8300.

### Provisions

**3.28** The installation of lifting devices will satisfy Requirement M1 or M2 if:

- a. there is an unobstructed manoeuvring space of 1500mm x 1500mm, or a straight access route 900mm wide, in front of each lifting device;

- b. the landing call buttons are located between 900mm and 1100mm from the floor of the landing and at least 500mm from any return wall;
- c. the landing call button symbols, where provided, and lifting device control button symbols are raised to facilitate tactile reading;
- d. all call and control buttons contrast visually with the surrounding face plate, and the face plate similarly contrasts with the surface on which it is mounted;
- e. the floor of the lifting device should not be of a dark colour and should have frictional qualities similar to, or higher than, the floor of the landing;
- f. a handrail is provided on at least one wall of the lifting device with its top surface at 900mm (nominal) above the floor and located so that it does not obstruct the controls or the mirror;
- g. a suitable emergency communication system is fitted.

## Passenger lifts

### Design considerations

**3.29** A wheelchair user needs sufficient space and time to enter and leave a passenger lift, particularly when sharing it with other people. Lift sizes should therefore be chosen to suit the anticipated density of use of the building and the needs of disabled people. The minimum size lift car shown in the provisions below accommodates a wheelchair user with an accompanying person. A larger lift size (2000mm wide by 1400mm deep) will accommodate any type of wheelchair together with several other passengers. It will also allow a wheelchair user or a person with a walking frame to turn through 180°.

**3.30** Lift door systems should be designed to allow adequate time for people, and any assistance dogs, to enter or leave the lift without coming into contact with closing doors.

**3.31** People using or waiting for a lift need audible and visual information to tell them that a lift has arrived, which floor it has

reached and where in a bank of lifts it is located.

**3.32** The use of visually and acoustically reflective wall surfaces can cause discomfort for people with visual and hearing impairment.

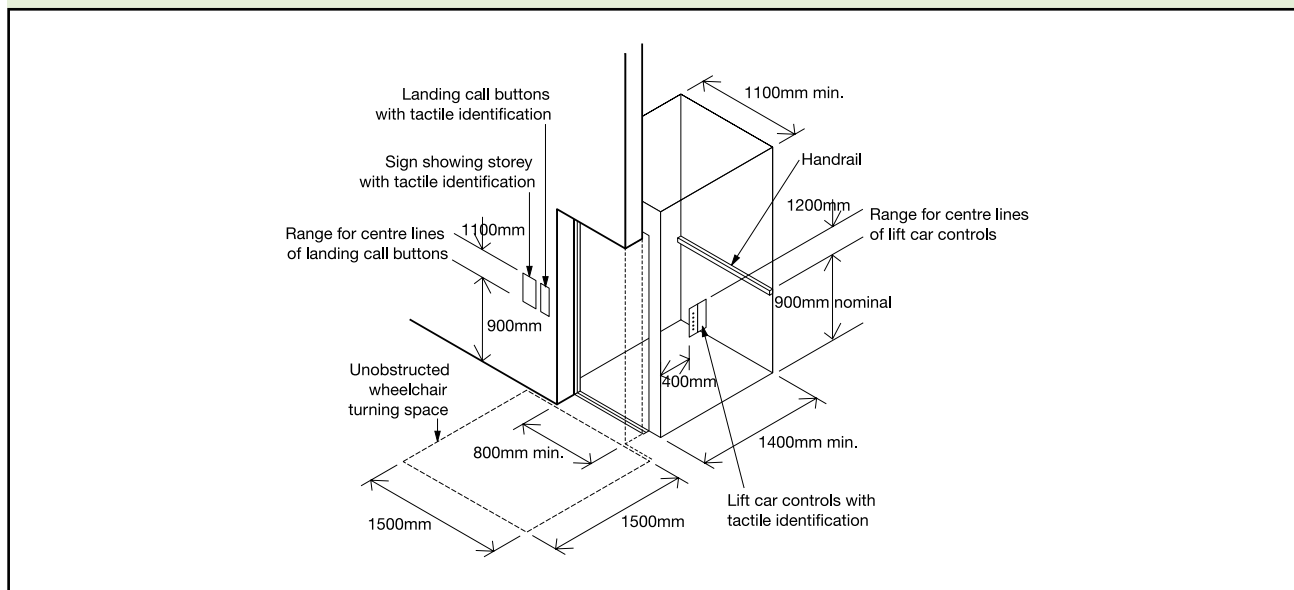
**3.33** Where planning allows, lift cars (used for access between two levels only) may be provided with opposing doors to allow a wheelchair user to leave without reversing out.

## Provisions

**3.34** Passenger lifts will satisfy Requirement M1 or M2 if:

- a. they conform to the requirements of the Lift Regulations 1997, SI 1997/831  
(**Note:** These regulations may be met by compliance with, among other things, the relevant British Standards, EN 81 series of standards, in particular BS EN 81-70:2003 Safety rules for the construction and installation of lifts. Particular applications for passenger and good passenger lifts, or, where necessary, by product certification issued by a Notified Body);
- b. they are accessible from the remainder of the storey;
- c. the minimum dimensions of the lift cars are 1100mm wide and 1400mm deep (see Diagram 11);
- d. for lifts of a size that does not allow a wheelchair user to turn around within the lift car, a mirror is provided in the lift car to enable a wheelchair user to see the space behind the wheelchair;
- e. power-operated horizontal sliding doors provide an effective clear width of at least 800mm (nominal);
- f. doors are fitted with timing devices and re-opening activators to allow adequate time for people and any assistance dogs to enter or leave;
- g. car controls are located between 900mm and 1200mm (preferably 1100mm) from the car floor and at least 400mm from any return wall;
- h. landing call buttons are located between 900mm and 1100mm from the floor of the landing and at least 500mm from any return wall;
- i. lift landing and car doors are distinguishable visually from the adjoining walls;

Diagram 11 **Key dimensions associated with passenger lifts**



- j. audible and visual indication of lift arrival and location is provided in the lift car and the lift lobby;
- k. areas of glass are identifiable by people with impaired vision;
- l. where the lift is to be used to evacuate disabled people in an emergency, it conforms to the relevant recommendations of BS 5588-8.

## Lifting platforms

### Design considerations

**3.35** A lifting platform should only be provided to transfer wheelchair users, people with impaired mobility and their companions vertically between levels or storeys.

**3.36** All users including wheelchair users should be able to reach and use the controls that summon and direct the lifting platform.

**3.37** People using or waiting for a lifting platform need audible and visual information to tell them that the platform has arrived, and which floor it has reached.

**3.38** Lifting platforms travel slowly between landings and may not be suitable for lone users with certain disabilities, e.g. those easily fatigued.

**3.39** Lifting platforms are operated by continuous pressure controls. In their simplest form these may be push buttons. However, another means of continuous pressure control may need to be considered to accommodate the needs of users with varying degrees of manual dexterity.

**3.40** It is important when selecting a lifting platform that due care and attention is paid to its intended use particularly if located in an unsupervised environment. Where management control cannot be exercised, particular attention should be paid to the product's designed duty cycle.

**3.41** Where planning allows, lifting platforms may be provided with opposing doors when used for access between two levels only, to allow a wheelchair user to leave without reversing out. In some cases, it may be more convenient to provide a second door at 90° to the first, in which case a wider platform would be required.

**3.42** The use of visually and acoustically reflective wall surfaces should be minimised within the lifting platform to prevent discomfort for people with visual and hearing impairment.

### Provisions

**3.43** Lifting platforms will satisfy Requirement M1 or M2 if:

- a. they conform to the requirements of the Supply of Machinery (Safety) Regulations 1992, SI 1992/3073 (**Note:** These regulations may be met by compliance, among other things, with the relevant British Standards, EN81 series of standards or, where necessary, by product certification issued by a Notified Body. In the absence of relevant harmonised European Standards, products with a travel exceeding 3m must have a product certificate issued by a Notified Body);
- b. the vertical travel distance is:
  - i. not more than 2m, where there is no liftway enclosure and no floor penetration;
  - ii. more than 2m, where there is a liftway enclosure;
- c. the rated speed of the platform does not exceed 0.15m/s;
- d. lifting platform controls are located between 800mm and 1100mm from the floor of the lifting platform and at least 400mm from any return wall;
- e. continuous pressure controls are provided;
- f. landing call buttons are located between 900mm and 1100mm from the floor of the landing and at least 500mm from any return wall;
- g. the minimum clear dimensions of the platform are:
  - i. 800mm wide and 1250mm deep, where the lifting platform is not enclosed and where provision is being made for an unaccompanied wheelchair user;

- ii. 900mm wide and 1400mm deep, where the lifting platform is enclosed and where provision is being made for an unaccompanied wheelchair user;
- iii. 1100mm wide and 1400mm deep where two doors are located at 90° relative to each other and where the lifting platform is enclosed or where provision is being made for an accompanied wheelchair user;
- h. doors have an effective clear width of at least 900mm for an 1100mm wide and 1400mm deep lifting platform and at least 800mm in other cases;
- i. they are fitted with clear instructions for use;
- j. the lifting platform entrances are accessible from the remainder of the storey;
- k. doors are distinguishable visually from the adjoining walls;
- l. an audible and visual announcement of platform arrival and level reached is provided;
- m. areas of glass are identifiable by people with impaired vision.

## **Wheelchair platform stairlifts**

### **Design considerations**

**3.44** Wheelchair platform stairlifts are only intended for the transportation of wheelchair users and should only be considered for conversions and alterations where it is not practicable to install a conventional passenger lift or a lifting platform. Such stairlifts travel up the string of a stair. They should not be installed where their operation restricts the safe use of the stair by other people.

**3.45** A wheelchair platform stairlift allows a wheelchair user to travel independently up and down stairs while remaining seated in a wheelchair. A wheelchair platform stairlift may be more suitable for use in small areas with a unique function, e.g. a small library gallery, a staff rest room or a training room.

**3.46** Wheelchair platform stairlifts travel slowly between landings and may not be suitable for users with certain disabilities, e.g. those easily fatigued.

**3.47** Wheelchair platform stairlifts are operated by continuous pressure controls, commonly a joystick. However, another means of continuous pressure control may need to be considered to accommodate users with varying degrees of manual dexterity.

**3.48** Wheelchair platform stairlifts are only suitable where users can be instructed in their safe use and where management supervision can be ensured.

### **Provisions**

**3.49** Wheelchair platform stairlifts will satisfy Requirement M1 or M2 if

- a. they conform to the requirements of the Supply of Machinery (Safety) Regulations 1992, SI 1992/3073 (**Note:** These regulations may be met by compliance, among other things, with the relevant British Standards, EN81 series of standards or where necessary Notified Body approval);
- b. in a building with a single stairway, the required clear width of the flight of stairs and landings for means of escape is maintained when the wheelchair platform is in the parked position (see also Approved Document B);
- c. the rated speed of the platform does not exceed 0.15m/s;
- d. continuous pressure controls are provided;
- e. the minimum clear dimensions of the platform are 800mm wide and 1250mm deep;
- f. they are fitted with clear instructions for use;
- g. access with an effective clear width of at least 800mm is provided;
- h. controls are designed to prevent unauthorised use.

## Internal stairs

### Design considerations

**3.50** With the exception of the need for hazard warning surfaces on landings, other design considerations for internal stairs are as those for 'Stepped access' (see 1.29 to 1.32). It is not reasonable to require a hazard warning surface at the head of internal stairs since there is no recognised warning surface for use internally which can be guaranteed not to constitute a trip hazard when used alongside flooring surfaces with different frictional resistance characteristics. However, designers should be aware of the potential risk of having a stair directly in line with an access route. For mobility-impaired people, a going of at least 300mm is preferred.

### Provisions

**3.51** Internal stairs will satisfy Requirement M1 or M2 if they comply with Approved Document K, section 1.

**Note:** Diagram 12 has been moved to Approved Document K, Section 1, all other numbering remains the same.

## Internal ramps

### Design considerations

**3.52** With the exception of issues relating specifically to the external environment, the design considerations for internal ramps are as those for 'Ramped access' (see 1.19 to 1.25). It is worth reiterating that ramps are not necessarily safe and convenient for ambulant disabled people. For example, some people who can walk but have restricted mobility find it more difficult to negotiate a ramp than a stair. Unless, therefore, a ramp is short, has a shallow gradient and the rise is no more than the minimum that can be provided by two risers, steps should be provided as well as a ramp.

### Provisions

**3.53** Internal ramps will satisfy Requirement M1 or M2 if they comply with Approved Document K, section 2.

## Handrails to internal steps, stairs and ramps

### Design considerations

**3.54** The design considerations for handrails are as those for 'Handrails to external stepped and ramped access' in 1.34 to 1.36.

### Provisions

**3.55** Handrails to internal steps, stairs and ramps will satisfy Requirement M1 or M2 if they comply with Approved Document K, sections 1–3.

## Section 4: Facilities in buildings other than dwellings

### OBJECTIVES

**4.1** The aim is for all people to have access to, and the use of, all the facilities provided within buildings. They should also be able to participate in the proceedings at lecture/conference facilities and at entertainment or leisure and social venues, not only as spectators, but also as participants and/or staff.

**4.2** Where permanent or removable seating is provided as part of the design, allowance should be made for disabled people to have a choice of seating location at spectator events. It should also be possible for them to have a clear view of the activity taking place while not obstructing the view of others.

**4.3** In refreshment facilities, bars and counters (or sections of them) should be at a level suitable for wheelchair users. All floor areas, even when located at different levels, should be accessible.

**4.4** A proportion of the sleeping accommodation in hotels, motels and student accommodation should be designed for independent use by wheelchair users. The remainder should include facilities that make them suitable for people who do not use a wheelchair, but may have mobility, sensory, dexterity or learning difficulties.

### Audience and spectator facilities

#### Design considerations

**4.5** Audience and spectator facilities fall primarily into three categories:

- a. lecture/conference facilities
- b. entertainment facilities (e.g. theatres/cinemas)
- c. sports facilities (e.g. stadia).

**Note:** The guidance here relates mainly to seating. For guidance on reception and sales counters, refer to 3.2 to 3.5.

#### *Audience facilities generally*

**4.6** Wheelchair users and those with mobility or sensory impairment may need to view or listen from a particular side, or sit in the front for lip reading or to read sign interpreters. They should be provided with spaces into which they can manoeuvre easily, and which offer them a clear view of an event, while ensuring they are not segregated into special areas. Wheelchair users, people who have difficulty in using seats with fixed arms and those with assistance dogs should also have the choice of sitting next to a conventionally seated person or a companion wheelchair user. Consideration should be given to providing an area next to certain seats for an assistance dog to rest. By having some removable seating at the front and back of blocks of seats (possibly in complete rows), greater flexibility in location can be achieved and a greater number of wheelchair users than the minimum provision shown in Table 3 can be accommodated.

**4.7** Greater spacing between rows of seats at the rear of a block of seating, or at the end of rows, may provide extra legroom for people of large stature. With several seats removed, these locations may also be suitable for wheelchair users. It is desirable for seating to contrast visually with the surroundings.

**4.8** All users of facilities should be able to locate suitable seating and move safely and easily to and from the seating area and ancillary accommodation, such as lavatories, dining rooms and bedroom suites.

#### *Lecture/conference facilities*

**4.9** People with hearing impairments should be able to participate fully in conferences, committee meetings and study groups. All people should be able to use presentation facilities. Consideration should be given to good sight lines and the design and location of lecture equipment (demonstration table, lectern, projection

screen) to ensure that patterned walls, poor interior lighting or very bright natural back-lighting does not have a detrimental effect on the ability of people to receive information from a sign language interpreter or a lip speaker (see 4.32 to 4.34).

#### *Entertainment, leisure and social facilities*

**4.10** In facilities for entertainment, e.g. theatres and cinemas, it is normal for seating to be more closely packed than in other types of auditoria. Care is needed in the design and location of wheelchair spaces so that all visitors can enjoy the atmosphere. Reference should also be made to Technical standard for places of entertainment.

#### *Sports facilities*

**4.11** For guidance on integrating the needs of disabled people into the design of spectator facilities, in particular the provision of, and access to, suitable spaces for wheelchair users in stadia, see Guide to safety at sports grounds, Accessible stadia: a good practice guide to the design of facilities to meet the needs of disabled spectators and other users and accessible sports facilities.

### Provisions

**4.12** Audience and spectator facilities will satisfy Requirement M1 if:

#### *For audience seating generally*

- the route to wheelchair spaces is accessible by wheelchair users;
- stepped access routes to audience seating are provided with fixed handrails (see 1.34 to 1.37 for details of handrails);
- the minimum number of permanent and removable spaces provided for wheelchair users is in accordance with Table 3;

**Table 3 Provision of wheelchair space in audience seating**

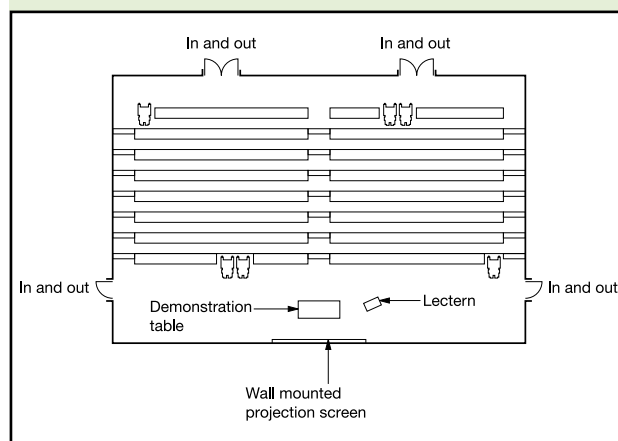
Seating capacity	Minimum provision of spaces for wheelchairs	
	Permanent	Removable
Up to 600	1 % of total seating capacity (rounded up)	Remainder to make a total of 6
Over 600 but less than 10,000	1 % of total seating capacity (rounded up)	Additional provision, if desired

**Note:**

For seating capacities of 10,000 or more, guidance is given in 'Accessible stadia: a good practice guide to the design of facilities to meet the needs of disabled spectators and other users'.

- some wheelchair spaces (whether permanent or created by removing seats) are provided in pairs, with standard seating on at least one side (see Diagram 13);

**Diagram 13 An example of wheelchair spaces in a lecture theatre**



- where more than two wheelchair spaces are provided, they are located to give a range of views of the event at each side, as well as at the front and back of the seating area;
- the minimum clear space provided for access to wheelchair spaces is 900mm;
- the clear space allowance for an occupied wheelchair in a parked position is 900mm wide by 1400mm deep;
- the floor of each wheelchair space is horizontal;

- i. some seats are located so that an assistance dog can accompany its owner and rest in front of, or under, the seat;
- j. standard seats at the ends of rows and next to wheelchair spaces have detachable, or lift-up, arms;

### *For seating on a stepped terraced floor*

- k. wheelchair spaces at the back of a stepped terraced floor are provided in accordance with Diagram 14 or 15, the arrangement in Diagram 15 being particularly suitable for entertainment buildings, such as theatres or cinemas, subject to the approval of the licensing authority;

### *For lecture/conference facilities*

- l. where a podium or stage is provided, wheelchair users have access to it by means of a ramp or lifting platform;
- m. a hearing enhancement system in accordance with 4.36 is provided for people with impaired hearing.

## **Provisions**

**4.16** Refreshment facilities will satisfy Requirement M1 if:

- a. all users have access to all parts of the facility;
- b. part of the working surface of a bar or serving counter is permanently accessible to wheelchair users, and at a level of not more than 850mm above the floor and, where necessary, part at a higher level for people standing;
- c. the worktop of a shared refreshment facility (e.g. for tea making) is at 850mm above the floor with a clear space beneath at least 700mm above the floor (see Diagram 16) and the delivery of water complies with 5.4(a) and (b);
- d. a wheelchair-accessible threshold (see 2.7(e)) is located at the transition between an external seating area and the interior of the facility.

## **Refreshment facilities**

### **Design considerations**

**4.13** Refreshment facilities, such as restaurants and bars, should be designed so that they can be reached and used by all people independently or with companions. Staff areas should also be accessible.

**4.14** All public areas, including lavatory accommodation, public telephones and external terraces should be accessible. Where premises contain self-service and waiter service, all patrons should have access to both.

**4.15** In many refreshment facilities, changes in level are used to differentiate between different functions or to create a certain atmosphere through interior design. Changes of floor level are acceptable provided the different levels are accessible.

Diagram 14 Possible location of wheelchair spaces in front of a rear aisle

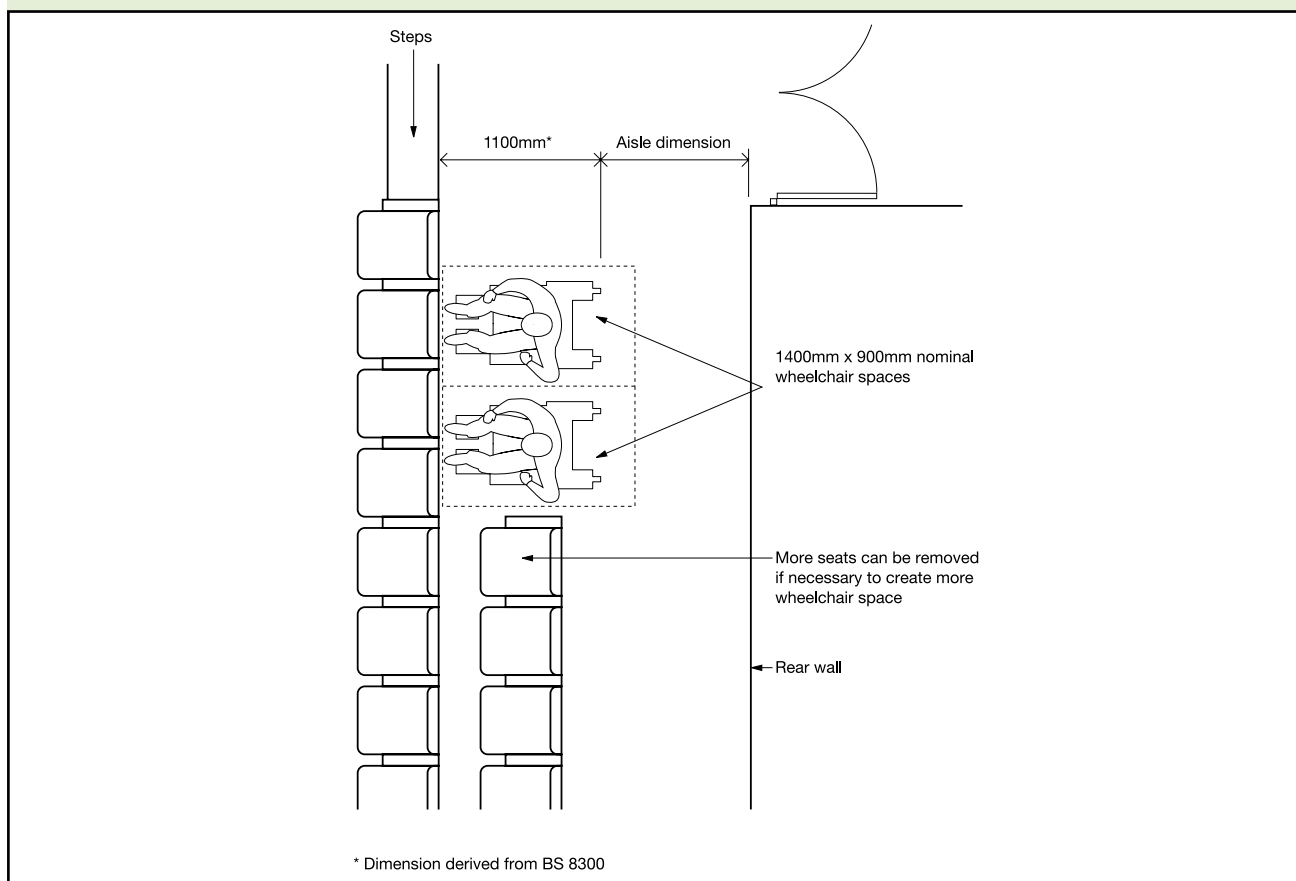
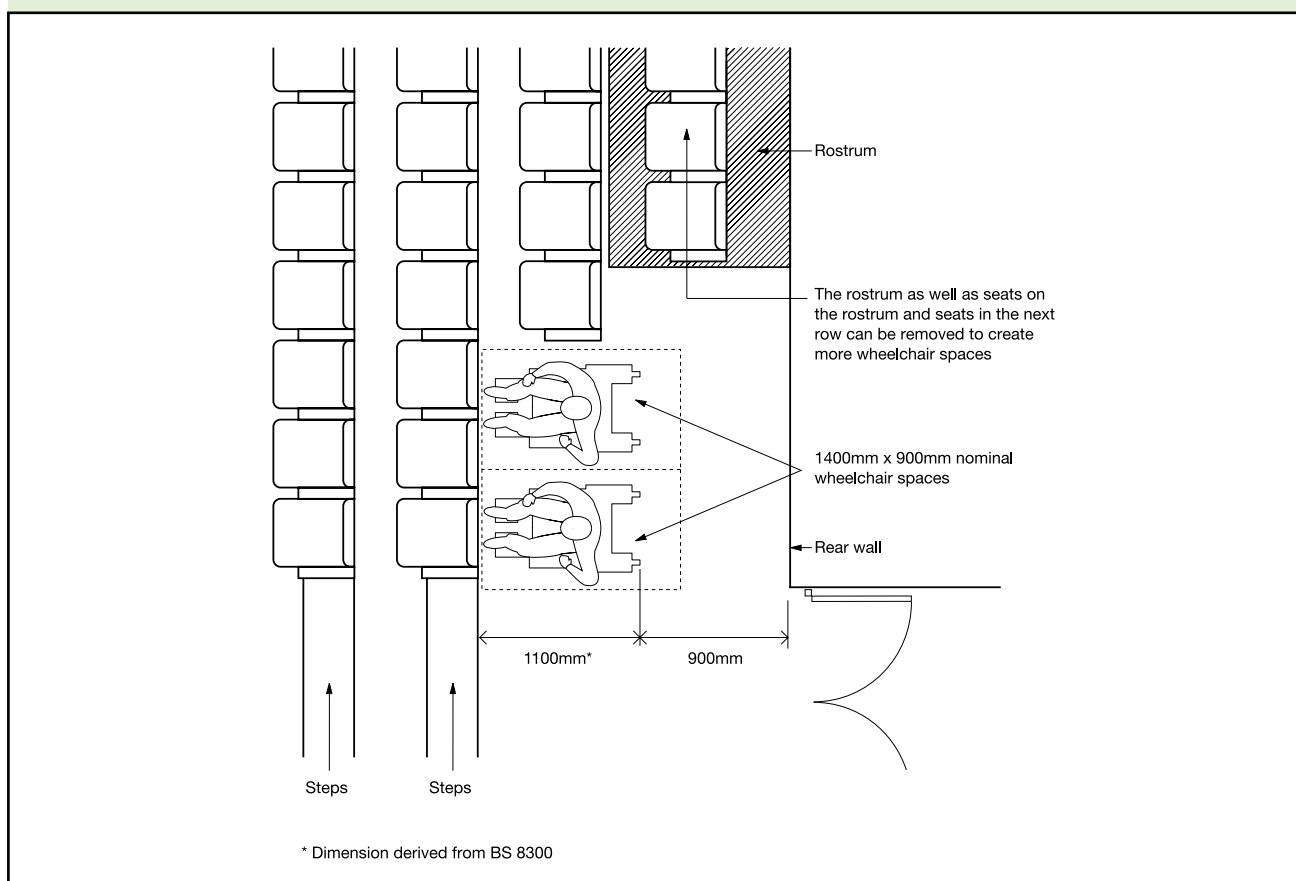
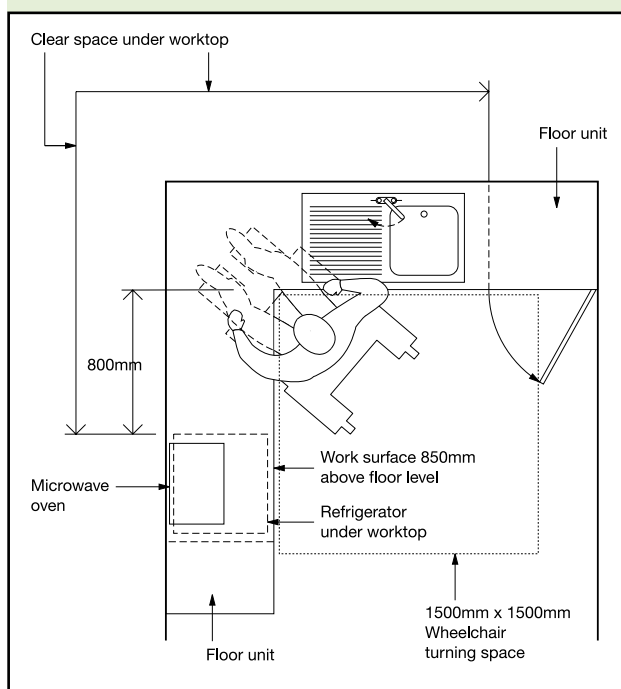


Diagram 15 An example of wheelchair space provision in a cinema or theatre



**Diagram 16 An example of a shared refreshment facility**



## Sleeping accommodation

### Design considerations

**4.17** Sleeping accommodation, where provided for a significant number of people, e.g. in hotels, motels and student accommodation, should aim to be convenient for all. People who use wheelchairs are likely to require greater provision of space and access to en-suite sanitary accommodation. A proportion of rooms will, therefore, need to accommodate wheelchair users. In student accommodation, it is beneficial to have a wheelchair-accessible toilet available for use by disabled visitors.

**4.18** Wheelchair users should be able to reach all the facilities available within the building. In general, accessible bedrooms should be no less advantageously situated than other bedrooms. It would be beneficial if entrance doors to wheelchair-accessible bedrooms were powered opening, as this could avoid the need for the 300mm access space adjacent to the leading edge of the door.

**4.19** Wheelchair-accessible bedrooms should be sufficiently spacious to enable a wheelchair user to transfer to one side of a bed, with or without assistance. Wheelchair users should be able to manoeuvre around and use the facilities in the room, and operate switches and controls. They should also be able to gain access to and conveniently use sanitary accommodation and, where provided, balconies. En-suite sanitary facilities are the preferred option for wheelchair-accessible bedrooms. Unless there are compelling reasons for not doing so, there should be at least as many en-suite shower rooms as en-suite bathrooms, as mobility-impaired people may find it easier to use a shower than a bath. An en-suite shower room or bathroom would benefit from having a finger rinse basin adjacent to the WC, as well as a wash basin or basin in a vanity unit.

**4.20** It is also important to ensure that, in all bedrooms, built-in wardrobes and shelving are accessible and convenient to use. It is an advantage if curtains and blinds are provided with automatic or other remotely controlled opening devices such as rods or pull cords.

**4.21** Wheelchair users should also be able to visit companions in other bedrooms, for example when attending conferences or when on holiday with their families. In these instances, bedrooms not designed for independent use by a person in a wheelchair need to have the outer door wide enough to be accessible to a wheelchair user.

**4.22** For a proportion of wheelchair-accessible bedrooms, it would be useful to provide a connecting door to an adjacent bedroom for a companion.

**4.23** For people with limited manual dexterity, electronic card-activated locks for bedroom entrance doors and lever taps in sanitary accommodation can be an advantage.

**Provisions**

**4.24** Sleeping accommodation will satisfy Requirement M1 if:

*For all bedrooms*

- a. the effective clear width of the door from the access corridor complies with Table 2;
- b. swing doors, where provided for built-in wardrobes and other storage systems, open through 180°;
- c. handles on hinged and sliding doors are easy to grip and operate and contrast visually with the surface of the door;
- d. openable windows and window controls are located between 800 and 1000mm above the floor and are easy to operate without using both hands simultaneously;
- e. all bedrooms have a visual fire alarm signal, in addition to the requirements of Part B;
- f. any room numbers are indicated in embossed characters;

*For wheelchair-accessible bedrooms*

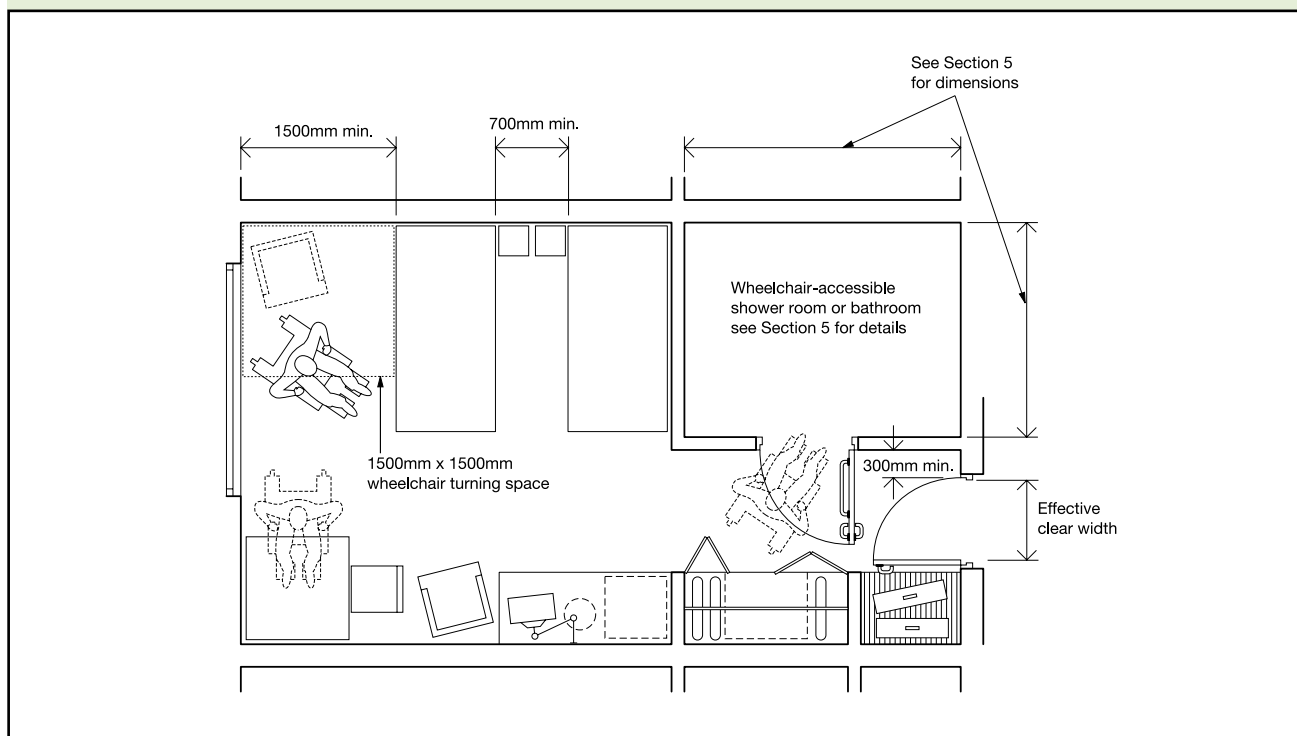
- g. at least one wheelchair-accessible bedroom is provided for every 20 bedrooms, or part thereof;
- h. wheelchair-accessible bedrooms are located on accessible routes that lead to all other available facilities within the building;
- i. wheelchair-accessible bedrooms are designed to provide a choice of location and have a standard of amenity equivalent to that of other bedrooms;
- j. the door from the access corridor to a wheelchair-accessible bedroom complies with the relevant provisions of 'Internal doors' (see 3.10), in particular the maximum permissible opening force, Table 2 and the need for a clear space of 300mm from the leading edge of the door to the side wall;
- k. the effective clear width of any door to an en-suite bathroom or shower room within the wheelchair-accessible bedroom complies with Table 2;

- l. the size of wheelchair-accessible bedrooms allows for a wheelchair user to manoeuvre at the side of a bed, then transfer independently to it. An example of a wheelchair-accessible bedroom layout is shown in Diagram 17;
- m. sanitary facilities, en-suite to a wheelchair-accessible bedroom, comply with the provisions of 5.15 to 5.21 for 'Wheelchair-accessible bathrooms' or 'Wheelchair-accessible shower facilities';
- n. wide angle viewers, where provided in the entrance door to a wheelchair-accessible bedroom, are located at 1050mm and 1500mm above floor level, to enable viewing by people who are seated or standing;
- o. a balcony, where provided to a wheelchair-accessible bedroom, has a door whose effective clear width complies with Table 2, has a level threshold and has no horizontal transoms between 900mm and 1200mm above the floor;
- p. there are no permanent obstructions in a zone 1500mm back from any balcony doors;
- q. an emergency assistance alarm (together with a reset button) is located in a wheelchair-accessible bedroom and activated by a pull cord, sited so that it can be operated both from the bed and from an adjacent floor area;
- r. an emergency assistance call signal outside an accessible bedroom is located so that it can be easily seen and heard by those able to give assistance and, in any case, at a central control point.

**Switches, outlets and controls****Design considerations**

**4.25** The key factors that affect the use of switches, outlets and controls are ease of operation, visibility, height and freedom from obstruction. However, there will be exceptions to height requirements for some outlets, e.g. those set into the floor in open plan offices.

Diagram 17 **One example of a wheelchair-accessible hotel bedroom with en-suite sanitary facilities**



**4.26** A consistent relationship with doorways and corners will further reinforce the ease with which people manipulate switches and controls.

**4.27** All users should be able to locate a control, know which setting it is on and use it without inadvertently changing its setting.

**4.28** Controls that contrast visually with their surroundings are more convenient for visually impaired people, as are light switches that are activated by a large push pad. The colours red and green should not be used in combination as indicators of 'on' and 'off' for switches and controls. It may be useful to use text or a pictogram to clarify the purpose and status of multiple switches and controls.

**4.29** It is also an advantage if individual switches on panels and on multiple socket outlets are well separated, or in the form of large touch plates, to avoid the inadvertent selection of an adjacent control by visually impaired people and people with limited dexterity.

## Provisions

**4.30** Switches, outlets and controls will satisfy Requirement M1 if:

- wall-mounted socket outlets, telephone points and TV sockets are located between 400mm and 1000mm above the floor, with a preference for the lower end of the range;
- switches for permanently wired appliances are located between 400mm and 1200mm above the floor, unless needed at a higher level for particular appliances;
- all switches and controls that require precise hand movements are located between 750mm and 1200mm above the floor;
- simple push button controls that require limited dexterity are not more than 1200mm above the floor;

- e. pull cords for emergency alarm systems are coloured red, located as close to a wall as possible and have two red 50mm diameter bangles, one set at 100mm and the other set between 800mm and 1000mm above the floor;
- f. controls that need close vision are located between 1200mm and 1400mm above the floor so that readings may be taken by a person sitting or standing (with thermostats at the top of the range);
- g. socket outlets are located consistently in relation to doorways and room corners, but in any case no nearer than 350mm from room corners;
- h. light switches for use by the general public have large push pads and align horizontally with door handles within the range 900 to 1100mm, for ease of location when entering a room;
- i. where switches described in 4.30(h) cannot be provided, lighting pull cords are set between 900mm and 1100mm above floor level, and fitted with a 50mm diameter bangle visually contrasting with its background and distinguishable visually from any emergency assistance pull cord;
- j. the operation of switches, outlets and controls does not require the simultaneous use of both hands, except where this mode of operation is necessary for safety reasons;
- k. switched socket outlets indicate whether they are 'on';
- l. mains and circuit isolator switches clearly indicate that they are on or off;
- m. front plates contrast visually with their backgrounds.

## Aids to communication

### Design considerations

**4.31** People will benefit most if there is an integrated system for wayfinding, public address and hearing enhancement.

**4.32** The appropriate choice of floor, wall and ceiling surface materials and finishes can help visually impaired people appreciate

the boundaries of rooms or spaces, identify access routes and receive information. For example, glare and reflections from shiny surfaces, and large repeating patterns, should be avoided in spaces where visual acuity is critical as they will hamper communication for people with impaired vision, and those who lip read or use sign language. This would apply to locations such as reception areas with enquiry desks and speakers' rostrums in lecture halls.

**4.33** The type and quality of public address, hearing enhancement and telephone systems should be chosen carefully to ensure intelligibility. The design of the acoustic environment should also ensure that audible information can be heard clearly.

**4.34** Artificial lighting should be designed to give good colour rendering of all surfaces, without creating glare or pools of bright light and strong shadows. Where appropriate, lighting should illuminate the face of a person speaking, to make lip reading easier where one-to-one communication is necessary. Uplighters mounted at low or floor level can disorientate some visually impaired people and should be avoided.

**4.35** In order to obtain the full benefit of attending public performances or taking part in discussions, a person with impaired hearing needs to receive a signal that is amplified in both volume and signal to noise ratio. The three systems commonly used to provide this enhanced level of sound are induction loop, infrared and radio. Sound field systems are also increasingly being used, particularly in educational establishments. In larger spaces, provision needs to be made for a permanent system, but in small meeting rooms, a portable induction loop would be acceptable. It should be recognised that there is the danger where adjacent spaces each have an induction loop system that the signals may overlap.

**Note:** Detailed guidance on surface finishes, visual, audible and tactile signs, as well as the characteristics and appropriate choice and use of hearing enhancement systems, is available in BS 8300.

### **Provisions**

**4.36** Aids to communication will satisfy Requirement M1 if:

- a. a clearly audible public address system is supplemented by visual information;
- b. provision for a hearing enhancement system is installed in rooms and spaces designed for meetings, lectures, classes, performances, spectator sport or films, and at service or reception counters when they are situated in noisy areas or they are behind glazed screens;
- c. the presence of an induction loop or infrared hearing enhancement system is indicated by the standard symbol;
- d. telephones suitable for hearing aid users are clearly indicated by the standard ear and 'T' symbol and incorporate an inductive coupler and volume control;
- e. text telephones for deaf and hard of hearing people are clearly indicated by the standard symbol;
- f. artificial lighting is designed to be compatible with other electronic and radio frequency installations.

# Section 5: Sanitary accommodation in buildings other than dwellings

## OBJECTIVES

**5.1** In principle, suitable sanitary accommodation should be available to everybody, including sanitary accommodation designed for wheelchair users, ambulant disabled people, people of either sex with babies and small children or people encumbered by luggage.

**5.2** In multi-storey buildings, the consistent location of toilets on each floor can help people with learning difficulties to locate these facilities easily.

## Sanitary accommodation generally

### Design considerations

**5.3** A number of issues need to be considered in connection with all forms of sanitary accommodation. These relate to the needs of people with visual or hearing impairments, people with learning difficulties and people whose lack of tactile sensitivity can cause them to be injured by touching hot surfaces. Taps and WC cubicle doors should be operable by people with limited strength or manual dexterity and doors to cubicles should be capable of being opened if a person has collapsed against them while inside the cubicle. Preferably, all doors to WC cubicles and wheelchair-accessible unisex toilets open out or, if they open in, the door swing should not encroach into the wheelchair turning space or minimum activity space. Where possible, light switches with large push pads should be used in preference to pull cords (see 4.28).

### Provisions

**5.4** Sanitary accommodation will satisfy Requirement M1 or M3 if:

- a. any bath or washbasin tap is either controlled automatically, or is capable of being operated using a closed fist, e.g. by lever action;
- b. terminal fittings comply with Guidance Note G18.5 of the Guidance Document relating to Schedule 2: Requirements

for Water Fittings, of the Water Supply (Water Fittings) Regulations 1999, SI 1999/1148;

- c. door handles and other ironmongery comply with provisions 3.10 (d) and (e) of 'Internal doors';
- d. WC compartment doors, and doors to wheelchair-accessible unisex toilets, changing rooms or shower rooms are fitted with light action privacy bolts so that they can be operated by people with limited dexterity and, if required to self-close, can be opened using a force at the leading edge of not more than 30N from 0° (the door in the closed position) to 30° open, and not more than 22.5N from 30° to 60° of the opening cycle;
- e. WC compartment doors, and doors to wheelchair-accessible unisex toilets, changing rooms or shower rooms have an emergency release mechanism so that they are capable of being opened outwards, from the outside, in case of emergency;
- f. doors, when open, do not obstruct emergency escape routes;
- g. any fire alarm emits a visual and audible signal to warn occupants with hearing or visual impairments;
- h. any emergency assistance alarm system has:
  - i. visual and audible indicators to confirm that an emergency call has been received;
  - ii. a reset control reachable from a wheelchair and the WC, or from the wheelchair and the shower/ changing seat;
  - iii. a signal that is distinguishable visually and audibly from the fire alarm.
- l. any lighting controls comply with the provisions for 'Switches and controls', see 4.30;

- j. any heat emitters are either screened or have their exposed surfaces kept at a temperature below 43°C;
- k. the surface finish of sanitary fittings and grab bars contrasts visually with background wall and floor finishes, and there is also visual contrast between wall and floor finishes.

## **Provision of toilet accommodation**

### **Design considerations**

**5.5** Toilet accommodation needs to be suitable, not only for disabled people, but for all people who use the building. For disabled people, suitable toilet accommodation may take the form of a specially designed cubicle in separate-sex toilet washrooms, or a self-contained unisex toilet. For wheelchair users in particular, a self-contained unisex toilet is always the preferred option since, if necessary, a partner or carer of a different sex can enter to give assistance. Wheelchair-accessible unisex toilets should always be provided in addition to any wheelchair-accessible accommodation in separate-sex toilet washrooms. Wheelchair-accessible unisex toilets should not be used for baby changing.

**5.6** The provision of an enlarged cubicle in a separate-sex toilet washroom can be of benefit to ambulant disabled people, as well as parents with children and people (e.g. those with luggage) who need an enlarged space. In large building developments, separate facilities for baby changing and an enlarged unisex toilet incorporating an adult changing table are desirable. Changing places toilets, facilities designed for individuals with complex and multiple impairments who may require the assistance of up to two assistants, should be provided in addition to any wheelchair-accessible accommodation in separate-sex toilet washrooms, wheelchair-accessible unisex toileting facilities and baby changing facilities. Further guidance on layout and equipment is available from the Changing Places Consortium campaign website ([www.changing-places.org](http://www.changing-places.org)) and by reference to guidance in section 18.6,

diagram 48 and Annexes F and G of BS 8300-2:2018.

**Note:** For specific guidance on the provision of sanitary accommodation in sports buildings, refer to 'accessible sports facilities'.

### **Provisions**

**5.7** The provision of toilet accommodation will satisfy Requirement M1 or M3 if:

- a. where there is space for only one toilet in a building, it is of a wheelchair-accessible unisex type, but of greater width to accommodate a standing height wash basin;
- b. at least one wheelchair-accessible unisex toilet is provided at each location in a building where sanitary facilities are provided for use by customers and visitors to a building, or by people working in the building;
- c. at least one WC cubicle is provided in separate-sex toilet accommodation for use by ambulant disabled people;
- d. where there are four or more WC cubicles in separate-sex toilet accommodation, one of these is an enlarged cubicle for use by people who need extra space, in addition to any provision under 5.7(c);
- e. at least one changing places toilet is provided in the following types of building:
  - i. assembly, recreation and entertainment buildings (see note) with a capacity for 350 or more people; or a collection of smaller buildings associated with a site used for assembly, recreation or entertainment, such as zoos, theme parks and venues for sport and exhibitions, with a capacity of 2000 people or more;
  - ii. shopping centres/malls or retail parks with a gross floor area of 30,000m<sup>2</sup> or more;
  - iii. retail premises with a gross floor area of 2500m<sup>2</sup> or more;

- iv. sport and leisure buildings with a gross floor area more than 5000m<sup>2</sup>;
- v. hospitals and primary care centres;
- vi. crematoria and cemetery buildings.

**Note:** Places of assembly, recreation and entertainment can be defined as buildings such as:

- amusement arcades;
- art galleries;
- cinemas;
- concert halls;
- conference centres;
- further education colleges;
- hotels that provide function, sport or leisure facilities;
- libraries open to the public;
- motorway service areas;
- museums;
- places of worship;
- theatres;
- university buildings open to the public;

or any other buildings or sites as defined by these thresholds, which are open to the public and used for the purpose of assembly, recreation or entertainment. Capacities should be derived from the combined total of a building's publicly accessible facilities. Alternatively, the capacity number may be taken as the number of fixed seats provided, if the occupants of the building will normally be seated. Approved Document B, Volume 2 provides a method for estimating the capacity of a building where this is not known.

The Department for Education will publish separate guidance regarding changing places toilets in schools providing community facilities in 2021.

## Wheelchair-accessible unisex toilets

### Design considerations

**5.8** Wheelchair users should be able to approach, transfer to and use the sanitary facilities provided within a building. This requires the provision of a wheelchair-accessible unisex toilet. The relationship of the WC to the finger rinse basin and other accessories should allow a person to wash and dry hands while seated on the WC. The space provided for manoeuvring should enable wheelchair users to adopt various transfer techniques that allow independent or assisted use. It is important that the transfer space alongside the WC is kept clear to the back wall. When transferring to and from their wheelchair, some people need horizontal support rails. The rail on the open side is a drop-down rail, but on the wall side, it can be a wall-mounted grab rail (which is thought to give a more rigid handhold) set at a greater distance than normal from the wall or, alternatively, a second drop-down rail in addition to the wall-mounted grab rail where the grab rail is spaced at the minimum distance from the wall and therefore does not give the same degree of support.

**5.9** A unisex toilet is approached separately from other sanitary accommodation. It is more easily identified than a wheelchair-accessible cubicle in a separate-sex toilet washroom and, provided it is used only by disabled people, it is more likely to be available when required. This is particularly important as some disabled people need to use a toilet more frequently than other users. The time needed to reach a wheelchair-accessible toilet should therefore be kept to a minimum when considering the location of unisex toilet accommodation. In addition, a unisex toilet enables one or two assistants of either sex to assist a disabled person. Consideration should be given to installing a chemical sanitary waste disposal unit in wheelchair-accessible WC accommodation. Some wheelchair users find it difficult to use a standard height WC seat and, for them, it is important that the

WC pan can accept a variable height toilet seat riser. WC pans manufactured to the key dimensions given in BS EN 997:2012 WC pans and WC suites with integral trap would be acceptable.

**Note:** More detailed guidance on the various techniques used to transfer from a wheelchair to a WC, as well as appropriate sanitary and other fittings, is given in BS 8300.

## Provisions

**5.10** Wheelchair-accessible unisex toilets will satisfy Requirement M1 or M3 if:

- a. one is located as close as possible to the entrance and/or waiting area of the building;
- b. they are not located in a way that compromises the privacy of users;
- c. they are located in a similar position on each floor of a multi-storey building, and allow for right- and left-hand transfer on alternate floors;
- d. when more than one unisex toilet is available in other than multi-storey buildings, a choice of layouts suitable for left-hand and right-hand transfer is provided;
- e. when it is the only toilet facility in the building, the width is increased from 1.5m to 2m and it includes a standing height washbasin, in addition to the finger rinse basin associated with the WC;
- f. they are located on accessible routes that are direct and obstruction free;
- g. doors are preferably outward opening and are fitted with a horizontal closing bar fixed to the inside face;
- h. any wheelchair user does not have to travel:
  - i. more than 40m on the same floor, unless a greater distance can be agreed with the building control body on the grounds that the circulation route is unobstructed, e.g. by the installation of doors with hold-open devices;
  - ii. more than a 40m combined horizontal distance where the unisex toilet accommodation is on another floor of the building, but is accessible by passenger lift (if a lifting platform is installed, vertical travel to a unisex toilet is limited to one storey);
- i. the minimum overall dimensions of, and the arrangement of fittings within, a wheelchair-accessible unisex toilet comply with Diagram 18;
- j. where the horizontal support rail on the wall adjacent to the WC is set with the minimum spacing from the wall, an additional drop-down rail is provided on the wall side at a distance of 320mm from the centre line of the WC;
- k. where the horizontal support rail on the wall adjacent to the WC is set so that its centre line is 400mm from the centre line of the WC, there is no additional drop-down rail;
- l. the heights and arrangement of fittings in a wheelchair-accessible unisex toilet comply with Diagram 19 and, as appropriate, Diagram 20;
- m. an emergency assistance alarm system is provided, complying with 5.4;
- n. the emergency assistance call signal outside the toilet compartment is located so that it can be easily seen and heard by those able to give assistance;
- o. an emergency assistance pull cord is easily identifiable (see 4.30(e)) and reachable from the WC and from the floor close to the WC;
- p. any heat emitters are located so that they do not restrict the minimum clear wheelchair manoeuvring space, nor the space beside the WC used for transfer from the wheelchair to the WC;
- q. WC pans conform to BS EN 997:2012 in terms of key dimensions in order to accommodate the use of a variable height toilet seat riser (see 5.9);
- r. cisterns for WCs that will be used by wheelchair users have their flushing mechanism positioned on the open or transfer side of the space, irrespective of handing.

Diagram 18 **Unisex wheelchair-accessible toilet with corner WC**

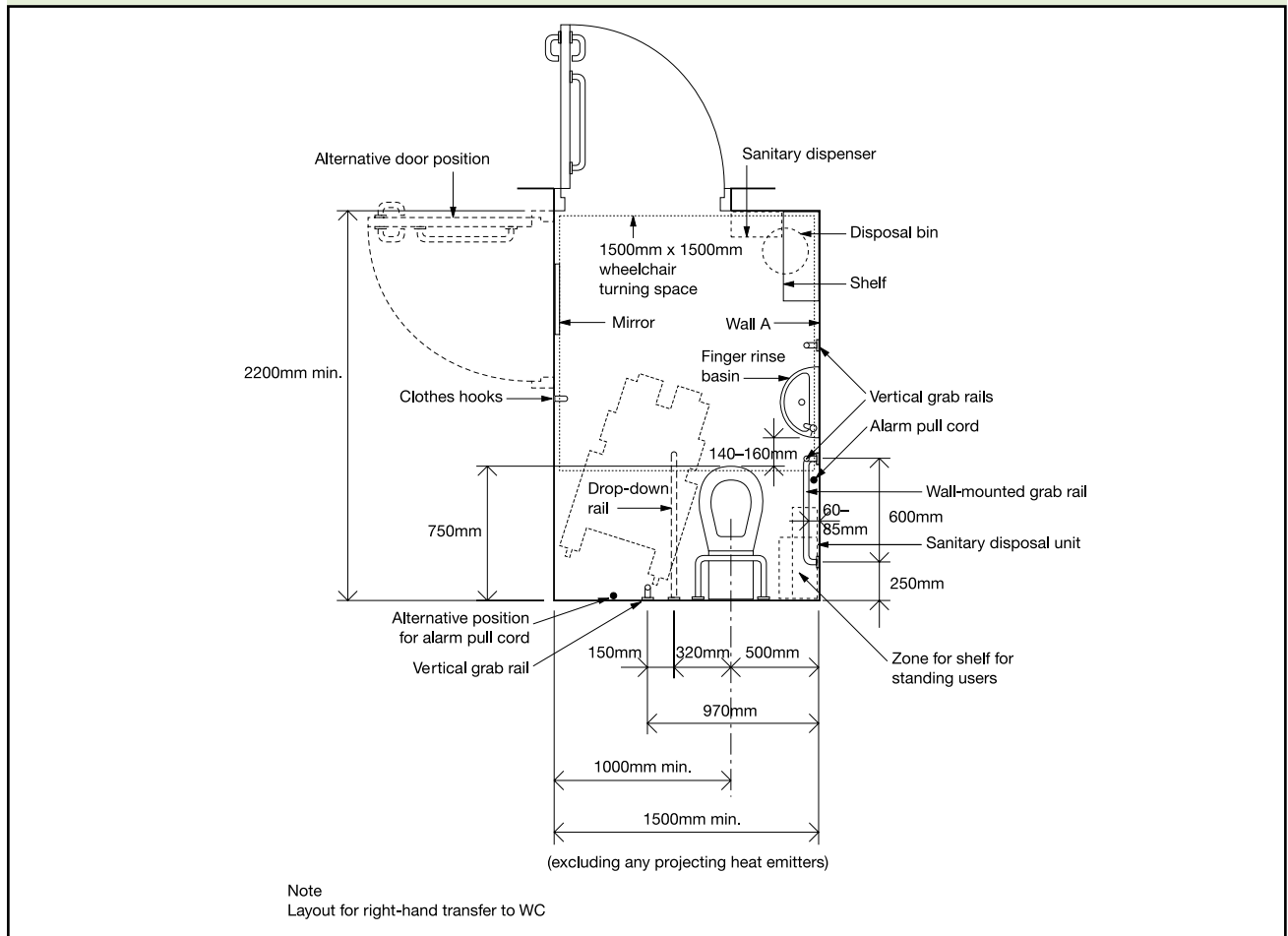
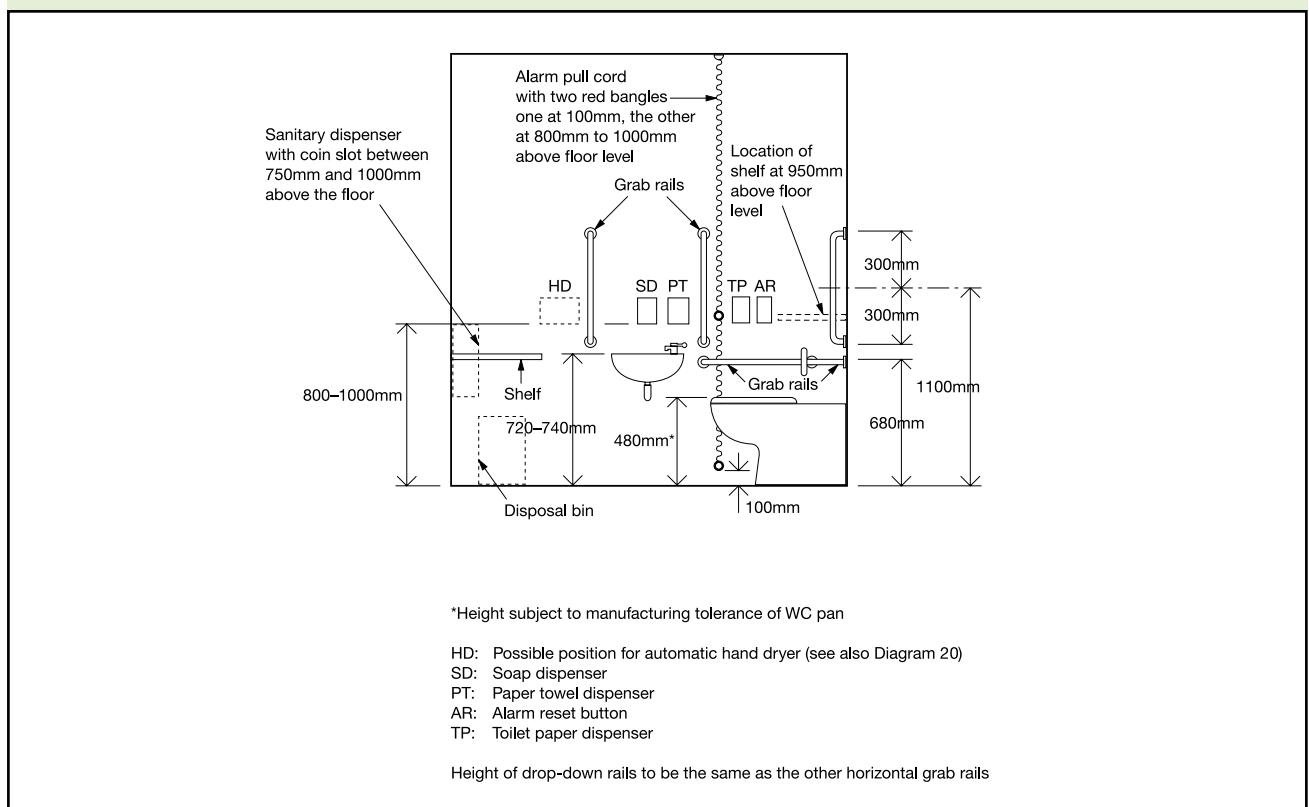
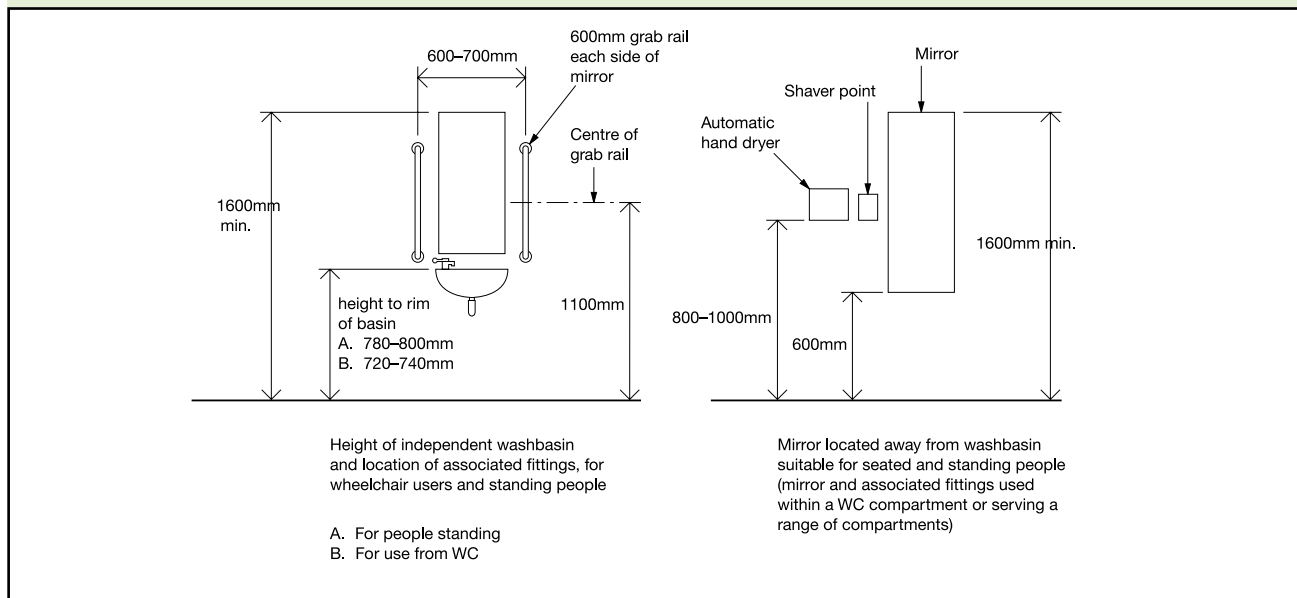


Diagram 19 **Heights and arrangement of fittings in a unisex wheelchair-accessible toilet (looking towards wall A in diagram 18)**



**Diagram 20 Height of various fittings in toilet accommodation**



## Toilets in separate-sex washrooms

### Design considerations

**5.11** Ambulant disabled people should have the opportunity to use a WC compartment within any separate-sex toilet washroom. The compartment should be fitted with support rails, and include a minimum activity space to accommodate people who use crutches, or otherwise have impaired leg movements. The presence of this facility helps avoid unnecessary travel to unisex toilet accommodation. Some ambulant disabled people find it difficult to use a standard height WC seat and, for them, it is important that the WC pan can accept a variable height toilet seat riser.

**5.12** Separate-sex toilet washrooms above a certain size should also include an enlarged WC cubicle for use by people who need extra space, e.g. parents with children and babies, people carrying luggage and also ambulant disabled people. Consideration should be given to installing a fold-down table, e.g. for baby changing. Standard WC compartments should also have a minimum manoeuvring space clear of any door swing.

**5.13** Where a separate-sex toilet washroom can be accessed by wheelchair users, it should be possible for them to use both a urinal, where appropriate, and a washbasin

at a lower height than is provided for other users. The relative numbers of urinals for men and WC compartments for women has been the subject of recent research. In general, the findings indicate that there should be at least the same number of WCs (for women) as urinals (for men) and for some building types, e.g. large retail buildings, at least twice as many. Consideration should be given to providing a low level urinal for children in male washrooms.

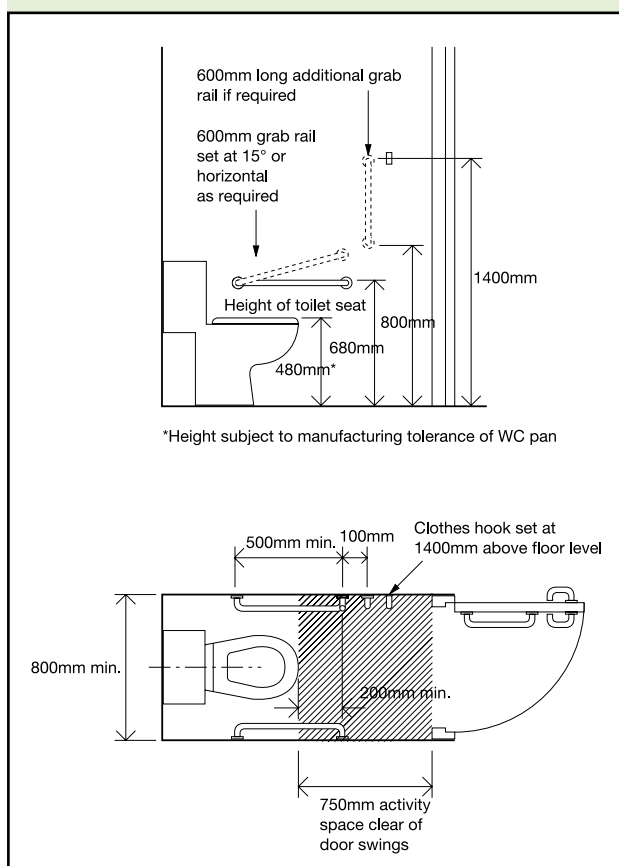
**Note:** More detailed guidance on appropriate sanitary and other fittings is given in BS 8300.

### Provisions

**5.14** WC compartments within separate-sex toilet washrooms will satisfy Requirement M1 or M3 if:

- the swing of any inward opening doors to standard WC compartments is such that a 450mm diameter manoeuvring space is maintained between the swing of the door, the WC pan and the side wall of the compartment;
- the minimum dimensions of compartments for ambulant disabled people, including the activity space, and the arrangement of grab bars and other fittings within the compartment, comply with Diagram 21;

Diagram 21 **WC cubicle for ambulant disabled people**



- c. doors to compartments for ambulant disabled people are preferably outward opening and are fitted with a horizontal closing bar fixed to the inside face;
- d. an enlarged compartment for those who need extra space (based on the compartment for ambulant disabled people) is 1200mm wide and includes a horizontal grab bar adjacent to the WC, a vertical grab bar on the rear wall and space for a shelf and fold-down changing table;
- e. any compartment for use by ambulant disabled people has a WC pan that conforms to BS EN 997:2012 in terms of key dimensions, in order to accommodate the use of a variable height toilet seat riser (see 5.9 and 5.11);
- f. a wheelchair-accessible compartment (where provided) has the same layout and fittings as the unisex toilet;
- g. any wheelchair-accessible washroom has at least one washbasin with its rim set at 720 to 740mm above the floor

and, for men, at least one urinal with its rim set at 380mm above the floor, with two 600mm long vertical grab bars with their centre lines at 1100mm above the floor, positioned either side of the urinal.

## Wheelchair-accessible changing and shower facilities

### Design considerations

**5.15** A choice of shower layout combined with the correct location of shower controls and fittings will allow disabled people to use the facilities independently or be assisted by others when necessary. For guidance on the provision of en-suite shower facilities associated with hotel bedrooms, see 4.19.

**5.16** In buildings where changing facilities are associated with showering facilities, many disabled people will be content to use changing and shower areas that are open but provided with subdivisions, whereas some will require the privacy and convenience of an individual self-contained cubicle or compartment. The dimensions of the self-contained compartment allow space for a helper. Any combined facility should be divided into distinct 'wet' and 'dry' areas. In open changing and shower areas, it may be difficult to provide a configuration of handrails, controls and seat suitable for all disabled people to use. Individual self-contained accommodation is therefore preferred although, if it contains a WC, it should not be the only wheelchair-accessible toilet accommodation.

**5.17** In the case of individual changing rooms not associated with showering, e.g. in clothes shops, the dimensions and fittings recommended for an individual self-contained changing cubicle in a sports building should be provided. In large building complexes, such as retail parks and large sports centres, there should be one wheelchair-accessible unisex toilet capable of including an adult changing table.

**Note 1:** For sports buildings, details of different types of changing and shower facilities are given in 'accessible sports facilities'.

**Note 2:** More detailed guidance on appropriate sanitary and other fittings is given in BS 8300.

## Provisions

**5.18** Wheelchair-accessible changing and shower facilities will satisfy Requirement M1 or M3 if:

### *For changing and shower facilities*

- a. a choice of layouts suitable for left-hand and right-hand transfer is provided when more than one individual changing compartment or shower compartment is available;
- b. they are provided with wall-mounted drop-down support rails and wall-mounted slip-resistant tip-up seats (not spring loaded);
- c. in communal shower facilities and changing facilities, they are provided with subdivisions that have the same configuration of space and equipment as for self-contained facilities but without doors;
- d. in sports facilities, individual self-contained shower facilities and changing facilities are available in addition to communal separate-sex facilities;
- e. an emergency assistance pull cord, complying with 4.30(e), is easily identifiable and reachable from the wall-mounted tip-up seat, or from the floor;
- f. an emergency assistance alarm system complying with 5.4(h) is provided;
- g. facilities for limb storage are included for the benefit of amputees;

### *For changing facilities*

- h. the minimum overall dimensions of, and the arrangement of equipment and controls within, individual self-contained changing facilities comply with Diagram 22;
- i. when associated with shower facilities, the floor of a changing area is level and slip resistant when dry or when wet;
- j. there is a manoeuvring space 1500mm deep in front of lockers in self-contained

or communal changing areas;

### *For shower facilities*

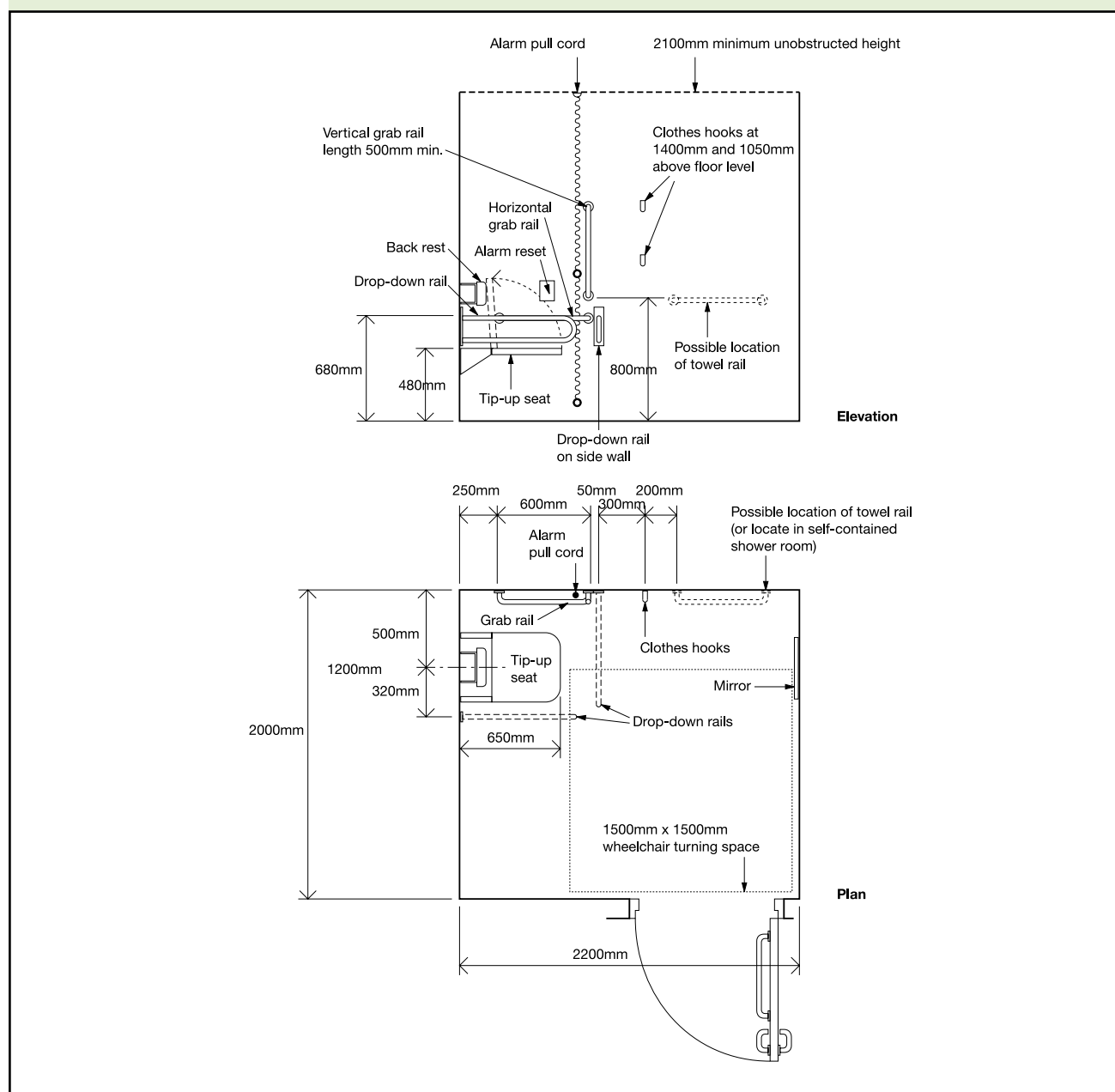
- k. individual self-contained shower facilities comply with Diagram 23;
- l. where showers are provided in commercial developments for the benefit of staff, at least one wheelchair-accessible shower compartment complying with Diagram 23 should be provided;
- m. a shower curtain, which encloses the seat and the rails when they are in a horizontal position, can be operated from the shower seat;
- n. a shelf that can be reached from the shower seat or from the wheelchair, before or after transfer, is provided for toiletries;
- o. the floor of the shower and shower area is slip resistant and self-draining;
- p. a shower terminal fitting complies with Guidance Note G18.5 of the Guidance Document relating to Schedule 2: Requirement for Water Fittings, of the Water Supply (Water Fittings) Regulations 1999, SI 1999/1148, and the markings on the shower control are logical and clear;
- q. where wheelchair-accessible shower facilities are available in communal areas, shower controls are positioned between 750 and 1000mm above the floor;

### *For shower facilities incorporating a WC*

- r. the minimum overall dimensions of, and the arrangement of fittings within, an individual self-contained shower area incorporating a corner WC, e.g. in a sports building, comply with Diagram 24;
- s. a choice of left-hand and right-hand transfer layouts is available when more than one shower area incorporating a corner WC is provided.

**Note:** Guidance prepared by the Health and Safety Executive on the slip resistance of floor surfaces is given in Annex C of BS 8300.

Diagram 22 An example of a self-contained changing room for individual use



## Wheelchair-accessible bathrooms

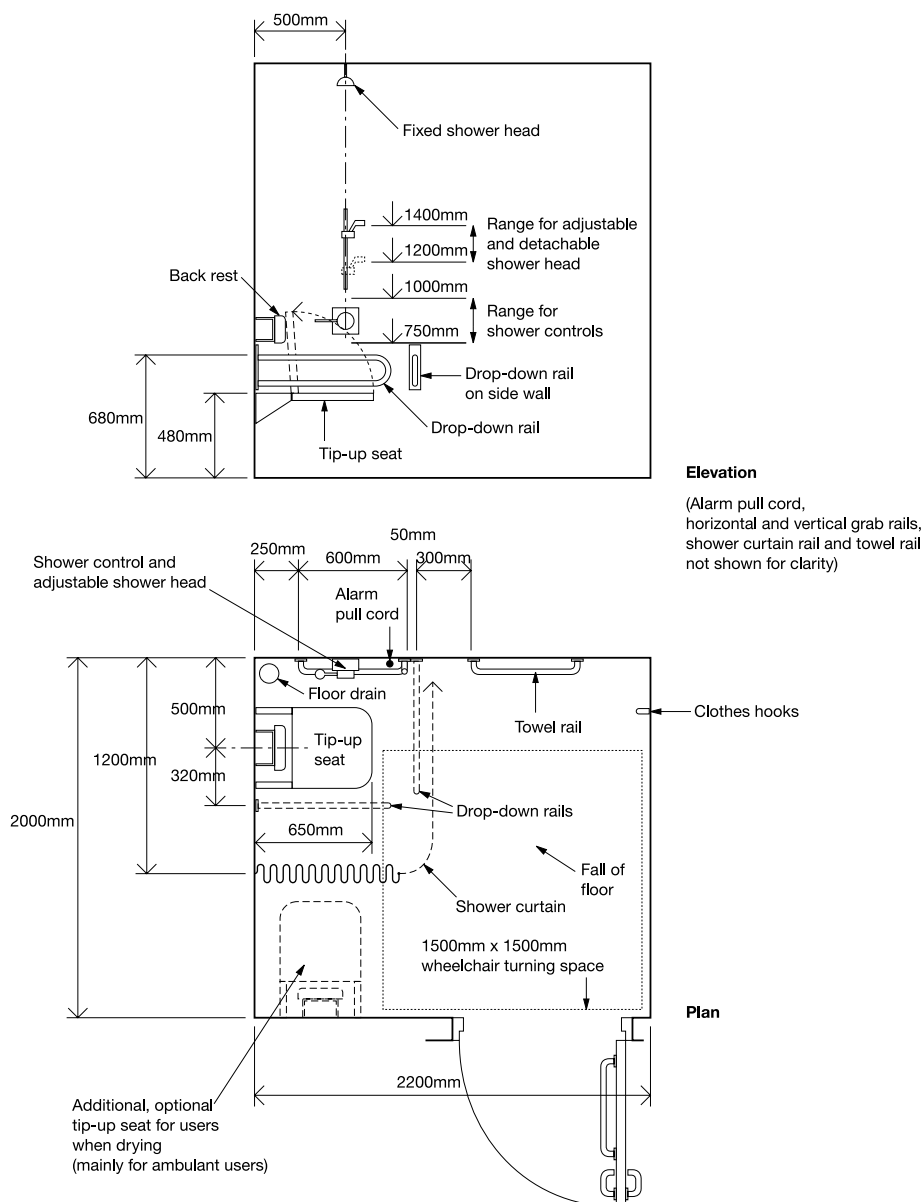
### Design considerations

**5.19** Wheelchair users and ambulant disabled people should be able to wash or bathe either independently or with assistance from others. The relationship of the bath to other sanitary fittings, and to the space required for manoeuvring, is therefore critical. Providing a choice of bathroom layout, wherever possible, will meet the needs of many disabled people and help maintain their independence.

**5.20** The guidance covered here applies to wheelchair-accessible bathing facilities where provided in buildings such as hotels, motels, relatives' accommodation in hospitals, and to student accommodation and sports facilities where baths are provided as an alternative, or as a supplement, to showers. For guidance on the provision of en-suite bathrooms associated with hotel bedrooms, see 4.19.

**Note:** More detailed guidance on appropriate sanitary and other fittings, including facilities for the use of mobile and fixed hoists is given in BS 8300.

**Diagram 23 An example of a self-contained shower room for individual use**

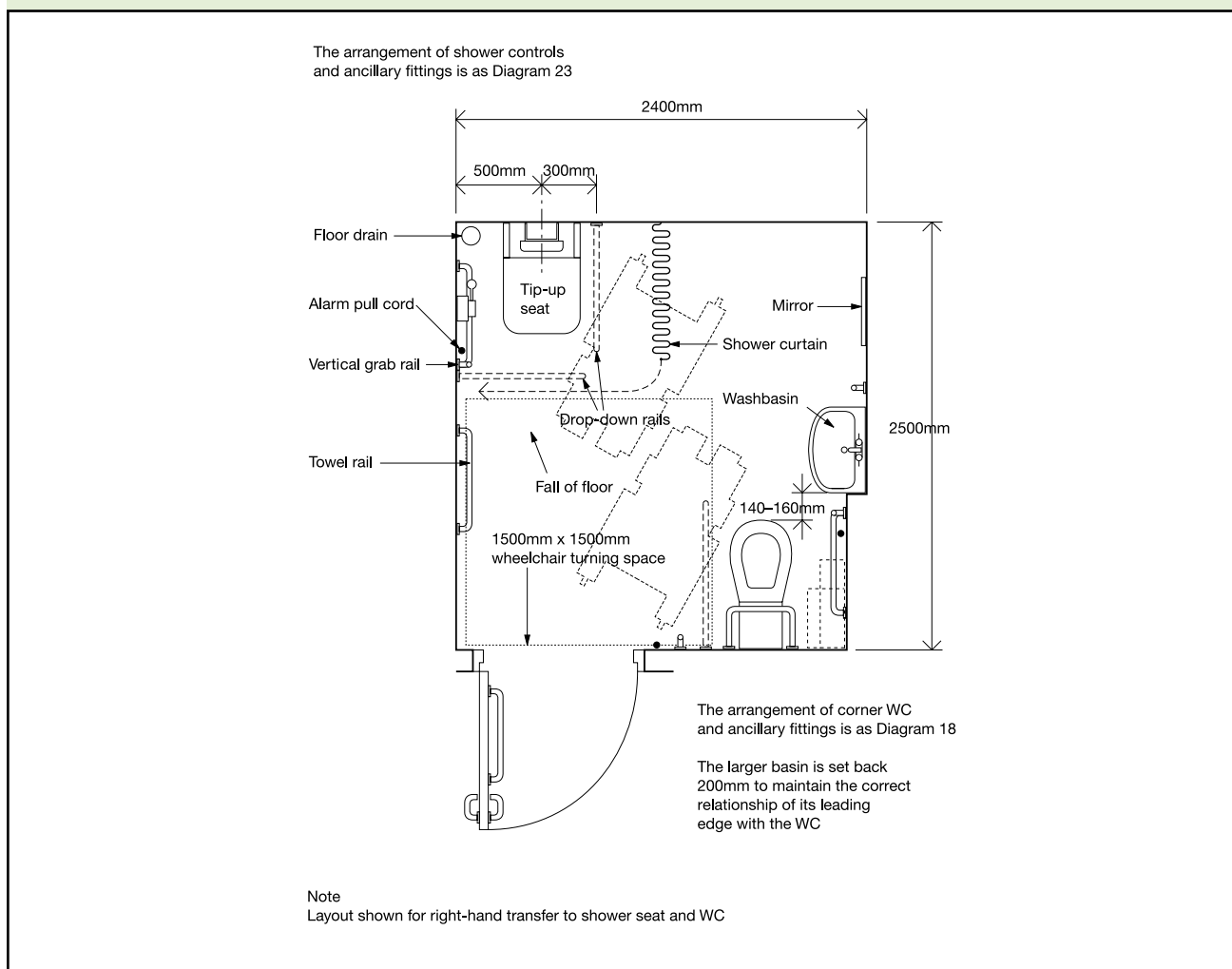


## Provisions

**5.21** Wheelchair-accessible bathrooms will satisfy Requirement M1 or M3 if:

- the minimum overall dimensions of, and the arrangement of fittings within, a bathroom for individual use incorporating a corner WC comply with Diagrams 25 and 26;
- a choice of layouts suitable for left-hand and right-hand transfer is provided when more than one bathroom for individual use incorporating a corner WC is available;
- the floor of a bathroom is slip resistant when dry or when wet;
- the bath is provided with a transfer seat, 400mm deep and equal to the width of the bath;
- doors are preferably outward opening and are fitted with a horizontal closing bar fixed to the inside face;
- an emergency assistance pull-cord complying with 4.30(e) is easily identifiable and reachable from the bath or from the floor;

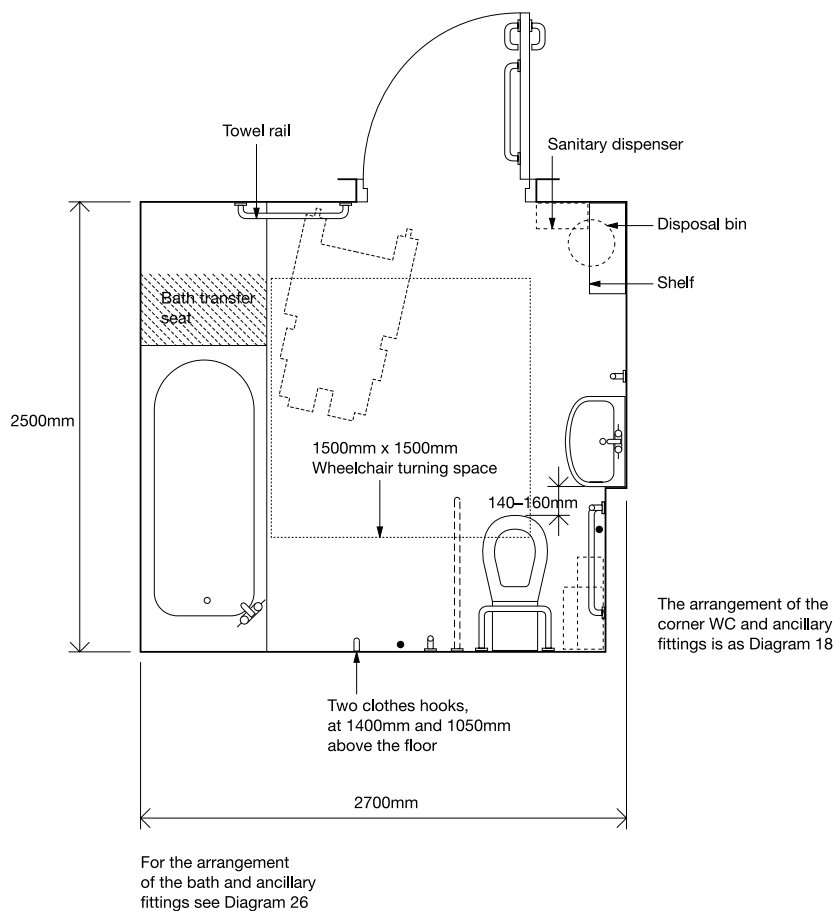
Diagram 24 An example of a shower room incorporating a corner WC for individual use



- g. an emergency assistance alarm system complying with 5.4(h) is provided.

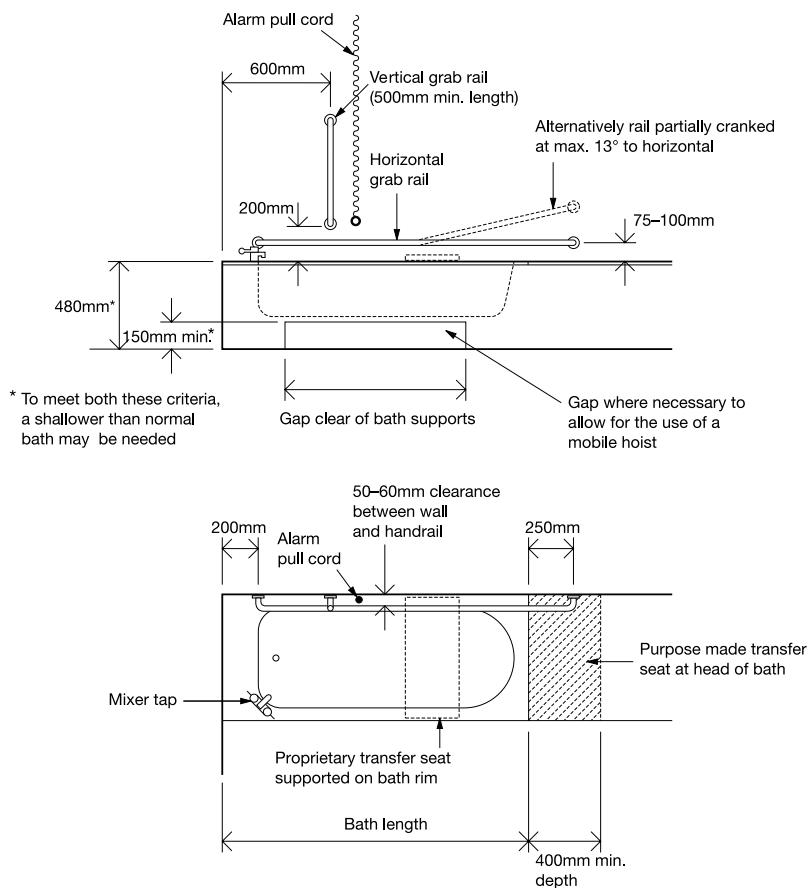
**Note:** Guidance prepared by the Health and Safety Executive on the slip resistance of floor surfaces is given in Annex C of BS 8300.

**Diagram 25 An example of a bathroom incorporating a corner WC**



Note  
Layout shown for right-hand transfer to bath and WC

Diagram 26 **Grab rails and fittings associated with a bath**



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**BS 5395-1:2000**

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**BS 8300-2:2018**

Design of an accessible and inclusive built environment. Buildings. Code of practice.

**BS EN 997:2012**

WC pans and WC suites with integral trap.

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### Department of National Heritage (DNH)

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### Department of the Environment Transport and the Regions (DETR)

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### Disabled Persons Transport Advisory Committee (DPTAC)

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### District Surveyors Association (DSA) and Association of British Theatre Technicians (ABTT)

*Technical standards for places of entertainment*, 2002. ISBN 1 90403 105 6

### Football Stadia Improvement Fund (FSIF) and Football Licensing Authority (FLA)

*Sports Ground and Stadia Guide No 1 Accessible stadia*, 2003. ISBN 0 95462 930 2 Available to download from [www.sportengland.org/disabled.pdf](http://www.sportengland.org/disabled.pdf)

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ISBN 1 85112 604 X  
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## LIST OF APPROVED DOCUMENTS

The following publications give practical guidance on how to meet the Building Regulations. You can find the date of the edition approved by the Secretary of State at [www.gov.uk](http://www.gov.uk).

### **Approved Document A**

Structure

### **Approved Document B**

Fire safety

Volume 1: Dwellings

Volume 2: Buildings other than dwellings

### **Approved Document C**

Site preparation and resistance to contaminants and moisture

### **Approved Document D**

Toxic substances

### **Approved Document E**

Resistance to the passage of sound

### **Approved Document F**

Ventilation

### **Approved Document G**

Sanitation, hot water safety and water efficiency

### **Approved Document H**

Drainage and waste disposal

### **Approved Document J**

Combustion appliances and fuel storage systems

### **Approved Document K**

Protection from falling, collision and impact

### **Approved Document L1A**

Conservation of fuel and power in new dwellings

### **Approved Document L1B**

Conservation of fuel and power in existing dwellings

### **Approved Document L2A**

Conservation of fuel and power in new buildings other than dwellings

### **Approved Document L2B**

Conservation of fuel and power in existing buildings other than dwellings

### **Approved Document M**

Access to and use of buildings

Volume 1: Dwellings

Volume 2: Buildings other than dwellings

### **Approved Document P**

Electrical safety – Dwellings

### **Approved Document Q**

Security – Dwellings

### **Approved Document R**

Physical infrastructure for high-speed electronic communications networks

### **Approved Document 7**

Materials and workmanship

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# The Building Regulations 2010

## Electrical safety – Dwellings

**APPROVED DOCUMENT**

**P**

**P1 Design and installation of electrical installations**

# Main changes in the 2013 edition

This approved document supports Part P: Electrical safety – Dwellings. It takes effect on 6 April 2013 and is for use in England\*. The 2006 edition will continue to apply to work begun before 6 April 2013, or to work subject to a building notice, full plans application or initial notice submitted before 6 April 2013.

**The main changes in this approved document are:**

## Changes in the legal requirements

- The range of electrical installation work that is notifiable (where there is a requirement to certify compliance with the Building Regulations) has been reduced.
- An installer who is not a registered competent person may use a registered third party to certify notifiable electrical installation work as an alternative to using a building control body.

## Changes in the technical guidance

- The approved document now refers to **BS 7671:2008** incorporating Amendment No 1:2011.

\* This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No. 2) Order 2009.

# The approved documents

## What is an approved document?

The Secretary of State has approved a series of documents that give practical guidance about how to meet the requirements of the Building Regulations 2010 for England. Approved documents give guidance on each of the technical parts of the regulations and on regulation 7 (see the back of this document).

Approved documents set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirements of the Building Regulations to which they refer. If you follow the guidance in an approved document, there will be a presumption of compliance with the requirements covered by the guidance. However, compliance is not guaranteed; for example, 'normal' guidance may not apply if the particular case is unusual in some way.

Note that there may be other ways to comply with the requirements – *there is no obligation to adopt any particular solution contained in an approved document*. If you prefer to meet a relevant requirement in some other way than described in an approved document, you should discuss this with the relevant building control body.

In addition to guidance, some approved documents include provisions that must be followed exactly, as required by regulations or where methods of test or calculation have been prescribed by the Secretary of State.

Each approved document relates only to the particular requirements of the Building Regulations that the document addresses. However, building work must also comply with any other applicable requirements of the Building Regulations.

## How to use this approved document

This document uses the following conventions.

- a. Text against a green background is an extract from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations.
- b. Key terms, printed in green, are defined in Appendix A.
- c. When this approved document refers to a named standard or other document, the relevant version is listed in Appendix B (standards). However, if the issuing body has revised or updated the listed version of the standard or document, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations.

**NOTE:** Standards and technical approvals may also address aspects of performance or matters that are not covered by the Building Regulations, or they may recommend higher standards than required by the Building Regulations.

## Where you can get further help

If you do not understand the technical guidance or other information in this approved document or the additional detailed technical references to which it directs you, you can seek further help through a number of routes, some of which are listed below.

- a. The Planning Portal website: [www.planningportal.gov.uk](http://www.planningportal.gov.uk).
- b. *If you are the person undertaking the building work*: either from your local authority building control service or from an approved inspector.
- c. *If you are registered with a competent person scheme*: from the scheme operator.
- d. *If your query is highly technical*: from a specialist or an industry technical body for the relevant subject.

# The Building Regulations

The following is a high level summary of the Building Regulations relevant to most types of building work. Where there is any doubt you should consult the full text of the regulations, available at [www.legislation.gov.uk](http://www.legislation.gov.uk).

## Building work

Regulation 3 of the Building Regulations defines 'building work'. Building work includes:

- a. the erection or extension of a building
- b. the provision or extension of a controlled service or fitting
- c. the material alteration of a building or a controlled service or fitting.

Regulation 4 states that building work should be carried out in such a way that, when work is complete:

- a. for new buildings or work on a building that complied with the applicable requirements of the Building Regulations: the building complies with the applicable requirements of the Building Regulations
- b. for work on an existing building that did not comply with the applicable requirements of the Building Regulations:
  - (i) the work itself must comply with the applicable requirements of the Building Regulations
  - (ii) the building must be no more unsatisfactory in relation to the requirements than before the work was carried out.

## Material change of use

Regulation 5 defines a 'material change of use' in which a building or part of a building that was previously used for one purpose will be used for another.

The Building Regulations set out requirements that must be met before a building can be used for a new purpose. To meet the requirements, the building may need to be upgraded in some way.

## Materials and workmanship

In accordance with regulation 7, building work must be carried out in a workmanlike manner using adequate and proper materials. Guidance on materials and workmanship is given in Approved Document 7.

## Energy efficiency requirements

Part 6 of the Building Regulations imposes additional specific requirements for energy efficiency.

If a building is extended or renovated, the energy efficiency of the existing building or part of it may need to be upgraded.



## Notification of work

Most building work and material changes of use must be notified to a building control body unless one of the following applies.

- a. It is work that will be self-certified by a registered competent person or certified by a registered third party.
- b. It is work exempted from the need to notify by regulation 12(6A) of, or Schedule 4 to, the Building Regulations.

## Responsibility for compliance

People who are responsible for building work (for example, the agent, designer, builder or installer) must ensure that the work complies with all applicable requirements of the Building Regulations. The building owner may also be responsible for ensuring that work complies with the Building Regulations. If building work does not comply with the Building Regulations, the building owner may be served with an enforcement notice.

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# Approved Document P: Electrical safety – Dwellings

## Summary

**0.1** This approved document gives guidance on how to comply with Part P of the Building Regulations. It contains the following sections:

**Section 1:** Technical requirements for electrical work in dwellings

**Section 2:** The types of building and **electrical installation** within the scope of Part P, and the types of electrical work that are notifiable

**Section 3:** The different procedures that may be followed to show that electrical work complies with Part P

**Appendix A:** Key terms

**Appendix B:** Standards referred to.

## Interaction with other parts of the Building Regulations

**0.2** Other parts of the Building Regulations contain requirements that affect **electrical installations**. Examples include, but are not limited to, the following:

- a. Part A (Structure): depth of chases in walls, and size of holes and notches in floor and roof joists
- b. Part B (Fire safety): fire safety of certain **electrical installations**; provision of fire alarm and fire detection systems; fire resistance of service penetrations through floors, walls and ceilings
- c. Part C (Site preparation and resistance to contaminants and moisture): resistance of service penetrations to rainwater and contaminants such as radon
- d. Part E (Resistance to the passage of sound): soundproofing of service penetrations
- e. Part F (Ventilation): dwelling ventilation rates
- f. Part L (Conservation of fuel and power): energy efficient lighting
- g. Part M (Access to and use of buildings): height of socket-outlets and switches.

# Requirement P1: Design and installation

This approved document deals with the following requirement from Part P of Schedule 1 to the Building Regulations 2010.

## Requirements

### *Requirement*

#### **Design and installation**

**P1.** Reasonable provision shall be made in the design and installation of electrical installations in order to protect persons operating, maintaining or altering the installations from fire or injury.

### *Limits on application*

The requirements of this part apply only to electrical installations that are intended to operate at low or extra-low voltage and are:

- (a) in or attached to a dwelling;
- (b) in the common parts of a building serving one or more dwellings, but excluding power supplies to lifts;
- (c) in a building that receives its electricity from a source located within or shared with a dwelling; or
- (d) in a garden or in or on land associated with a building where the electricity is from a source located within or shared with a dwelling.

## Performance

In the Secretary of State's view, the requirements of Part P will be met if **low voltage** and **extra-low voltage electrical installations** in dwellings are designed and installed so that both of the following conditions are satisfied.

- a. They afford appropriate protection against mechanical and thermal damage.
- b. They do not present electric shock and fire hazards to people.

# Section 1: Design and installation

## General

- 1.1** Electrical installations should be designed and installed in accordance with **BS 7671:2008** incorporating Amendment No 1:2011.

### Provision of information

- 1.2** Sufficient information should be provided to ensure that people can operate, maintain or alter an electrical installation with reasonable safety.

The information should comprise items listed in **BS 7671** and other appropriate information including:

- electrical installation certificates or reports describing the installation and giving details of the work carried out
- permanent labels, for example on earth connections and bonds, and on items of electrical equipment such as consumer units and residual current devices (RCDs)
- operating instructions and logbooks
- for unusually large or complex installations only, detailed plans.

### Functionality requirements

- 1.3** Part P of the Building Regulations covers the safety of electrical installation work; it does not cover system functionality. Other parts of the Building Regulations and other legislation cover the functionality of electrically powered products such as fire alarm systems, fans and pumps.

## New dwellings

- 1.4** Wall-mounted socket-outlets, switches and consumer units in new dwellings should be easy to reach, in accordance with Part M of the Building Regulations (Access to and use of buildings).

**NOTE:** Approved Document M recommends that in new dwellings only, switches and socket-outlets for lighting and other equipment should be between 450mm and 1200mm from finished floor level. Approved Document M does not recommend a height for new consumer units. However, one way of complying with Part M in new dwellings is to mount consumer units so that the switches are between 1350mm and 1450mm above floor level. At this height, the consumer unit is out of reach of young children yet accessible to other people when standing or sitting.

## New dwellings formed by a change of use

- 1.5** Where a material change of use creates a new dwelling, or changes the number of dwellings in a building, regulation 6 requires that any necessary work is carried out to ensure that the building complies with requirement P1. This means that in some cases the existing electrical installation will need to be upgraded to meet current standards.

**NOTE:** If existing cables are adequate, it is not necessary to replace them, even if they use old colour codes.

## Additions and alterations to existing electrical installations

- 1.6** Regulation 4(3) states that when building work is complete, the building should be no more unsatisfactory in terms of complying with the applicable parts of Schedule 1 to the Building Regulations than before the building work was started. Therefore, when extending or altering an **electrical installation**, only the new work must meet current standards. There is no obligation to upgrade the existing installation unless either of the following applies.
- The new work adversely affects the safety of the existing installation.
  - The state of the existing installation is such that the new work cannot be operated safely.
- 1.7** Any new work should be carried out in accordance with **BS 7671**. The existing **electrical installation** should be checked to ensure that the following conditions are all satisfied.
- The rating and condition of existing equipment belonging to both the consumer and to the electricity distributor are suitable for the equipment to carry the additional loads arising from the new work.
  - Adequate protective measures are used.
  - The earthing and equipotential bonding arrangements are satisfactory.

## Section 2: Application of Part P

### General

- 2.1** All electrical installation work carried out in a dwelling is subject to requirement P1, and should comply with the design and installation guidance in Section 1. Section 2 sets out:
- the types of building and **electrical installation** that are within the scope of Part P
  - the types of electrical work that are notifiable and must be certified as complying with the Building Regulations.

Certification procedures are set out in Section 3.

### Scope

- 2.2** Part P applies to **electrical installations**:

- in a dwelling-house or flat, and to parts of the installation that are:
  - outside the dwelling – for example fixed lighting and air conditioning units attached to outside walls, photovoltaic panels on roofs, and fixed lighting and pond pumps in gardens
  - in outbuildings such as sheds, detached garages and domestic greenhouses.
- in the common access areas of blocks of flats such as corridors and staircases
- in shared amenities of blocks of flats such as laundries, kitchens and gymnasiums
- in business premises (other than agricultural buildings) connected to the same meter as the **electrical installation** in a dwelling – for example shops and public houses below flats.

- 2.3** Part P does not apply to **electrical installations**:

- in business premises in the same building as a dwelling but with separate metering
- that supply the power for lifts in blocks of flats (but Part P does apply to lift installations in single dwellings).

**NOTE:** Schedule 2 to the Building Regulations identifies buildings – for example unoccupied, agricultural, temporary and small detached buildings – that are generally exempt from the requirements of the Regulations. However, conservatories, porches, domestic greenhouses, garages and sheds that share their electricity with a dwelling are not exempt from Part P (by virtue of regulation 9(3)) and must comply with its requirements.

- 2.4** The scope of Part P is illustrated in Diagram 1.

See paragraphs 2.2 to 2.4

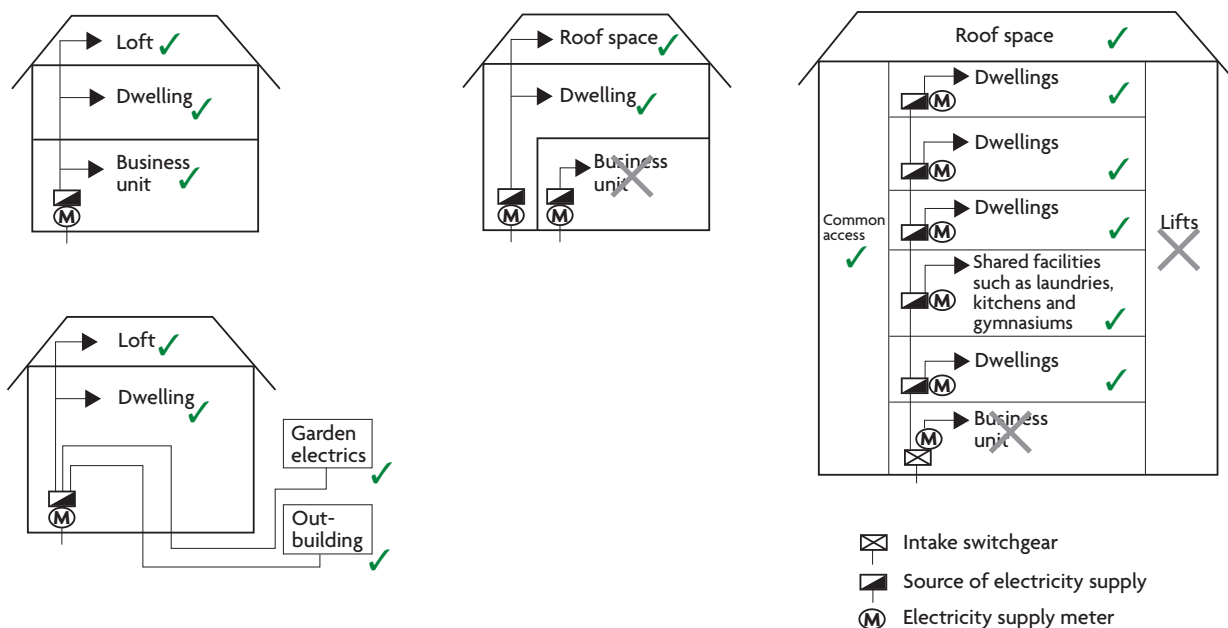


Diagram 1 Scope of Part P

## Notifiable work

**2.5** Electrical installation work that is notifiable is set out in regulation 12(6A).

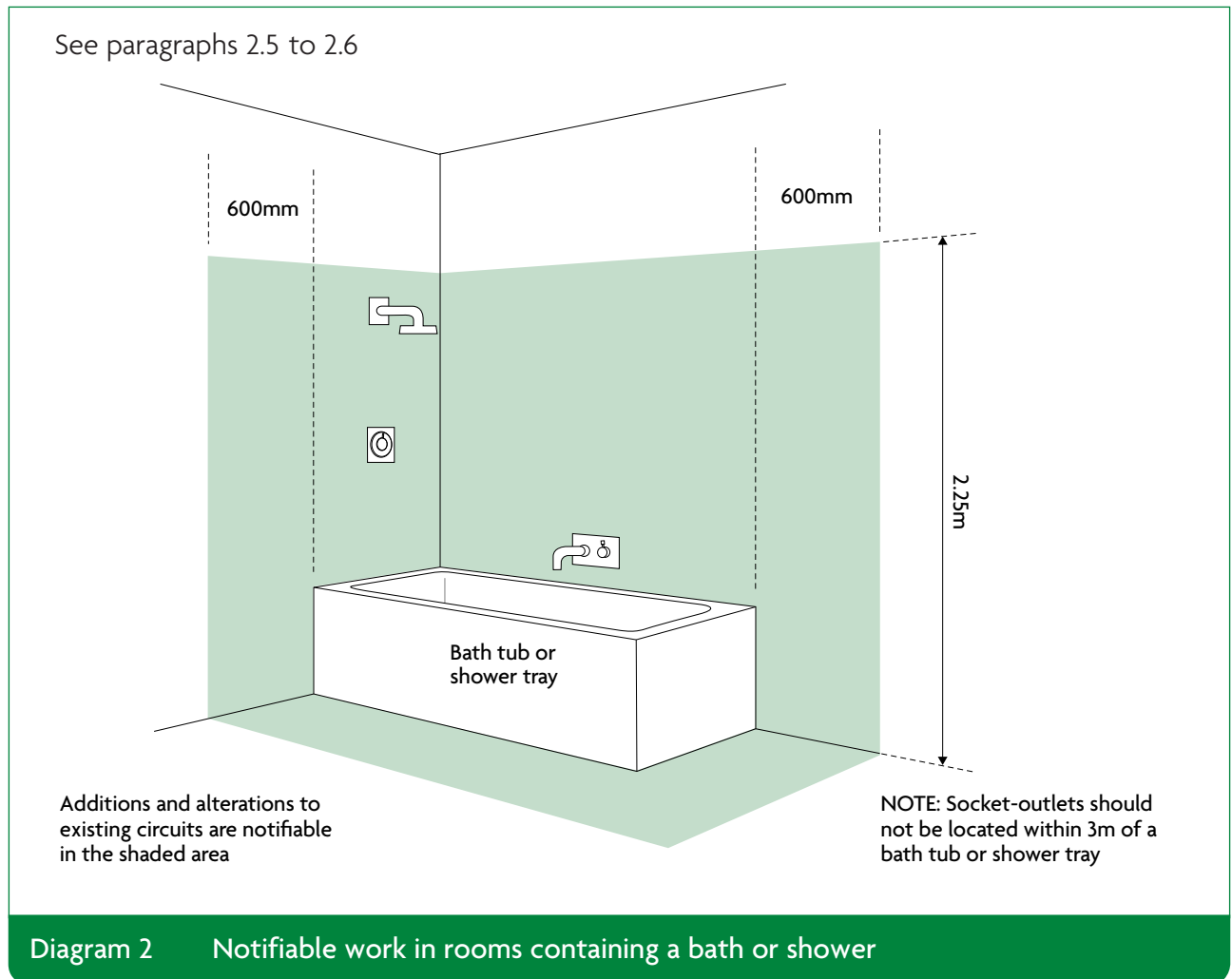
**12.—(6A)** A person intending to carry out building work in relation to which Part P of Schedule 1 imposes a requirement is required to give a building notice or deposit full plans where the work consists of—

- (a) the installation of a new circuit;
- (b) the replacement of a consumer unit; or
- (c) any addition or alteration to existing circuits in a special location.

—(9) In this regulation “special location” means—

- (a) within a room containing a bath or shower, the space surrounding a bath tap or shower head, where the space extends—
  - (i) vertically from the finished floor level to—
    - (aa) a height of 2.25 metres; or
    - (bb) the position of the shower head where it is attached to a wall or ceiling at a point higher than 2.25 metres from that level; and
  - (ii) horizontally—
    - (aa) where there is a bath tub or shower tray, from the edge of the bath tub or shower tray to a distance of 0.6 metres; or
    - (bb) where there is no bath tub or shower tray, from the centre point of the shower head where it is attached to the wall or ceiling to a distance of 1.2 metres; or
- (b) a room containing a swimming pool or sauna heater.

- 2.6** Diagram 2 illustrates the space around a bath tub or shower tray (a special location) within which minor additions and alterations to existing circuits, as well as the installation of new circuits, are notifiable.



## Non-notifiable work

- 2.7** Regulation 12(6A) sets out electrical installation work that is notifiable. All other electrical installation work is not notifiable – namely additions and alterations to existing installations outside special locations, and replacements, repairs and maintenance anywhere.
- 2.8** Installing fixed electrical equipment is within the scope of Part P, even if the final connection is by a standard 13A plug and socket, but is notifiable only if it involves work set out in regulation 12(6A). For example:
- installing a built-in cooker is not notifiable work unless a new cooker circuit is needed
  - connecting an electric gate or garage door to an existing isolator switch is not notifiable work, but installing a new circuit from the consumer unit to the isolator is notifiable.

- 2.9** Installing prefabricated, modular wiring (for example for kitchen lighting systems) linked by plug and socket connectors is also within the scope of Part P, but again is notifiable only if it involves work set out in regulation 12(6A).

## Section 3: Certification, inspection and testing

### General

- 3.1** For notifiable electrical installation work, one of the following three procedures must be used to certify that the work complies with the requirements set out in the Building Regulations.
- Self-certification by a **registered competent person**.
  - Third-party certification by a **registered third-party certifier**.
  - Certification by a **building control body**.
- 3.2** To verify that the design and installation of electrical work is adequate, and that installations will be safe to use, maintain and alter, the electrical work should be inspected and tested in accordance with the procedures in **BS 7671**.

**NOTE:** Electrical inspection and test forms should be given to the person ordering the work. Building Regulations certificates should normally be given to the occupier, but in the case of rented properties may be given to the person ordering the work and copied to the occupier.

### Self-certification by a registered competent person

- 3.3** Electrical installers who are **registered competent persons** should complete a **BS 7671** electrical installation certificate for every job they undertake. The electrical installer should give the certificate to the person ordering the work.
- 3.4** The installer or the installer's registration body must within 30 days of the work being completed do both of the following.
- Give a copy of the **Building Regulations compliance certificate** to the occupier.
  - Give the certificate, or a copy of the information on the certificate, to the **building control body**.

### Certification by a registered third party

- 3.5** Before work begins, an installer who is not a **registered competent person** may appoint a **registered third-party certifier** to inspect and test the work as necessary.
- 3.6** Within 5 days of completing the work, the installer must notify the **registered third-party certifier** who, subject to the results of the inspection and testing being satisfactory, should then complete an electrical installation condition report and give it to the person ordering the work.
- NOTE:** The electrical installation condition report should be the model **BS 7671** form or one developed specifically for Part P purposes.
- 3.7** The registration body of the third-party certifier must within 30 days of a satisfactory condition report being issued do both of the following.
- Give a copy of the **Building Regulations compliance certificate** to the occupier.
  - Give the certificate, or a copy of the information on the certificate, to the **building control body**.

## Certification by a building control body

- 3.8** If an installer is not a **registered competent person** and has not appointed a **registered third-party certifier**, then before work begins the installer must notify a **building control body**.
- 3.9** The **building control body** will determine the extent of inspection and testing needed for it to establish that the work is safe, based on the nature of the electrical work and the competence of the installer. The **building control body** may choose to carry out any necessary inspection and testing itself, or it may contract a specialist to carry out some or all of the work and furnish it with an electrical installation condition report.
- 3.10** An installer who is competent to carry out inspection and testing should give the appropriate **BS 7671** certificate to the **building control body**, who will then take the certificate and the installer's qualifications into account in deciding what further action, if any, it needs to take. **Building control bodies** may ask installers for evidence of their qualifications.
- 3.11** This can result in a lower building control charge as, when setting its charge, a local authority is required by the Building (Local Authority Charges) Regulations 2010 to take account of the amount of inspection work that it considers it will need to carry out.
- 3.12** Once the **building control body** has decided that, as far as can be ascertained, the work meets all Building Regulations requirements, it will issue to the occupier a Building Regulations completion certificate (if a local authority) or a final certificate (if an approved inspector).

## Inspection and testing of non-notifiable work

- 3.13** Non-notifiable electrical installation work, like notifiable work, should be designed and installed, and inspected, tested and certificated in accordance with **BS 7671**.
- 3.14** If local authorities find that non-notifiable work is unsafe and non-compliant, they can take enforcement action.

# Appendix A: Key terms

## The following are key terms used in this document:

### Building control body

A local authority or private sector approved inspector

### Building Regulations compliance certificate

A certificate issued by an installer registered with an authorised competent person self-certification scheme, or by a certifier registered with an authorised third-party certification scheme stating that the work described in the certificate complies with regulations 4 and 7 of the Building Regulations 2010 (that is, the work complies with all applicable requirements in the Building Regulations)

### Electrical installation\*

Fixed electric cables or fixed electrical equipment located on the consumer's side of the electricity supply meter

### Extra-low voltage\*

A voltage not exceeding 50V ac or 120V ripple-free dc, whether between conductors or to earth

### Low voltage\*

A voltage exceeding **extra-low voltage** but not exceeding 1000V ac or 1500V dc between conductors, or 600V ac or 900V dc between conductors and earth

### Registered competent person

A competent person registered with a Part P competent person self-certification scheme

### Registered third-party certifier

A competent person registered with a Part P competent person third-party certification scheme

**NOTE:** \*Terms defined in regulation 2 of the Building Regulations 2010

## Appendix B: Standards referred to

### **BS 7671**

Requirements for Electrical Installations  
[2008 + A1:2011] (IET Wiring Regulations 17th Edition,  
ISBN 978-1-84919-269-9)

# The Building Regulations 2010

## Security – Dwellings

### APPROVED DOCUMENT



#### Q1 Unauthorised access

# The 2015 Edition

This approved document supports requirement Q1 of Schedule 1 to the Building Regulations 2010. It takes effect on 1 October 2015 for use in England\*. It does not apply to work started before 1 October 2015, or work subject to a building notice, full plans application or initial notice submitted before that date provided the work is started on site before 1 October 2016.

\* This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No.2) Order 2009.

# The approved documents

## What is an approved document?

The Secretary of State has approved a series of documents that give practical guidance about how to meet the requirements of the Building Regulations 2010 for England. Approved documents give guidance on each of the technical parts of the regulations and on regulation 7 (see the back of this document).

Approved documents set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirements of the Building Regulations to which they refer. If you follow the guidance in an approved document, there will be a presumption of compliance with the requirements covered by the guidance. However, compliance is not guaranteed; for example, 'normal' guidance may not apply if the particular case is unusual in some way.

Note that there may be other ways to comply with the requirements – *there is no obligation to adopt any particular solution contained in an approved document*. If you prefer to meet a relevant requirement in some other way than described in an approved document, you should discuss this with the relevant building control body.

In addition to guidance, some approved documents include provisions that must be followed exactly, as required by regulations or where methods of test or calculation have been prescribed by the Secretary of State.

Each approved document relates only to the particular requirements of the Building Regulations that the document addresses. However, building work must also comply with any other applicable requirements of the Building Regulations.

## How to use this approved document

This document uses the following conventions.

- a. Text against a green background is an extract from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations.
- b. Key terms, printed in green, are defined in Appendix A.
- c. When this approved document refers to a named standard or other document, the relevant version is listed in Appendix C (documents) or Appendix C (standards). However, if the issuing body has revised or updated the listed version of the standard or document, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations.

**NOTE:** Standards and technical approvals may also address aspects of performance or matters that are not covered by the Building Regulations, or they may recommend higher standards than required by the Building Regulations.

## Where you can get further help

If you do not understand the technical guidance or other information in this approved document or the additional detailed technical references to which it directs you, you can seek further help through a number of routes, some of which are listed below.

- a. The Government website: [www.gov.uk](http://www.gov.uk)
- b. *If you are the person undertaking the building work:* either from your local authority building control service or from an approved inspector
- c. *If you are registered with a competent person scheme:* from the scheme operator
- d. *If your query is highly technical:* from a specialist or an industry technical body for the relevant subject.

# The Building Regulations

The following is a high level summary of the Building Regulations relevant to most types of building work. Where there is any doubt you should consult the full text of the regulations, available at [www.legislation.gov.uk](http://www.legislation.gov.uk).

## Building work

Regulation 3 of the Building Regulations defines ‘building work’. Building work includes:

- a. the erection or extension of a building
- b. the provision or extension of a controlled service or fitting
- c. the material alteration of a building or a controlled service or fitting.

Regulation 4 states that building work should be carried out in such a way that, when work is complete:

- a. *For new buildings or work on a building that complied with the applicable requirements of the Building Regulations:* the building complies with the applicable requirements of the Building Regulations.
- b. *For work on an existing building that did not comply with the applicable requirements of the Building Regulations:*
  - (i) the work itself must comply with the applicable requirements of the Building Regulations
  - (ii) the building must be no more unsatisfactory in relation to the requirements than before the work was carried out.

## Material change of use

Regulation 5 defines a ‘material change of use’ in which a building or part of a building that was previously used for one purpose will be used for another.

The Building Regulations set out requirements that must be met before a building can be used for a new purpose. To meet the requirements, the building may need to be upgraded in some way. The requirements of Part Q apply to a material change of use, but where only part of a building is subject to building work, only that part of the building need meet the requirements of Part Q.

## Materials and workmanship

In accordance with regulation 7, building work must be carried out in a workmanlike manner using adequate and proper materials. Guidance on materials and workmanship is given in Approved Document 7.

## Energy efficiency requirements

Part 6 of the Building Regulations imposes additional specific requirements for energy efficiency.

If a building is extended or renovated, the energy efficiency of the existing building or part of it may need to be upgraded.

## Notification of work

Most building work and material changes of use must be notified to a building control body unless one of the following applies.

- a. It is work that will be self-certified by a registered competent person or certified by a registered third party.
- b. It is work exempted from the need to notify by regulation 12(6A) of, or Schedule 4 to, the Building Regulations.

## Responsibility for compliance

People who are responsible for building work (e.g. agent, designer, builder or installer) must ensure that the work complies with all applicable requirements of the Building Regulations. The building owner may also be responsible for ensuring that work complies with the Building Regulations. If building work does not comply with the Building Regulations, the building owner may be served with an enforcement notice.

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# Approved Document Q: Security

## Summary

**0.1** This approved document gives guidance on how to comply with requirement Q1 of the Building Regulations. It contains the following sections:

**Section 1:** Doors

**Section 2:** Windows

**Appendix A:** Key terms

**Appendix B:** Bespoke timber secure doorsets

**Appendix C:** Documents referred to

**Appendix D:** Standards referred to

## Application

**0.2** The guidance in this approved document applies to new dwellings only; this includes dwellings formed by a material change of use.

# Requirement Q1: Unauthorised access

This approved document deals with the following requirement from Part Q of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
<b>PART Q SECURITY</b>	
<b>Unauthorised access</b>	
<b>Q1</b>	Requirement Q1 applies only in relation to new dwellings.
Reasonable provision must be made to resist unauthorised access to—	
(a) any dwelling; and	
(b) any part of a building from which access can be gained to a flat within the building.	

## Performance

Requirement Q1 applies to **easily accessible** doors and **windows** that provide access in any of the following circumstances:

- into a dwelling from outside
- into parts of a building containing flats from outside
- into a flat from the common parts of the building.

In the Secretary of State's view, doors and **windows** will meet requirement Q1 if they can resist physical attack by a casual or opportunist burglar by being both:

- sufficiently robust
- fitted with appropriate hardware.

# Section 1: Doors

## General

- 1.1** All **easily accessible doorsets** (including garage **doorsets** and communal entrance **doorsets**) that provide access into a dwelling or into a building containing a dwelling should be **secure doorsets** in accordance with paragraphs 1.2 to 1.4.

**NOTE:** If a garage has no interconnecting **doorset** allowing access into the dwelling, garage **doorsets** need not be **secure doorsets**. Where access to the dwelling can be gained via an interconnecting **doorset** from the garage, then either the garage **doorset** (pedestrian and vehicular) or the interconnecting **doorset** should be a **secure doorset**.

## Design of secure doorsets

- 1.2** **Secure doorsets** should be either:

- a. manufactured to a design that has been shown by test to meet the security requirements of British Standards publication PAS 24:2012, or
- b. designed and manufactured in accordance with Appendix B.

**NOTE:** **Doorsets** satisfying other standards that provide similar or better performance are also acceptable. These standards include:

- STS 201 Issue 5:2013
- LPS 1175 Issue 7:2010 security rating 2
- STS 202 Issue 3:2011 burglary rating 2
- LPS 2081 Issue 1:2015 security rating B.

Further advice is available in Secured by Design's *New Homes 2014*.

- 1.3** Letter plates, where provided, should:

- a. have a maximum aperture of 260mm x 40mm, and
- b. be located and/or designed to hinder anyone attempting to remove keys with sticks and/or insert their hand, for example by incorporating a flap or other features to restrict access.

**NOTE:** Letter plates meeting the requirements of the Door and Hardware Federation's (DHF) technical specification TS 008:2012 have been shown to protect against the attacks mentioned above.

- 1.4** The main doors for entering a dwelling (usually the front door) should have a door viewer unless other means exist to see callers, such as clear glass within the door or a **window** next to the **doorset**. The same **doorset** should also have a door chain or door limiter.

**NOTE:** In some situations a door chain or limiter is not appropriate, for example where a warden may need emergency access to residents in sheltered housing. Alternative caller-identification measures, such as electronic audio-visual door entry systems, can be used to identify visitors.

## Installation and fixing of secure doorsets

- 1.5** Frames should be mechanically fixed to the structure of the building in accordance with the manufacturer's installation instructions.
- 1.6** Lightweight framed walls should incorporate a resilient layer to reduce the risk of anyone breaking through the wall and accessing the locking system.

The resilient layer should be timber sheathing at least 9mm thick, expanded metal or a similar resilient material. The resilient layer should be to the full height of the door and 600mm either side of the **doorset**.

## Section 2: Windows

### General

- 2.1** Ground floor, basement and other **easily accessible windows** (including **easily accessible** rooflights) should be **secure windows** in accordance with paragraphs 2.2 and 2.3.

### Design of secure windows

- 2.2** **Windows** should be made to a design that has been shown by test to meet the security requirements of British Standards publication PAS 24:2012.

**NOTE:** **Windows** satisfying other standards that provide similar or better performance are also acceptable. These standards include:

- STS 204 Issue 3:2012
- LPS 1175 Issue 7:2010 security rating 1
- LPS 2081 Issue 1:2015 security rating A.

Further advice is available in Secured by Design's *New Homes 2014*.

### Installation and fixing of secure windows

- 2.3** Frames should be mechanically fixed to the structure of the building in accordance with the manufacturer's installation instructions.

## Appendix A: Key terms

### Doorset

A complete door assembly, assembled on site or delivered as a completed assembly, consisting of the door frame, door leaf or leaves, essential hardware and any integral side panel or fanlight (but excluding **coupled assemblies**).

### Window

Windows, rooflights, roof windows and similar.

### Secure doorset

Either:

- a **doorset** that is **proven** to resist physical attack by a casual or opportunist burglar, or
- a bespoke **doorset** incorporating construction features that are **proven** to reduce crime.

### Secure window

Either:

- a **window** that is **proven** to resist criminal attack, or
- a bespoke **window** incorporating construction features that are **proven** to reduce crime.

### Easily accessible

Either:

- a **window** or doorway, any part of which is within 2m vertically of an accessible level surface such as the ground or basement level, or an access balcony, or
- a **window** within 2m vertically of a flat or sloping roof (with a pitch of less than 30°) that is within 3.5m of ground level.

### Coupled assembly

A **doorset** and **window** that are supplied as separate self-contained frames and fixed together on site.

### Proven

(In the context of **secure doorsets** and **secure windows**) – a product designed and constructed in accordance with a specification or design shown by test to be capable of meeting the required performance.

Further information on materials and workmanship is given in Approved Document 7.

**NOTE 1:** Laboratories accredited by the United Kingdom Accreditation Service (UKAS) or an equivalent European national accreditation body should have the necessary expertise to conduct the relevant tests.

**NOTE 2:** Any test evidence used to confirm the security of a construction should be carefully checked to ensure that it demonstrates compliance that is adequate and that applies to the intended use. Evidence passed from one organisation to another can become unreliable if important details are lost. Small differences in construction can significantly affect the performance of a **doorset** or **window**.

**NOTE 3:** Schemes that certify compliance with PAS 24:2012 or other standards that offer similar or better performance may be acceptable for demonstrating compliance. A list of UKAS-accredited certification bodies is given on the UKAS website. Many recognised schemes are also listed in Secured by Design's *New Homes 2014*, Section 2.

## Appendix B: Bespoke timber secure doorsets

- B.1** A timber **doorset** constructed in accordance with this appendix is considered a **secure doorset** for the purposes of requirement Q1.

**NOTE:** The information in this appendix applies to doors of up to 1000mm wide and 2000mm high. Additional measures may be necessary for larger **doorsets**.

### Material

- B.2** The **doorset** should be manufactured from solid or laminated timber with a minimum density of 600kg/m<sup>3</sup>.

### Dimensions

- B.3** Door rails, stiles and muntins should be at least 44mm thick. After rebating, frame components should retain at least 32mm of timber.
- B.4** Any panel within the **doorset** should be at least 15mm thick. The panel should be securely held in place. Beading should be mechanically fixed and glued in position.
- B.5** The smaller dimension of each panel – which can be either the width or height of the panel – should be 230mm or less.

### Locks, hinges and letter plates

- B.6** The main doors for entering a dwelling (usually the front **doorset**) should be fitted with a multipoint locking system that meets the requirements of:

- PAS 3621 (key locking on both sides), or
- PAS 8621 (non-key locking on the internal face), or
- PAS 10621 (non-key locking on the internal face, but with an external locking override facility).

If it is not practical or desirable to install a multipoint locking system, a mortice lock that conforms with one of the following standards can be fitted instead, with a surface-mounted rim lock that conforms to the same standard:

- BS 3621 (key locking both sides), or
- BS 8621 (non-key locking on the internal face), or
- BS 10621 (non-key locking on the internal face, but with an external locking override facility).

Between the locking points for the mortice lock and surface-mounted rim lock, the distance should be 400–600mm.

- B.7** The non-primary doors for entering a dwelling (for example, back door or garage interconnecting doors) should be fitted with a multipoint locking system that meets the requirements of:
- PAS 3621 (key locking on both sides), or
  - PAS 8621 (non-key locking on the internal face), or

- PAS 10621 (non-key locking on the internal face, but with an external locking override facility).

If it is not practical or desirable to install a multipoint locking system, a mortice lock that conforms with one of the following standards can be fitted instead, with two morticed bolts.

- BS 3621 (key locking both sides), or
- BS 8621 (non-key locking on the internal face), or
- BS 10621 (non-key locking on the internal door face, but with an external locking override facility).

The morticed bolts should have a minimum projection of 20mm, should be at least 100mm from the top and bottom corners of the door, and should avoid any door construction joints.

**B.8** Hinges accessible from outside should incorporate hinge bolts.

**B.9** Letter plates, where provided, should:

- a. have a maximum aperture of 260mm x 40mm, and
- b. incorporate a flap or other features designed to hinder anyone attempting to remove keys with sticks and/or insert their hand.

**NOTE:** Letter plates meeting the requirements of the Door and Hardware Federation's (DHF's) technical specification TS 008:2012 have been shown to protect against the attacks mentioned above.

## Door limitation and caller identification

**B.10** The main doors for entering a dwelling (usually the front door) should have a door viewer unless other means exist to see callers, such as clear glass within the door or a window next to the **doorset**. The same **doorset** should also have a door chain or door limiter.

**NOTE:** In some situations a door chain or limiter is not appropriate, for example where a warden may need emergency access to residents in sheltered housing. Alternative caller-identification measures such as electronic audio-visual door entry systems can be used to identify visitors.

## Glazing

**B.11** Any glazing which, if broken, would permit someone to insert their hand and release the locking device on the inside of the door should be a minimum of class P1A in accordance with BS EN 356:2000. Double- or triple-glazed units need to incorporate only one pane of class-P1A glass.

## Appendix C: Documents referred to

Secured by Design, *New Homes 2014*. ACPO, 2014.

## Appendix D: Standards referred to

### British Standards

#### **BS EN 356**

Glass in building. Security glazing. Testing and classification of resistance against manual attack [2000]

#### **BS 3621**

Thief resistant lock assembly. Key egress [2007+A2:2012]

#### **BS 8621**

Thief resistant lock assembly. Keyless egress [2007+A2:2012]

#### **BS 10621**

Thief resistant dual-mode lock assembly [2007+A2:2012]

### Publicly available specifications

#### **PAS 24**

Enhanced security performance requirements for doorsets and windows in the UK. External doorsets and windows intended to offer a level of security suitable for dwellings and other buildings exposed to comparable risk [2012]

#### **PAS 3621**

Multipoint locking assemblies. Keyed egress. Performance requirements and test methods [2011]

#### **PAS 8621**

Multipoint locking assemblies. Keyless egress. Performance requirements and test methods [2011]

**PAS 10621**

Multipoint locking assemblies. Dual mode egress. Performance requirements and test methods [2011]

**Loss Prevention Certification Board****LPS 2081: Issue 1**

Requirements and testing procedures for the LPCB approval and listing of building components, strongpoints, security enclosures and free-standing barriers offering resistance to intruders attempting to use stealth to gain entry [2015]

**LPS 1175: Issue 7**

Requirements and testing procedures for the LPCB approval and listing of intruder resistant building components, strongpoints, security enclosures and free-standing barriers [2010]

**Certisecure: Warrington Certification Limited****STS 201: Issue 5**

Enhanced security requirements for doorsets to satisfy the requirements of PAS 24 [2013]

**STS 202: Issue 3**

Requirements for burglary resistance of construction products including hinged, pivoted, folding or sliding doorsets, windows, curtain walling, security grilles, garage doors and shutters [2011]

**STS 204: Issue 3**

Enhanced security performance for windows to satisfy the requirements of PAS 24 [2012]

**Door and Hardware Federation****TS 008**

Enhanced security and general requirements for letter plate assemblies and slide through boxes [2012].

# The Building Regulations 2010

## **Physical infrastructure for high-speed electronic communications networks**

**APPROVED DOCUMENT**

# R

### **R1 In-building physical infrastructure**

## 2016 edition

This approved document supports requirement R1 of Schedule 1 to the Building Regulations 2010.

The approved document takes effect on 1 January 2017 for use in England\*. It does not apply to work subject to a building notice, full plans application or initial notice submitted before 1 January 2017.

\* This approved document gives guidance for compliance with the Building Regulations for building work carried out in England. It also applies to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No.2) Order 2009.

# The approved documents

## What is an approved document?

The Secretary of State has approved a series of documents that give practical guidance about how to meet the requirements of the Building Regulations 2010 for England. Approved documents give guidance on each of the technical parts of the regulations and on regulation 7 (see the back of this document).

Approved documents set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirements of the Building Regulations to which they refer. If you follow the guidance in an approved document, there will be a presumption of compliance with the requirements covered by the guidance. However, compliance is not guaranteed; for example, 'normal' guidance may not apply if the particular case is unusual in some way.

Note that there may be other ways to comply with the requirements – *there is no obligation to adopt any particular solution contained in an approved document*. If you prefer to meet a relevant requirement in some other way than described in an approved document, you should discuss this with the relevant building control body.

In addition to guidance, some approved documents include provisions that must be followed exactly, as required by regulations or where methods of test or calculation have been prescribed by the Secretary of State.

This approved document relates only to the particular requirements of the Building Regulations that the document addresses. However, building work must also comply with any other applicable requirements of the Building Regulations.

## How to use this approved document

This document uses the following conventions.

- a. Text against a green background is an extract from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations
- b. Key terms, printed in green, are defined in Appendix A
- c. When this approved document refers to a named document, the relevant version is listed in Appendix B. However, if the issuing body has revised or updated the listed version of the document or standard, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations

**NOTE:** Standards and technical approvals may also address aspects of performance or matters that are not covered by the Building Regulations, or they may recommend higher standards than required by the Building Regulations.

## Where you can get further help

If you do not understand the technical guidance or other information in this approved document or the additional detailed technical references to which it directs you, you can seek further help through a number of routes, some of which are listed below.

- a. The Government website: [www.gov.uk](http://www.gov.uk)
- b. *If you are the person undertaking the building work:* either from your local authority building control service or from an approved inspector
- c. *If you are registered with a competent person scheme:* from the scheme operator
- d. *If your query is highly technical:* from a specialist or an industry technical body for the relevant subject

# The Building Regulations

The following is a high level summary of the building regulations relevant to most types of building work. Where there is any doubt you should consult the full text of the regulations, available at [www.legislation.gov.uk](http://www.legislation.gov.uk).

## Building work

Regulation 3 of the Building Regulations 2010 defines ‘building work’. Building work includes:

- a. the erection or extension of a building
- b. the provision or extension of a controlled service or fitting
- c. the material alteration of a building or a controlled service or fitting

Regulation 4 states that building work should be carried out in such a way that, when work is complete:

- a. *For new buildings or work on a building that complied with the applicable requirements of the Building Regulations:* the building complies with all the applicable requirements of the Building Regulations
- b. *For work on an existing building that did not comply with the applicable requirements of the Building Regulations:*
  - (i) the work itself must comply with all the applicable requirements of the Building Regulations
  - (ii) the building must be no more unsatisfactory in relation to the requirements than before the work was carried out

## Material change of use

Regulation 5 defines a ‘material change of use’ in which a building or part of a building that was previously used for one purpose will be used for another.

Regulation 6 sets out the particular requirements of Schedule 1 that must be met before a building can be used for a new purpose. To meet the requirements, the building may need to be upgraded in some way. Compliance with Part R is not one of the requirements identified in regulation 6 – that is, Part R requirements do not apply to a material change of use.

## Materials and workmanship

In accordance with regulation 7, building work must be carried out in a workmanlike manner using adequate and proper materials. Guidance on materials and workmanship is given in Approved Document 7.

## Energy efficiency requirements

Part 6 of the Building Regulations imposes additional specific requirements for energy efficiency.

If a building is extended or renovated, the energy efficiency of the existing building or part of it may need to be upgraded.

## Notification of work

Most building work and material changes of use must be notified to a building control body (local authority or approved inspector) unless one of the following applies.

- a. It is work that can be self-certified by a registered competent person scheme installer, or certified by a registered third party certifier
- b. It is work exempted from the need to notify by regulation 12(6A) of, or Schedule 4 to, the Building Regulations 2010

## Responsibility for compliance

People who are responsible for building work (e.g. agent, designer, builder or installer) must ensure that the work complies with all applicable requirements of the Building Regulations. The building owner may also be responsible for ensuring that work complies with the Building Regulations. If building work does not comply with the Building Regulations, the building owner may be served with an enforcement notice.

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# Approved Document R: Physical infrastructure for high-speed electronic communications networks

## Summary

**0.1** This approved document gives guidance on how to comply with requirement R1 in Schedule 1 to the Building Regulations. It contains the following sections:

**Section 1:** In-building physical infrastructure

# Requirement R1: In-building physical infrastructure

This approved document deals with the following requirement from Part R of Schedule 1 to the Building Regulations 2010.

Requirement	
<i>Requirement</i>	<i>Limits on application</i>
<b>Part R Physical infrastructure for high-speed electronic communications networks</b>	
<b>In-building physical infrastructure</b>	
<b>R1</b>	
(1) Building work must be carried out so as to ensure that the building is equipped with a high-speed-ready in-building physical infrastructure, up to a network termination point for high-speed electronic communications networks.	Requirement R1 applies to building work that consists of— (a) the erection of a building; or (b) major renovation works to a building.
(2) Where the work concerns a building containing more than one dwelling, the work must be carried out so as to ensure that the building is equipped in addition with a common access point for high-speed electronic communications networks.	

## Performance

In the Secretary of State's view, a building will meet requirement R1 if it is designed and constructed so that **high-speed electronic communications networks** can be installed in the future.

# Section 1: In-building physical infrastructure

## Introduction

**1.1** Requirement R1 applies to new buildings and to existing buildings that are subject to **major renovation works**. The requirement applies both to dwellings and to buildings other than dwellings. See paragraph 1.5 for types of building and building work that are exempt.

**1.2** Requirement R1 is to provide the **in-building physical infrastructure** so that, in future, copper or fibre-optic cables or wireless devices capable of delivering broadband speeds greater than 30 Mbps can be installed.

**NOTE:** A standard copper telephone cable, when connected to a service provider's fibre network, can deliver broadband speeds up to 70 Mbps.

**1.3** The requirement is to provide only the **in-building physical infrastructure**, from the service provider's **access point** to the occupier's **network termination point**. Multi-dwelling buildings must be equipped with a common **access point** capable of serving all the dwellings within the building.

**1.4** It is not a requirement to provide any network cabling or equipment, or any in-building infrastructure that extends internally beyond the **network termination point**. Nor is it a requirement to provide any external or site-wide infrastructure beyond the **access point**. The developer and broadband service provider should agree who will install such external infrastructure.

## Application

**1.5** Requirement R1 does not apply to the following types of building or building work:

- a. buildings and work described in Classes 2 to 7 of Schedule 2 (exempt buildings and work) to the Building Regulations
  - *for example, sheds, domestic greenhouses, garages, conservatories and other small detached buildings with no sleeping accommodation*
- b. buildings included in the schedule of monuments maintained under section 1 of the Ancient Monuments and Archaeological Areas Act 1979
- c. buildings for which compliance with Requirement R1 would unacceptably alter their character or appearance and that are:
  - (i) listed in accordance with section 1 of the Planning (Listed Buildings and Conservation Areas) Act 1990, or
  - (ii) in a conservation area designated in accordance with section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990
- d. buildings occupied by the Ministry of Defence or the armed forces of the Crown, or otherwise occupied for purposes connected to national security
- e. buildings in isolated areas where the prospect of a high-speed connection is considered too remote to justify equipping the building with **high-speed-ready in-building physical infrastructure** or an **access point**

– for example, areas that are so isolated that no duty is placed on a communications provider (under the Electronic Communications (Universal Service) Order 2003<sup>1</sup>) to meet the full cost of installing a telephone line to the building

- f. **major renovation works** if the cost of compliance with Requirement R1 would be disproportionate to the benefit gained

– a person wishing to take advantage of this exemption would need to demonstrate to a building control body that in the particular case the cost of compliance would be unreasonable, taking into account the work required and the available alternative means of high-speed broadband delivery

## Ductwork for copper and fibre-optic cables

- 1.6** A suitable position for at least one **network termination point** should be identified for each dwelling or building unit. Suitable ducting should be provided to connect all such **network termination points** to an appropriate **access point**.
- 1.7** Diagram 1<sup>2</sup> shows a possible arrangement for the physical infrastructure for a single-occupancy building. The **access point** is on an outside wall and is connected by a through-wall duct<sup>3</sup> to a **network termination point**.
- 1.8** A multi-dwelling building should have a common **access point** and dedicated vertical and horizontal service routes so that service providers can connect from the **access point** to the **network termination point** in each dwelling. Diagram 2<sup>2</sup> shows a possible arrangement for the physical infrastructure for a multi-dwelling building.
- 1.9** This guidance applies also to dwellings in mixed-use multi-unit buildings. The requirement is for the common **access point** to serve the dwellings within the building. Other units may also use the common **access point** or they may have an entirely separate **in-building physical infrastructure**.

## Satellite and wireless communications

- 1.10** The design of the **in-building physical infrastructure** should take account of satellite and wireless technologies where there is evidence that the required network speeds could be met.

## Further information

- 1.11** Publicly Available Specification (PAS) 2016, *Next generation access for new build homes – Guide*, provides best practice guidance on infrastructure and cabling for broadband networks in new homes.

**NOTE:** Developers should refer to PAS 2016 and manufacturers' specifications for guidance on the duct dimensions, bending radii, etc., required to allow copper and fibre-optic cables to be installed in the future.

- 1.12** The NHBC Foundation's *Connected Home* guide covers the benefits of current and future smart technologies. The Guide recommends that house builders 'future proof' new homes by including additional hard wiring.

1 Under the Electronic Communications (Universal Service) Order 2003, which transposed Directive 2002/22/EC, British Telecommunications plc (BT) and Kingston Communications plc are required to provide connections upon reasonable request and at uniform prices, irrespective of geographical location. This requirement helps customers in remote rural areas who might otherwise not be served by the market. Where installation of a new line costs £3,400 or less, BT sets a standard charge. Where installation costs over £3,400, BT requires the customer to pay the excess costs (plus BT's standard connection charge).

2 The diagrams show underground ducts for network cables outside the building, but this does not preclude the use of overhead lines.

3 For copper cables, the duct may simply be a hole drilled in the wall. Note the downwards slope to outside to prevent rainwater ingress.

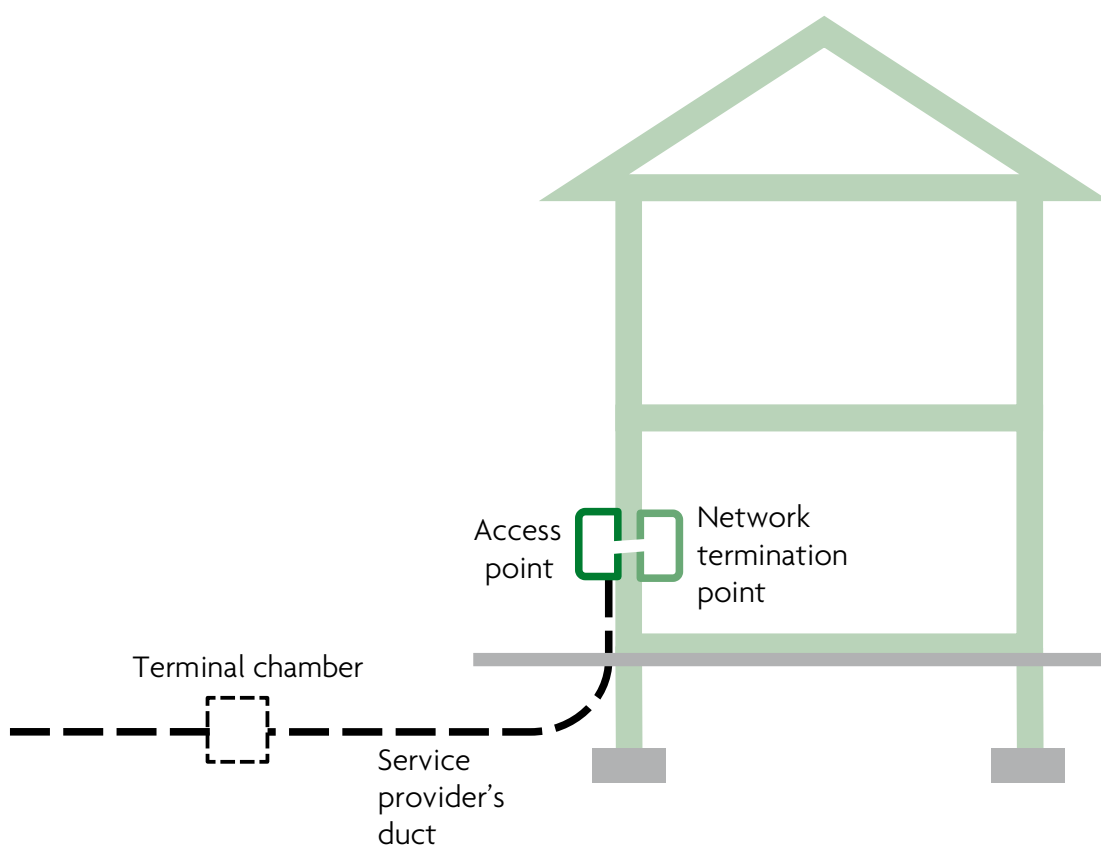


Diagram 1 Schematic example of the in-building physical infrastructure for a single-occupancy building

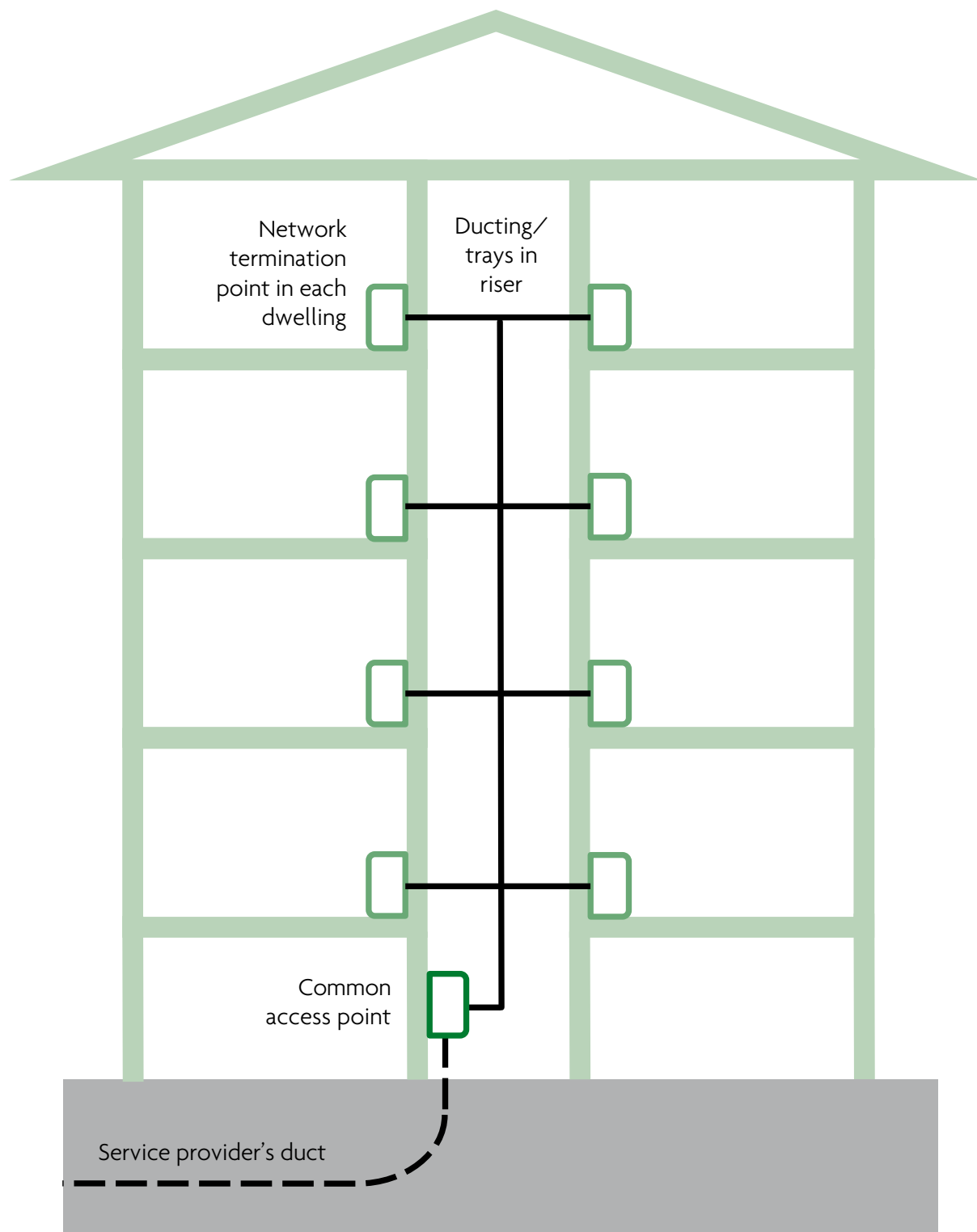


Diagram 2 Schematic example of the in-building physical infrastructure for a multi-dwelling building

## Appendix A: Key terms

The following are key terms used in this document and defined in regulation 44C of the Building Regulations 2010 (as amended):

### Access point

A physical point, located inside or outside the building, accessible to undertakings providing or authorised to provide public communications networks, where connection to the **high-speed-ready in-building physical infrastructure** is made available.

### High-speed electronic communications network

An electronic communications network which is capable of delivering broadband access services at speeds of at least 30 Mbps.

### High-speed-ready in-building physical infrastructure

In-building physical infrastructure intended to host elements, or enable delivery, of **high-speed electronic communications networks**.

### In-building physical infrastructure

Physical infrastructure or installations at the end-user's location, including elements under joint ownership, intended to host wired or wireless access networks, where such access networks are capable of delivering electronic communications services and connecting the building **access point** with the **network termination point**.

### Major renovation works

Works at the end-user's location encompassing structural modifications of the entire **in-building physical infrastructure**, or of a significant part of it.

### Network termination point

A physical point at which an occupier is provided with access to **high-speed electronic communications networks**.

**NOTE:** The 'occupier' is the subscriber to the broadband service. The termination point is typically inside the building, but may be outside the building for wireless connections.

## Appendix B: Documents referred to

### Legislation

Building Regulations 2010 (S.I. 2010/2219)

Planning (Listed Buildings and Conservation Areas)

Act 1990 c. 9

Ancient Monuments and Archaeological Areas Act

1979 c. 46

All legislation is available at [www.legislation.gov.uk](http://www.legislation.gov.uk)

### Standards

PAS 2016:2010, *Next generation access for*

*new build homes – Guide*. Publicly Available

Specification produced by BIS and the British

Standards Institution (BSI). Available at [www.gov.](http://www.gov.uk/government/publications/pas-2016-2010-next-generation-access-for-new-build-homes-guide)

[uk/government/publications/pas-2016-2010-next-generation-access-for-new-build-homes-guide](http://www.gov.uk/government/publications/pas-2016-2010-next-generation-access-for-new-build-homes-guide)

### Other guidance

*The connected home: Designing and building*

*technology into today's new homes*. NHBC

Foundation guide NF67, January 2016. Available at

[www.nhbcfoundation.org/Publications](http://www.nhbcfoundation.org/Publications)