



Office of the
Deputy Prime Minister

Creating sustainable communities

The Building Regulations 2000

Ventilation

F

APPROVED DOCUMENT

- F1** Means of ventilation
- F2** Condensation in roofs

ONLINE VERSION

1995 edition
incorporating 2000
amendments

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Use of guidance

THE APPROVED DOCUMENTS

The Building Regulations 2000 (SI 2000/2531), which came into operation on 1 January 2001, replace the Building Regulations 1991 (SI 1991/2768) 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 2000 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 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 should, in accordance with Regulation 7, be carried out with proper materials and in a workmanlike manner.

You may show that you have complied with Regulation 7 in a number of ways. These include the appropriate use of a product bearing CE marking in accordance with the Construction Products Directive (89/106/EEC)¹ as amended by the CE Marking Directive (93/68/EEC)², or a product complying with an appropriate technical

specification (as defined in those Directives), a British Standard, or an alternative national technical specification of any state which is a contracting party to the European Economic Area which, in use, is equivalent, or a product covered by a national or European certificate issued by a European Technical Approval issuing body, and the conditions of use are in accordance with the terms of the certificate. You will find further guidance in the Approved Document supporting Regulation 7 on materials and workmanship.

Independent certification schemes

There are many UK product certification schemes. Such schemes certify compliance with the requirements of a recognised document which is appropriate to the purpose for which the material is to be used. Materials which are not so certified may still conform to a relevant standard.

Many certification bodies which approve such schemes are accredited by UKAS.

Technical specifications

Building Regulations are made for specific purposes: health and safety, energy conservation and the welfare and convenience of disabled people. Standards and technical approvals are relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance such as serviceability, or aspects which although they relate to health and safety are not covered by the Regulations.

When an Approved Document makes reference to a named standard, the relevant version of the standard 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 appropriate use of a product which complies with a European Technical Approval as defined in the Construction Products Directive will meet the relevant requirements.

The Department intends to issue periodic amendments to its Approved Documents to reflect emerging harmonised European Standards. Where a national standard is to be replaced by a harmonised European Standard, there will be a co-existence period during which either standard may be referred to. At the end of the co-existence period the national standard will be withdrawn.

¹ As implemented by the Construction Products Regulations 1991 (SI 1991/1620).

² As implemented by the Construction Products (Amendment) Regulations 1994 (SI 1994/3051).

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, The Workplace (Health, Safety and Welfare) Regulations 1992, Approved Code of Practice and Guidance*; The Health and Safety Commission, L24; Published by HMSO 1992; ISBN 0 11886 333 9.

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.

ONLINE VERSION

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The Requirement

This Approved Document deals with the following Requirement from Part F of Schedule 1 to the Building Regulations 2000.

<i>Requirement</i>	<i>Limits on application</i>
<p>Means of ventilation</p> <p>F1. There shall be adequate means of ventilation provided for people in the building.</p>	<p>Requirement F1 does not apply to a building or space within a building:</p> <ul style="list-style-type: none"> (a) into which people do not normally go; or (b) which is used solely for storage; or (c) which is a garage used solely in connection with a single dwelling.

Reference should be made to: Approved Document B for guidance on the design of mechanical ventilation and air-conditioning systems for the purpose of fire safety; and Approved Document J in relation to the provision for combustion air to appliances.

Note: attention is drawn to the *Workplace (Health, Safety and Welfare) Regulations 1992*.

The provisions in this Approved Document would, in accordance with Section 23(3) of the Health and Safety at Work, etc. Act 1974, if followed, prevent the service of an improvement notice with regard to the requirements for ventilation in Regulation 6(1) of the Workplace (Health, Safety and Welfare) Regulations 1992.

Guidance

Performance

In the Secretary of State's view the requirement of F1 will be met if ventilation is provided which under normal conditions is capable (if used) of restricting the accumulation of such moisture (which could lead to mould growth) and pollutants originating within a building as would otherwise become a hazard to the health of the people in the building.

This could be achieved by the provision of ventilation to:

- a. extract, before it is generally widespread, water vapour from areas where it is produced in significant quantities (e.g. kitchens, utility rooms and bathrooms);
- b. extract, 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 which generate harmful contaminants and rest rooms where smoking is permitted);
- c. rapidly dilute, when necessary, pollutants and water vapour produced in habitable rooms, occupiable rooms and sanitary accommodation;
- d. make available over long periods a minimum supply of fresh air for occupants and to disperse, where necessary, residual water vapour. Such ventilation should not significantly affect comfort and, where necessary, should be reasonably secure and provide protection against rain penetration.

AND

- e. mechanical ventilation or air-conditioning systems proposed for non-domestic buildings would satisfy the requirement if they provided, as necessary, the ventilation as set out in (a) to (d) above and are:
- f. designed, installed and commissioned to perform in a way which is not detrimental to the health of the people in the building; and
- g. designed to facilitate necessary maintenance for the purpose of (e) and (f) above.

Definitions

0.1 Ventilation opening can include any means of ventilation (whether it is permanent or closable) which opens directly to external air, such as the openable parts of a window, a louvre, airbrick, progressively openable ventilator or window trickle ventilator. It also includes any door which opens directly to external air.

0.2 Habitable room means a room used for dwelling purposes but which is not solely a kitchen.

0.3 Bathroom means a room containing a bath or a shower, and can include sanitary accommodation.

0.4 Sanitary accommodation means a space containing one or more 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.

0.5 Utility room means a room designed to or likely to be used to contain clothes washing and similar equipment such as a sink, washing machine, tumble dryer or other feature or equipment which may reasonably be expected to produce water vapour in significant quantities.

0.6 Occupiable room means a room in a non-domestic building occupied by people such as an office, workroom, classroom, hotel bedroom, etc. but not a bathroom, sanitary accommodation, utility room or rooms or spaces used solely or principally for circulation, building services plant and storage purposes.

0.7 Domestic buildings mean those buildings used for dwelling purposes including dwelling houses, flats, student accommodation and residential homes.

0.8 Non-domestic buildings mean all other buildings, including buildings where people temporarily reside, such as hotels.

0.9 Passive stack ventilation (PSV) is a ventilation system using ducts from the ceiling of rooms to terminals on the roof, which operate by a combination of the natural stack effect, i.e. the movement of air due to the difference in temperature between inside and outside, and the effect of wind passing over the roof of the dwelling.

Section 1: Domestic buildings

Introduction to provisions

1.1 This Approved Document shows two main ways of complying with the requirement by:

- a. following the provisions set out in paragraphs 1.2 to 1.8; or
- b. alternative approaches set out in paragraph 1.9.

General

1.2 The performance will be achieved if the following provisions are made in accordance with Table 1:

- a. for **rapid ventilation**, one or more ventilation openings with some part of the ventilation opening at high level (typically 1.75m above the floor level), e.g. an opening window; and
- b. for **background ventilation**, a ventilation opening (or openings), e.g. trickle ventilators, air bricks with a 'hit and miss' ventilator, or where appropriate, suitably designed opening windows (see Diagram 1). The ventilation opening(s) should be reasonably secure,

adjustable and located (typically 1.75m above the floor level) so as to avoid discomfort due to cold draughts and to prevent rain ingress; and

- c. for **extract ventilation**, either by:
 - i. mechanical extract ventilation operated manually and/or automatically by sensor or controller; or
 - ii. passive stack ventilation operated manually and/or automatically by sensor or controller (see note 2 to Table 1); or
 - iii. an appropriate open-flued heating appliance (see note 3 to Table 1).

For extract ventilation with open-flued appliances the guidance in paragraph 1.8 should be followed.

1.3 For kitchens, utility rooms, bathrooms and sanitary accommodation not containing openable windows, see paragraph 1.5.

1.4 If the ventilation of a habitable room is through another room or space, see paragraphs 1.6 and 1.7.

Table 1 Ventilation of rooms containing openable windows (i.e. located on an external wall)

Room ⁽⁶⁾	Rapid ventilation (e.g. opening windows)	Background ventilation ⁽¹⁾ (see Diagram 1)	Extract ventilation fan rates or passive stack (PSV) ⁽²⁾⁽³⁾
Habitable room	1/20th of floor area	8000mm ²	–
Kitchen	opening window (no minimum size)	4000mm ²	30 litres/second adjacent to a hob or 60 litres/second elsewhere ⁽⁴⁾ or PSV
Utility room ⁽⁵⁾	opening window (no minimum size)	4000mm ²	30 litres/second or PSV
Bathroom (with or without WC)	opening window (no minimum size)	4000mm ²	15 litres/second or PSV
Sanitary accommodation (separate from bathroom)	1/20th of floor area or mechanical extract at 6 litres/second	4000mm ²	–

Notes:

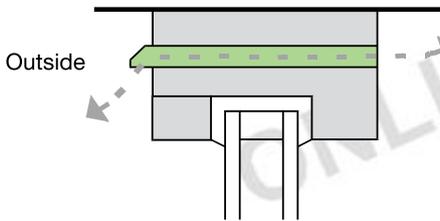
1. As an alternative approach to the provisions listed in Table 1, the overall provision for background ventilation for the dwelling should be equivalent to an average of 6000mm² per room for the rooms listed in Table 1, with a minimum provision of 4000mm² in each room.
2. Passive stack ventilation provided in accordance with BRE Information Paper 13/94 or with appropriate third party certification, such as a BBA certificate, would be satisfactory.
3. Open-flued appliances take their combustion air from the room or space in which they are installed and so contribute to the extract ventilation when in operation. They can also be arranged to provide adequate extract ventilation when not firing. For instance no additional extract ventilation would be necessary to satisfy the requirement 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 with a free area at least equivalent to a 125mm diameter duct and the appliance's combustion air inlet and dilution air 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 1.8).
4. Mechanical extract ventilation should be rated: a. not less than 30 litres/second, (i) when incorporated within a cooker hood or (ii) when located near the ceiling within 300mm of the centreline of the space for the hob and under humidistat control; or b. rated not less than 60 litres/second when located elsewhere.
5. For the purpose of the Building Regulations, provision for ventilation need not be made for a utility room which is accessible only from outside the building.
6. Where rooms serve a combined function as defined in Table 1, such as a kitchen-diner, the individual provisions for rapid, background and extract ventilation need not be duplicated provided that the greatest provision for the individual functions is made from Table 1.

Diagram 1 Provisions for background ventilation

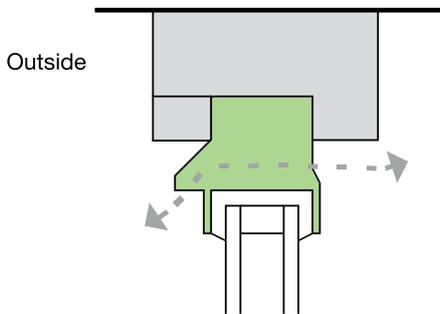
See para 1.2b

The following are examples of provisions for background ventilation. In each case, the ventilation opening should be located (typically 1.75m above floor level) so as to avoid discomfort due to cold draughts.

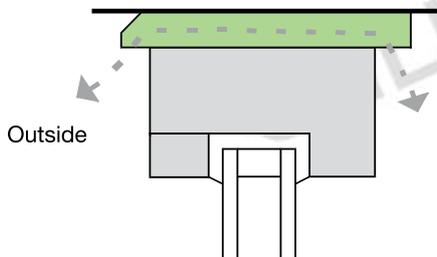
1. Trickle ventilators



(a) In window frames

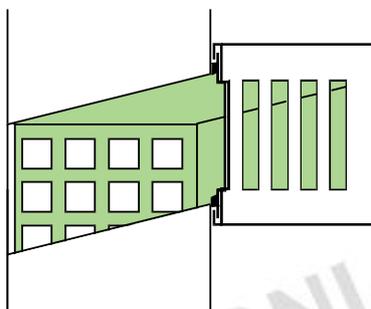


(b) In glazed openings



(c) Above window frames

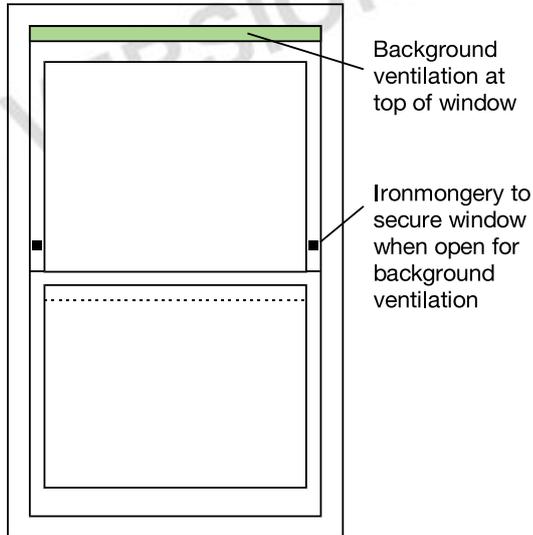
2. Airbrick with 'hit and miss' ventilator



Notes to examples 1 and 2:

To minimise resistance to air flow, the main air passages (not insect screens or baffles, etc.) of an installed ventilation opening (when fully open) should have a smallest dimension of at least 5mm for slots or 8mm for square or circular holes.

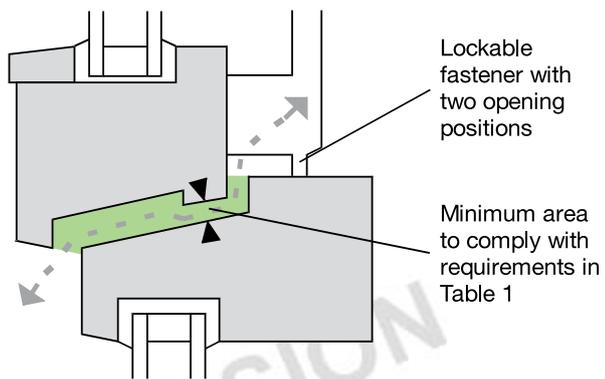
3. Vertical sliding sash windows with adjustable fixed locking positions



For background ventilation, the opening of the window should be adjustable to provide the required area and lockable so it is secure when open for background ventilation.

Note: Provisions in B1 for certain windows to be usable for means of escape.

4. High-level top hung window with adjustable locking positions (because of the risk to security, this should generally be restricted to use above ground floor level)



For background ventilation, the opening of the window should be adjustable to provide the required area and be lockable with a removable key or similar device so it is secure in at least two opening positions for background ventilation.

Ventilation of non-habitable rooms not containing openable windows

1.5 In kitchens, utility rooms, bathrooms and sanitary accommodation not containing openable windows (i.e. internal rooms) the requirement will be satisfied if there is:

- mechanical extract ventilation rated as in Table 1 and the fan has a 15 minute overrun and is controlled either automatically or manually[†]; or
- passive stack ventilation as in paragraph 1.2(c)ii; or
- an open-flued heating appliance as in paragraph 1.2(c)iii.

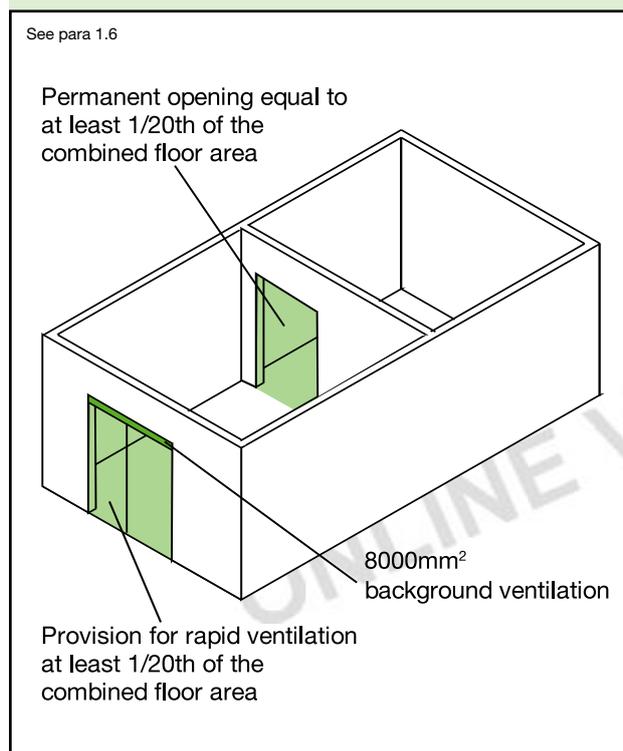
For (a) to (c) above, an air inlet should be provided, e.g. a 10mm gap under the door.

[†] In rooms with no natural light it would be appropriate for the fans to be controlled by the operation of the light switch.

Ventilation of habitable rooms through other rooms and spaces

1.6 Two habitable rooms may be treated as a single room for ventilation purposes if there is an area of permanent opening between them equal to at least 1/20th of the combined floor areas and provision for the rooms was made from Table 1 for a habitable room of the combined floor area (see Diagram 2).

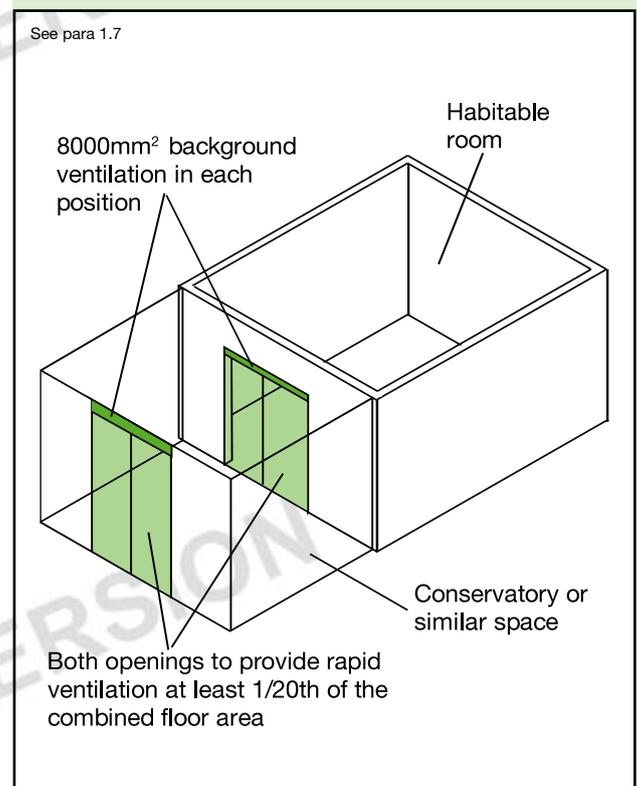
Diagram 2 Two rooms treated as a single room for ventilation purposes



1.7 A habitable room ventilated through an adjoining space (see Diagram 3) would satisfy the requirement if:

- the adjoining space is a conservatory or similar space; and
- there is from the space to outside provision for both:
 - rapid ventilation**, one or more ventilation openings, with a total area of at least 1/20th of the combined floor area of the habitable room and space and with some part of the ventilation opening at high level (typically 1.75m above the floor level); and
 - background ventilation**, a ventilation opening (or openings) of at least 8,000mm²; and
- there are openings (which may be closable) between the habitable room and the space for:
 - rapid ventilation equivalent to b(i) above; and
 - background ventilation equivalent to b(ii) above.

Diagram 3 A habitable room ventilated through an adjoining space



Interaction of mechanical extract ventilation and open-flued combustion appliances

1.8 Mechanical extract ventilation can cause the spillage of flue gases from open-flued combustion appliances in dwellings whether or not the fan(s) or extract air terminals and combustion appliances are located in the same room. Such spillage of flue gases is dangerous and in dwellings where it is proposed to install open-flued appliances and mechanical extract ventilation the appliance needs to be able to operate safely whether or not the fan is running. For example with:

- a. **gas appliances**, where the appliance and the fan are located in the kitchen, the maximum recommended extract rate is 20 litres/second. A spillage test as described in BS 5440-1:1990, Clause 4.3.2.3 should be carried out whether or not the appliance and the fan are in the same room. Where a fan causes an appliance in a different room to spill, the extract rate may be reduced to cure the problem. (Further advice is contained in BRE Information Paper 21/92.)
- b. **oil-fired appliances**, installed in compliance with Technical Information Note T1/112, which can be obtained from: Oil Firing Technical Association for the Petroleum Industry (OFTEC), Century House, 100 High Street, Banstead, Surrey SM7 2NN. For further advice contact OFTEC.
- c. **solid fuel appliances**, mechanical extract ventilation should not be provided in the same room. For further advice contact HETAS (Heating Equipment Testing and Approval Scheme), PO Box 37, Bishop's Cleeve, Gloucestershire GL52 4TB.

Alternative approaches

1.9 As an alternative to paragraphs 1.2 to 1.7 the requirement will be satisfied by following the relevant recommendations of:

- a. BS 5925:1991 *Code of practice for ventilation principles and designing for natural ventilation*. The relevant clauses are 4.4, 4.5, 4.6.1, 4.6.2, 5.1, 6.1, 6.2, 7.2, 7.3, 12 and 13; or
- b. BS 5720:1979 *Code of practice for mechanical ventilation and air-conditioning in buildings*. The relevant clauses are 2.3.2.1, 2.3.3.1, 2.5.2.9, 3.1.1.1, 3.1.1.3 and 3.2.6; or
- c. BS 5250:1989 *Code of practice for the control of condensation in buildings*. The relevant clauses are 6, 7, 8, 9.1, 9.8, 9.9.1 to 9.9.3 and Appendix C; or

- d. BRE Digest 398 *Continuous mechanical ventilation in dwellings: design, installation and operation*. For the design of either:
 - continuous balanced (supply and extract) mechanical ventilation to be provided throughout the dwelling; or
 - continuous mechanical extract ventilation to be provided in kitchens, utility rooms, bathrooms and sanitary accommodation.

Section 2: Non-domestic buildings

Introduction to provisions

2.1 This Approved Document shows the main ways of complying with the requirement:

- a. by following the provisions set out in paragraphs 2.2 to 2.5 or by following the alternative approaches set out in paragraph 2.6; and where relevant.
- b. for specialist activities by following the provisions set out in paragraph 2.7; and
- c. for car parks by following the provisions set out in paragraph 2.8 or the alternative approach set out in paragraph 2.9;

AND FOR MECHANICAL VENTILATION/AIR-CONDITIONING PLANT

- d. by following the provisions set out in paragraphs 2.11 to 2.13 or the alternative approaches set out in paragraph 2.14 for the design of mechanical ventilation/air-conditioning plant and the provisions set out in paragraphs 2.15 and 2.16 for access for maintenance; and

- e. where a mechanical ventilation or air-conditioning system serving more than 200m² is installed by following the provision in paragraph 2.17.

General

2.2 The requirement will be satisfied if the following provisions are made in accordance with Table 2 for:

- a. **rapid ventilation.** One or more ventilation openings with some part of the ventilation opening at high level (typically 1.75m above the floor level), e.g. an opening window; and
- b. **background ventilation.** A ventilation opening (or openings), e.g. trickle ventilators, air bricks with a 'hit and miss' ventilator, suitably designed opening windows (see Diagram 4). The ventilation opening(s) should be adjustable and located (typically 1.75m above floor level) so as to avoid discomfort due to cold draughts and to prevent rain ingress; and
- c. **extract ventilation.** By mechanical extract ventilation operated manually and/or automatically by sensor or controller.

Table 2 Ventilation of rooms containing openable windows (i.e. located on an external wall)

Room	Rapid ventilation (e.g. opening windows)	Background ventilation (see Diagram 4)	Extract ventilation ⁽³⁾⁽⁴⁾ fan rates
Occupiable room ⁽¹⁾	1/20th of floor area	for floor areas: up to 10m ² – 4000mm ² ; greater than 10m ² – at the rate of 400mm ² /m ² of floor area	–
Kitchen ⁽²⁾ (domestic type)	opening window (no minimum size)	4000mm ²	30 litres/second adjacent to a hob or 60 litres/second elsewhere
Bathrooms (including shower rooms)	opening window (no minimum size)	4000mm ² per bath/shower	15 litres/second per bath/shower
Sanitary accommodation (and/or washing facilities)	1/20th of floor area or mechanical ventilation at 6 litres/second per WC or 3 air changes per hour	4000mm ² per WC	–

Notes:

1. For specific rooms designed for heavy smoking, such as rest rooms where smoking is permitted, see paragraph 2.7(e).
2. A domestic type kitchen is one where the appliances and usage are of a domestic nature. This provision is not intended to cover commercial kitchens, see paragraph 2.7(f).
3. PSV as described in paragraph 1.2(c)ii can be used as an alternative to a mechanical extract fan for domestic type facilities.
4. Where 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 be able to operate safely whether or not the fan is running and guidance is provided in paragraph 1.8 and Approved Document J.

Mechanical ventilation of rooms

- 2.3** The requirement will be satisfied for:
- a. occupiable rooms, where mechanical ventilation is provided at the rate of not less than 8 litres/second of fresh air per occupant. This assumes that the provision is for no smoking; an appropriate provision for rooms designed for light smoking would be a fresh air supply of 16 litres/second per occupant. For specific rooms designed for heavy smoking, such as rest rooms where smoking is permitted, see paragraph 2.7(e).
 - b. kitchens, bathrooms and sanitary accommodation without windows (e.g. internal rooms), where provision is made for mechanical extract ventilation rated as in Table 2 and the fan has 15 minutes' overrun and is controlled either automatically or manually. For such rooms, it would be appropriate for the operation of the fans to be controlled by the light switch, or occupant detecting sensor. An air inlet to the room should be provided, e.g. a 10mm gap under the door.

2.4 For the design and commissioning of mechanical ventilation and air-conditioning plant, see paragraphs 2.11 to 2.17.

Ventilation of common spaces in non-domestic buildings

2.5 These provisions only apply to common spaces where large numbers of people are expected to gather, such as shopping malls and foyers. They do not apply to common spaces used solely or principally for circulation.

The requirement will be satisfied if there is provision to spaces where large numbers of people are expected to gather for either:

- a. natural ventilation by appropriately located ventilation opening(s) with a total area of at least 1/50th of the floor area of the common space; or
- b. mechanical ventilation designed to provide a supply of fresh air of one litre/second per m² of floor area.

Alternative approaches

2.6 As an alternative to paragraphs 2.2 and 2.5 the requirement will be satisfied:

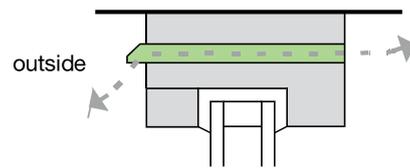
- a. by following the relevant recommendations of BS 5925:1991 *Code of practice for ventilation principles and designing for natural ventilation*. The relevant clauses are 5.1, 5.2, 6.1, 6.2, 7.3, 12 and 13; or
- b. by following the relevant recommendations of CIBSE Guide A: *Design data* and CIBSE Guide B: *Installation and equipment data*. The relevant sections are A4 *Air infiltration and natural ventilation*, B2 *Ventilation and air-conditioning (requirements)*.

Diagram 4 Provisions for background ventilation

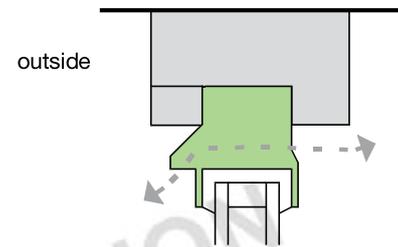
See para 2.2b

The following are examples of provisions for background ventilation. In each case, the ventilation opening should be located (typically 1.75m above floor level) so as to avoid discomfort due to cold draughts.

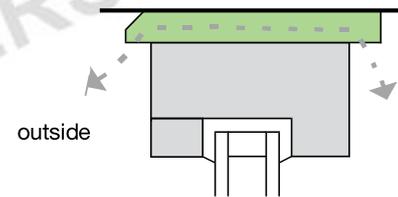
1. Trickle ventilators



a) In window frames

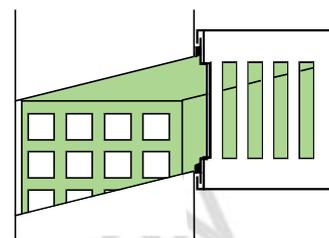


b) In glazed openings



c) Above window frames

2. Airbrick with 'hit and miss' ventilator



Notes to examples 1 and 2:
To minimise resistance to air flow, the main air passages (not insect screens or baffles, etc.) of an installed opening (when fully open) should have a smallest dimension of at least 5mm for slots or 8 mm for square or circular holes.

3. Vertical sliding sash or top-hung windows

For background ventilation, the opening of the window should be adjustable to provide the required area shown in Table 2.

Ventilation of specialist activities

2.7 The requirement will be satisfied by following the appropriate design guidance for each of the specialist activities, such as:

- a. **School or other educational establishment.** Ventilation provisions can be made either in accordance with the guidance in DFEE Building Bulletin 87, or in accordance with Table 2, with the exception of sanitary accommodation where six air changes per hour are desirable. In spaces where noxious fumes may be generated additional provision for ventilation should be made and may require the use of fume cupboards designed in accordance with DFE Design Note 29.
- b. **Workplaces.** Aspects relating to specific workplaces and work processes, following the recommendations given in HSE Guidance Note EH22 *Ventilation of the workplace*.
- c. **Hospitals.** The ventilation needed for various types of accommodation will be different depending on the functional use of the space; these values will also vary throughout the year. The requirements are contained in the DHSS *Activity Data Base* with general guidance and provision given in Department of Health Building Notes appropriate to each specific departmental area (e.g. HBN 4 *Adult Acute Wards*, HBN 21 *Maternity Departments* and HBN 46 *General Medical Practice Premises*).
- d. **Building services plant rooms.** Provision for emergency ventilation to control dispersal of contaminating gas releases (e.g. refrigerant leak) given in paragraphs 25 to 27 of HSE Guidance Note EH22 *Ventilation of the workplace*. Other guidance in BS 4434:1989. *Specification for safety aspects in the design, construction and installation of refrigeration appliances and systems*.
- e. **Rest rooms where smoking is permitted.** The Workplace Regulations require that 'Rest rooms and rest areas shall include suitable arrangements to protect non-smokers from discomfort caused by tobacco smoke'. The following guidance would satisfy this requirement:
 - i. **natural ventilation.** Provision should be made for both:
 - an air supply in accordance with Table 2 for an occupiable room; and
 - the removal of tobacco smoke particles through local extract ventilation.
 - ii. **mechanical ventilation.** The design of the ventilation system should prevent the recirculation of air contaminated with tobacco smoke. This could be achieved by extracting the smoke-laden air to outside at a rate of at least 16 litres/second per person.
- f. **Commercial kitchens.** Guidance on ventilation provision is given in CIBSE Guide B, Tables B2.3 and B2.11.

Ventilation of car parks

2.8 The requirement will be satisfied for car parks below ground level, enclosed type car parks and multi-storey car parks if there is:

- a. **Naturally ventilated car parks.** The provision of well distributed permanent natural ventilation, e.g. openings at each car parking level with an aggregate area equal to at least 1/20th of the floor area at that level, of which at least half should be in two opposing walls.
- b. **Mechanically ventilated car parks,** either:
 - i. the provision of both permanent natural ventilation openings of not less than 1/40th of the floor area and a mechanical ventilation system capable of at least three air changes per hour; or
 - ii. for basement car parks, the provision of a mechanical ventilation system capable of at least six air changes per hour; and
 - iii. for exists and ramps, where cars queue inside the building with engines running, provision should be made to ensure a *local* ventilation rate of at least ten air changes per hour.

Alternative approach

2.9 As an alternative to paragraph 2.8, the requirement will be satisfied if the mean predicted pollutant levels are calculated and the ventilation designed to limit the concentration of carbon monoxide to not more than 50 parts per million averaged over an eight hour period and peak concentrations, such as by ramps and exits, not to go above 100 parts per million for periods not exceeding 15 minutes.

2.10 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 and in CIBSE Guide B, Section B2-6 and Table B2-7.

Design of mechanical ventilation/air-conditioning plant

2.11 The requirement will be satisfied if provision is made to protect the fresh air supplies from contaminants injurious to health. Air inlets for ventilation systems should not be sited where they may draw in excessively contaminated air (for example close to a flue, an exhaust ventilation system outlet, an evaporative cooling tower, or an area in which vehicles manoeuvre).

2.12 Guidance on design measures to avoid legionella contamination, including design features not related to the ventilation of the building, is covered in HSE's *The control of legionellosis including legionnaires' disease*. The relevant paragraphs are 71 to 89.

2.13 Guidance on recirculated air in air-conditioning and mechanical ventilation systems is given in HSE's Workplace (Health, Safety and Welfare) Regulations 1992 *Approved Code of Practice and Guidance L24*; the relevant paragraph is 32.

Alternative approaches

2.14 As an alternative to paragraphs 2.11 to 2.13 the requirement will be satisfied:

- by following the relevant recommendations of BS 5720:1979 *Code of practice for mechanical ventilation and air-conditioning in buildings*. The relevant clauses are 2.3.2, 2.3.3, 2.4.2, 2.4.3, 2.5, 3.2.6, 3.2.8 and 5.5.6; or
- by following the relevant recommendations of CIBSE Guide B *Installation and equipment data*. The relevant sections are B2 *Ventilation and air-conditioning (requirements)* and B3 *Ventilation and air-conditioning (systems, equipment and control)*.

Access for maintenance

2.15 Reasonable provision would be to include:

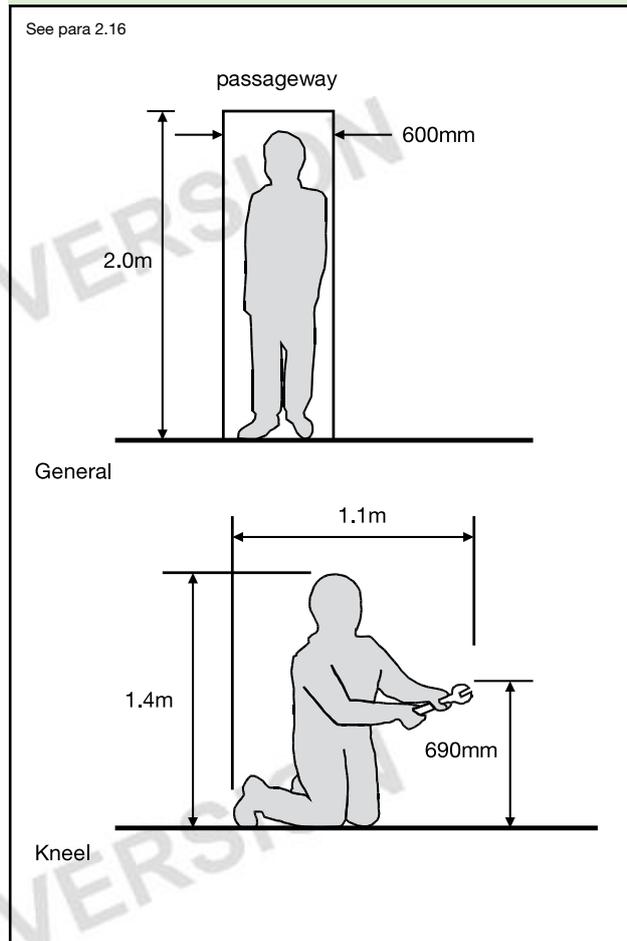
- access for the purpose of replacing filters; and
- provision of access points for cleaning duct work.

2.16 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 600mm space is provided where access is required between plants and 1100mm where space for routine cleaning is required (see Diagram 5). These figures are the minimum necessary and additional space may be needed for access doors. Further guidance for more complex situations can be found in BSRIA Technical Note 10/92: *Space allowances for building services distribution systems*, Section A5 and D2.

Commissioning

2.17 Where mechanical ventilation and air-conditioning systems are installed to serve floor areas in excess of 200m² and the relevant provisions in paragraphs 2.3 to 2.16 have been undertaken, the requirement will be satisfied if the building control body is provided with confirmation that the mechanical ventilation systems have been commissioned and tested to demonstrate that they are operating effectively for the purpose of ventilation. A way of demonstrating compliance with the requirements would be to present test reports and commissioning certificates which certify that commissioning and testing have been carried out in accordance with the CIBSE commissioning codes and that the systems perform in accordance with the specification.

Diagram 5 Space for access



The Requirement

This Approved Document deals with the following Requirement from Part F of Schedule 1 to the Building Regulations 2000.

<i>Requirement</i>	<i>Limits on application</i>
<p>Condensation in Roofs</p> <p>F2. Adequate provision shall be made to prevent excessive condensation:</p> <p>(a) in a roof; or</p> <p>(b) in a roof void above an insulated ceiling.</p>	

Guidance

Performance

In the Secretary of State's view, the requirement of F2 will be met if condensation in a roof and in the spaces above insulated ceilings is limited so that, under normal conditions:

- a. the thermal performance of the insulating materials and
- b. the structural performance of the roof construction

will not be substantially and permanently reduced.

Introduction to provisions

0.1 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, as in Sections 1 and 2 below.

0.2 It is not necessary to ventilate warm deck roofs or inverted roofs, i.e. those roofs where the moisture from the building cannot permeate the insulation.

0.3 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.

0.4 Guidance is given on meeting the requirements for pitched roofs in Section 1 below. However, if the ceiling of a room follows the pitch of the roof, ventilation should be provided as if it were a flat roof.

0.5 Guidance is given on meeting the requirements for flat roofs in Section 2 below.

0.6 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.

0.7 Ventilation openings may be continuous or distributed along the full length and may be fitted with a screen, fascia, baffle, etc.

0.8 Further detailed guidance is given in the BRE Report BR 262. *Thermal insulation: avoiding risks*, 1994 edition.

Section 1: Roofs with a pitch of 15° or more (pitched roofs)

Introduction

1.1 If the ceiling follows the pitch of the roof, see Section 2.

1.2 Pitched roof spaces should have ventilation openings at eaves level to promote cross ventilation. These openings should have an area on opposite sides at least equal to continuous ventilation running the full length of the eaves and 10mm wide (see Diagram 6(a)).

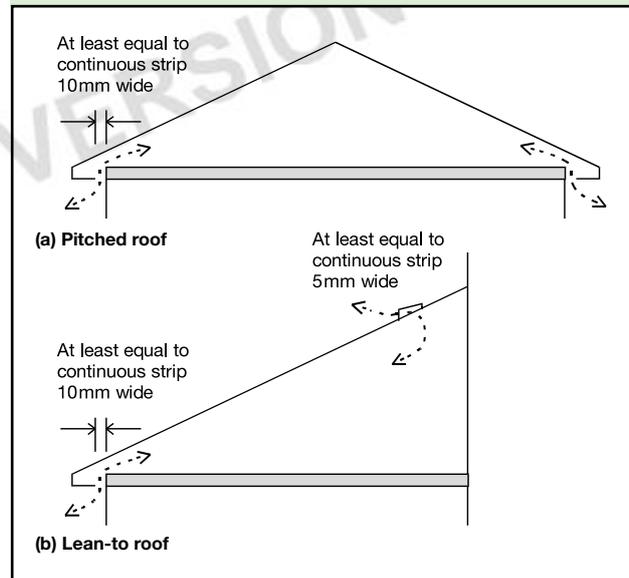
1.3 Purpose-made components are available to ensure that quilt and loose fill insulation will not obstruct the flow of air where the insulation and the roof meet.

1.4 A pitched roof which has a single slope and abuts a wall should have ventilation openings at eaves level and at high level. The ventilation at high level may be arranged at the junction of the roof and the wall or through the roof covering. If it is through the roof covering it should be placed as high as practicable. The area at high level should be at least equal to continuous ventilation running the full length of the junction and 5mm wide (see Diagram 6(b)).

Alternative approach

1.5 The requirement can also be met by following the relevant recommendations of BS 5250:1989 *Code of practice for the control of condensation in buildings*. The relevant clauses are 9.1, 9.2 and 9.4.

Diagram 6 Ventilating roof voids



Section 2: Roofs with a pitch less than 15° and those where the ceiling follows the pitch of the roof

2.1 These provisions also apply to roofs with a pitch of 15° or more if the ceiling follows the pitch of the roof.

2.2 Roof spaces should have ventilation openings in two opposite sides to promote cross ventilation. These openings should have an area at least equal to continuous ventilation running the full length of the eaves and 25mm wide (see Diagram 7(a)).

2.3 Roofs with a span exceeding 10m or other than a simple rectangle in plan may require more ventilation, totalling 0.6% of the roof area.

2.4 The void should have a free air space of at least 50mm between the roof deck and the insulation. Where joists run at right angles to the flow of air a suitable air space may be formed by using counter-battens.

2.5 Pitched roofs where the insulation follows the pitch of the roof also need ventilation at the ridge at least equal to continuous ventilation running the length of the ridge and 5mm wide (see Diagram 7 (b)).

2.6 Where the edges of the roof abut a wall or other obstruction in such a way that free air paths cannot be formed to promote cross ventilation or the movement of air outside any ventilation openings would be restricted, an alternative form of roof construction should be adopted (see paragraph 0.2 in F2).

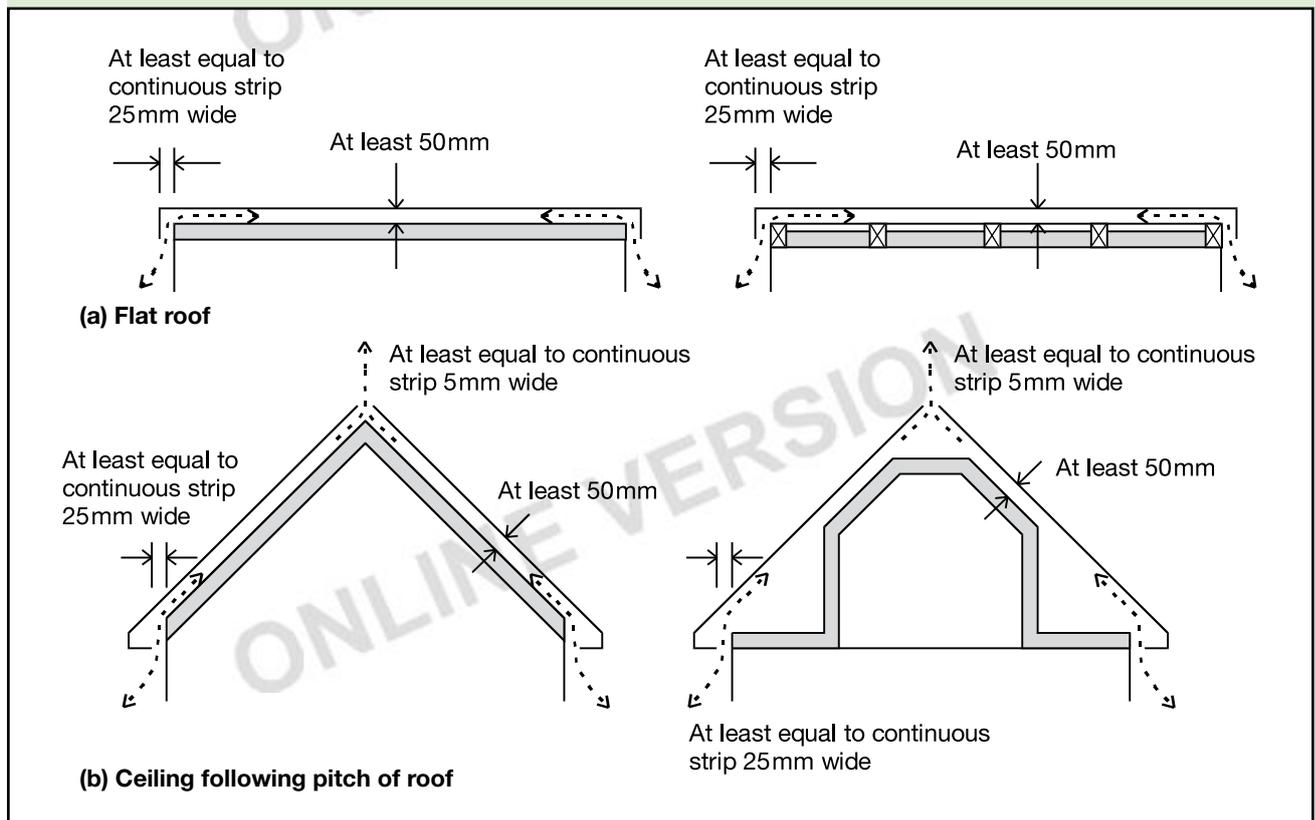
2.7 Vapour checks[†] can reduce the amount of moisture reaching a void but they cannot be relied on as an alternative to ventilation. A complete barrier to moisture is needed for this.

Alternative approach

2.8 The requirement can also be met by following the relevant recommendations of BS 5250:1989 *Code of practice for the control of condensation in buildings*. The relevant clauses are 9.1, 9.2 and 9.4.

[†] BS 5250 uses the term vapour control layer instead of vapour check.

Diagram 7 Ventilating roof voids



Standards referred to

F1 and F2

BS 4434:1989

Specification for safety aspects in the design, construction and installation of refrigerating appliances and systems.

(Withdrawn and superseded by BS 4434:1995.

Withdrawn and superseded by BS EN 378-1:2000, BS EN 378-2: 2000, BS EN 378-3:2000, BS EN 378-4:2000 Refrigerating systems and heat pumps.)

BS 5250:1989

Code of practice for the control of condensation in buildings.

(Withdrawn and superseded by BS 5250:2002

Code of practice for control of condensation in buildings.)

BS 5440-1:1990

Installation of flues and ventilation for gas appliances of rated input not exceeding 60kW (1st, 2nd and 3rd family gases). Specifications for installation of flues. AMD 8819 1995.

(Withdrawn and superseded by BS 5440-1:2000

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 flues. AMD 13983 2002, AMD 15981 2005.)

BS 5720:1979

Code of practice for mechanical ventilation and air-conditioning in buildings.

(Withdrawn.)

BS 5925:1991

Code of practice for ventilation principles and designing for natural ventilation. AMD 8930 1995.

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Information Paper IP 13/94 *Passive stack ventilation systems: design and installation*, 1994.

Report BR 262 *Thermal insulation: avoiding risks, 1994, 2nd edition*. ISBN 0 85125 632 5

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(Some sections have been withdrawn and others superseded by Guides B1, B2, B4, D, E and G)

Department for Education Design Note 29 *Fume cupboards*, 1982.
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Department for Education and Employment (DfEE) Building Bulletin 87 *Guidelines for environmental design in schools*, 1997. ISBN 0 11271 013 1
(Superseded by the 2nd edition 2003.)

OFTEC Technical Note TN/112 *The Building Regulations 1991 for England and Wales, Approved Document F1, Means of ventilation – oil fired appliances and extract fans*.
(Superseded by *Technical Information Note T1/112 Technical advice on oil fired appliances and extract fans*, 2005. Available to download from www.oftec.co.uk)

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