Building Regulations 2002

Technical Guidance Document F

Ventilation

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Amendments issued since publication

Technical Guidance Document F (2002) - Ventilation

Amd. No.	*Text Affected*
F(i)	Table 1:- Background Ventilation in Bathrooms:- Replace 6500 m^2 per bath/shower with 6500 mm^2 per bath/shower.
F(ii)	Table 1:- Background Ventilation in Sanitary Accommodation:- Replace 6500 m^2 per WC with 6500 mm^2 per WC.

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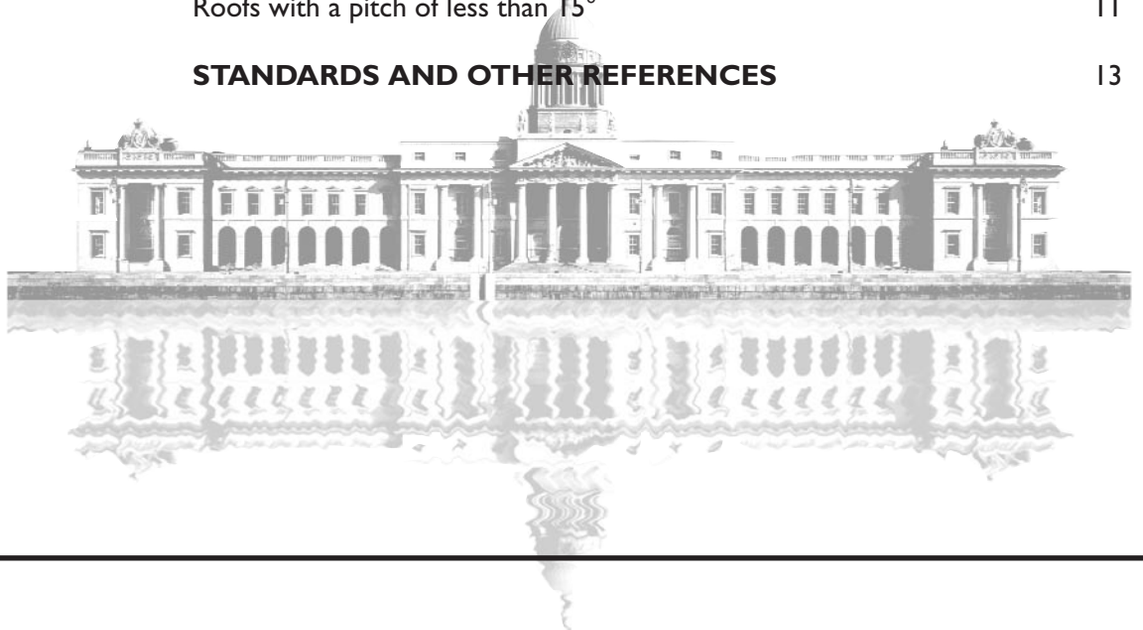


Building Regulations, 2002
Technical Guidance Document F
Ventilation

Introduction

This document has been published by the Minister for the Environment and Local Government under article 7 of the Building Regulations 1997. It provides guidance in relation to Part F of the Second Schedule to the Regulations as amended by the Building Regulations (Amendment) (No. 2) Regulations 2002. The document should be read in conjunction with the Building Regulations, 1997 and other documents published under these Regulations.

In general, Building Regulations apply to the construction of new buildings and to extensions and material alterations to buildings. In addition, certain parts of the Regulations apply to existing buildings where a material change of use takes place. Otherwise, Building Regulations do not apply to buildings constructed prior to 1 June, 1992.

Transitional Arrangements

In general, this document applies to works, or buildings in which a material change of use takes place, where the works or the change of use commence or takes place, as the case may be, on or after 1 January 2003. Technical Guidance Document F - **Ventilation** dated 1997, also ceases to have effect from that date. However, the latter document may continue to be used in the case of buildings

- where the work or the change of use commence or takes place, as the case may be, on or before 31 December 2002, or

- where planning approval or permission has been applied for on or before 31 December, 2002 and substantial work has been completed by 31 December, 2005, or a notice pursuant to Part 8 of the Planning and Development Regulations 2001, has been published on or before 31 December, 2002 and substantial work has been completed by 31 December, 2005.

  "Substantial work has been completed" means that the structure of the external walls of the house or flat has been erected.

The Guidance

The materials, methods of construction, standards and other specifications (including technical specifications) which are referred to in this document are those which are likely to be suitable for the purposes of the Regulations. Where works are carried out in accordance with the guidance in this document, this will, prima facie, indicate compliance with Part F of the Second Schedule to the Building Regulations. However, the adoption of an approach other than that outlined in the guidance is not precluded provided that the relevant requirements of the Regulations are complied with. Those involved in the design and construction of a building may be required by the relevant building control authority to provide such evidence as is necessary to establish that the requirements of the Building Regulations are being complied with.

Existing Buildings

In the case of material alterations or change of use of existing buildings, the adoption without modification of the guidance in this document may not, in all circumstances, be appropriate. In particular, the adherence to guidance, including codes, standards or technical specifications, intended for application to new work may be unduly restrictive or impracticable. Buildings of architectural or historical interest are especially likely to give rise to such circumstances. In these situations, alternative approaches based on the principles contained in the document may be more relevant and should be considered.

Technical Specifications

Building Regulations are made for specific purposes, e.g. to provide, in relation to buildings, for the health, safety and welfare of persons, the conservation of energy and access for disabled persons. Technical specifications (including harmonised European Standards, European Technical Approvals, National Standards and Agrément Certificates) are relevant to the extent that they relate to these considerations. Any reference to a technical specification is a reference to so much of the specification as is relevant in the context in which it arises. Technical specifications may also address other aspects not covered by the Regulations.

A reference to a technical specification is to the latest edition (including any amendments, supplements or addenda) current at the date of publication of this Technical Guidance Document.

However, if this version of the technical specification is subsequently revised or updated by the issuing body, the new version may be used as a source of guidance provided that it continues to address the relevant requirements of the Regulations.

Materials and Workmanship

Under Part D of the Second Schedule to the Building Regulations, building work to which the Regulations apply must be carried out with proper materials and in a workmanlike manner. Guidance in relation to compliance with Part D is contained in Technical Guidance Document D.

Interpretation

In this document, a reference to a section, sub-section, part, paragraph or diagram is, unless otherwise stated, a reference to a section, sub-section, part, paragraph or diagram, as the case may be, of this document. A reference to another Technical Guidance Document is a reference to the latest edition of a document published by the Minister for the Environment and Local Government under article 7 of the Building Regulations, 1997. Diagrams are used in this document to illustrate particular aspects of construction - they may not show all the details of construction.

Building Regulations - The Requirement

Part F of the Second Schedule to the Building Regulations 2002 provides as follows:-

Means of ventilation.	F1	Adequate means of ventilation shall be provided for people in buildings, including adequate provision for the removal of water vapour from kitchens, bathrooms and other areas where water vapour is generated.
Condensation in roofs.	F2	Adequate provision shall be made to prevent excessive condensation in a roof or in a roof void above an insulated ceiling.

This Technical Guidance Document is divided into two sections.

Section 1 relates to the requirement in F1.

Section 2 relates to the requirement in F2.

Section 1
Means of Ventilation

Means of ventilation.	F1	Adequate means of ventilation shall be provided for people in buildings, including adequate provision for the removal of water vapour from kitchens, bathrooms and other areas where water vapour is generated.

GENERAL

1.1 The ventilation system should:

(a) provide an adequate supply of fresh air for persons using an area in a building,

(b) achieve occasional rapid ventilation for the dilution of pollutants and of moisture likely to produce condensation in habitable rooms, kitchens and rooms containing sanitary appliances, and

(c) extract moisture from areas where it is produced in significant quantities (e.g. kitchens and bathrooms).

1.2 In this Document -

"background ventilation" means ventilation by means of a secure ventilation opening (or openings) consisting of a wall or window ventilator with a controllable ventilation grill and located so as to reduce drafts;

"habitable room" means a room in a dwelling used for living or sleeping purposes but does not include a kitchen having a floor area of less than 6.5 m^2;

"kitchen" means a room or part of a room used primarily for the preparation and cooking of food;

"mechanical extract ventilation" means a system of ventilation operated by a power driven mechanism which extracts air from a room and discharges it only to the external air;

"occupiable room" means a room in a building other than a dwelling, occupied as an office, workroom, classroom, hotel bedroom or similar room but does not include 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" means a ventilation system using ducts from high level locations within rooms to terminals on or above the roof, which provides a flow of air 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;

"rapid ventilation" means ventilation by means of a large adjustable ventilation opening or openings which will allow the movement of a substantial volume of air in a short time period e.g. an opening window or door, and with some part of the ventilation opening at least 1.75 m above the floor level;

"ventilation opening" means any means of permanent or controllable ventilation which -

- opens directly to the external air, and
- except in the case of a screen, fascia, baffle, etc., has a smallest dimension of at least 8 mm,

but does not include a flue to a chimney;

"utility room" means a room used for laundry purposes which contains a sink, washing machine, tumble drier or similar equipment and which is not entered solely from outside the building.

1.3 Ventilation to achieve the objectives set out in Paragraph 1.1 may be achieved by natural ventilation, or through the supply or extraction of air by mechanical means, or by a combination of these methods. The guidance in this Document relates only to non-complex buildings of normal design and construction where natural ventilation constitutes the primary means of ventilation.

Paragraphs 1.4 to 1.13 give some guidance on good practice in relation to the ventilation of dwellings (see Diagram 1).

Paragraphs 1.14 to 1.16 provide guidance in relation to buildings other than dwellings.

1.4 Where a room or space contains a heat producing appliance, permanent ventilation may be required. See Technical Guidance Document J - Heat Producing Appliances.

Regard shall also be had to the requirements of Part B - Fire Safety when dealing with the provision of ventilation and air inlet openings.

DWELLINGS

Habitable Rooms

1.5 In a habitable room other than a utility room, a kitchen or a room containing a kitchen, the following provision for ventilation should be adequate:

(a) a ventilation opening suitable for background ventilation having a total area not less than 6500 mm^2, and

(b) a ventilation opening suitable for rapid ventilation having a total area of at least 1/20th of the floor area of the room.

1.6 If ventilation is through another room or space or into a court, see pars. 1.9 to 1.11.

Kitchens and Utility Rooms

1.7 In a utility room, a kitchen or a room containing a kitchen, the following provision for ventilation should be adequate:

(a) a ventilation opening suitable for background ventilation having a total area of not less than 6500 mm^2, and

(b) a ventilation opening suitable for rapid ventilation having a total area of at least 1/20th of the floor area, and

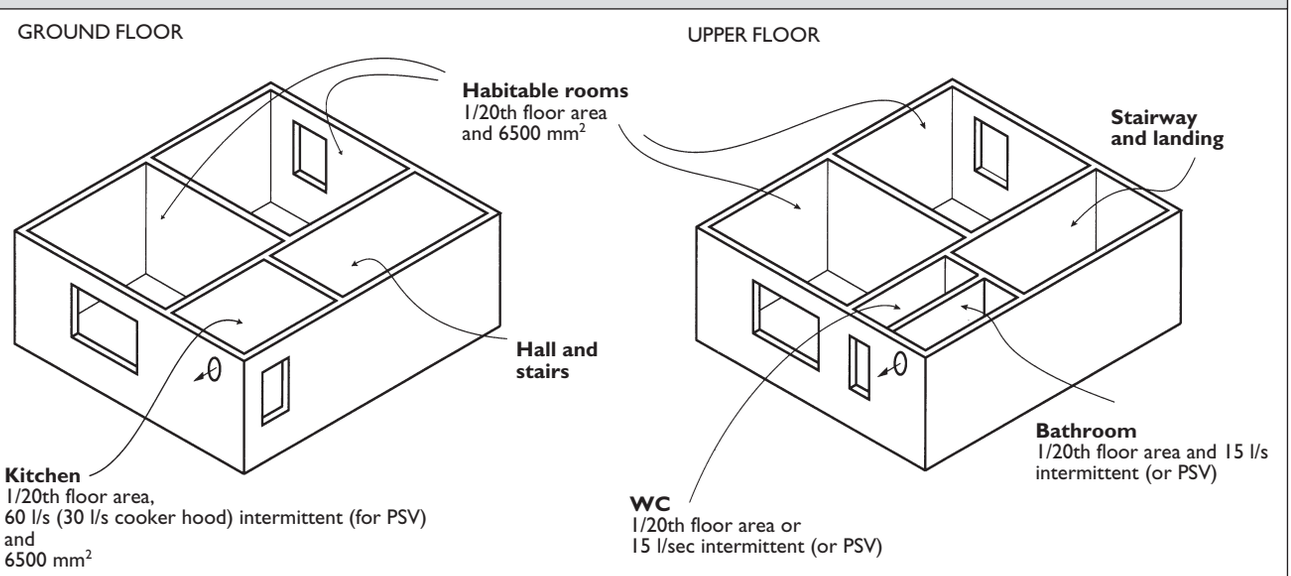
(c) (i) mechanical extract ventilation capable of extracting at a rate of 60 litres per second (or at a rate of 30 litres per second where the ventilation extract is incorporated in a cooker hood), which may be operated intermittently, e.g. when moisture vapour is being created during cooking, washing, etc., or

(ii) passive stack ventilation (PSV) designed and installed in accordance with BRE IP 13/94 and incorporating an automatic humidity sensitive ventilation inlet control grille.

Where a kitchen or utility room has a floor area of less than 6.5m^2 and does not contain an openable window or external door, e.g. an internal non-habitable room, provision of either c(i) or c(ii) above should be adequate. However, if mechanical extract ventilation is provided, it should include an automatic 15 minutes overrun, (after switch-off) or be controlled by humidistat. Provision should also be made for air supply to each room e.g. a 10 mm gap under the door or equivalent.

Where a kitchen or utility room contains an open-flued appliance which is the main source of space heating or hot water heating for the dwelling, or which has a flue with a free area of at least the equivalent of a 125mm diameter duct, and both flue and air inlets are permanently open, i.e. with no control dampers, the provision of either mechanical extract ventilation or passive stack ventilation should not be necessary.

Diagram 1 **Ventilation of a typical dwelling** *Par. 1.3*



Guidance in relation to the provision of mechanical extract ventilation in conjunction with open flued appliances is given in Paragraph 1.12.

Bathrooms and Sanitary Accommodation

1.8 In a bathroom (with or without a WC), the following provision for ventilation should be adequate:

(a) a ventilation opening suitable for rapid ventilation having a total area of at least 1/20th of the floor area, and

(b) (i) mechanical extract ventilation capable of extracting at a rate of 15 litres per second, or

(ii) passive stack ventilation (PSV) designed and installed in accordance with BRE IP 13/94 and incorporating an automatic humidity sensitive ventilation inlet control grille.

In sanitary accommodation (separate from bathroom), provision of either (a) or (b) above should be satisfactory.

Where a bathroom or sanitary accommodation does not contain an openable window or external door, e.g. an internal room, the provision of b(i) or b(ii) should be adequate. A ventilation opening for rapid ventilation need not be provided. However, if mechanical extract ventilation is provided, it should include an automatic 15 minutes overrun, (after switch-off) or should be controlled by humidistat. In addition appropriate provision for air supply should be made.

Ventilation of Habitable Rooms through other rooms and spaces

1.9 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 (see Diagram 2).

1.10 A habitable room may be ventilated through an adjoining space (see Diagram 3) if -

(a) the adjoining space is a conservatory or similar space, and

(b) there is an opening (which may be closeable) between the room and the space, with an area not less than 1/20th of the combined floor area of the room and space, and

Diagram 2 **Two rooms treated as a single room for ventilation purposes** *Par. 1.9*

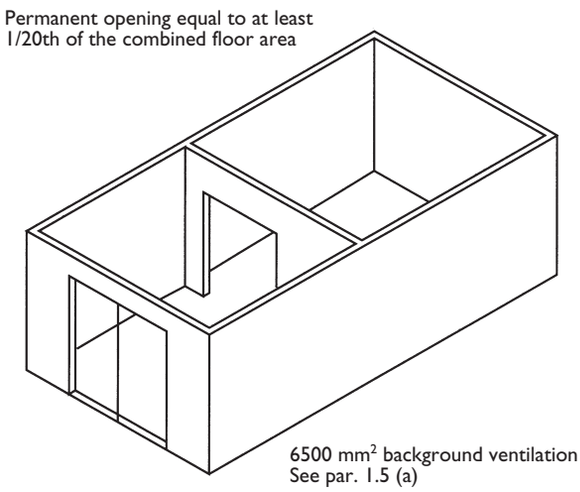
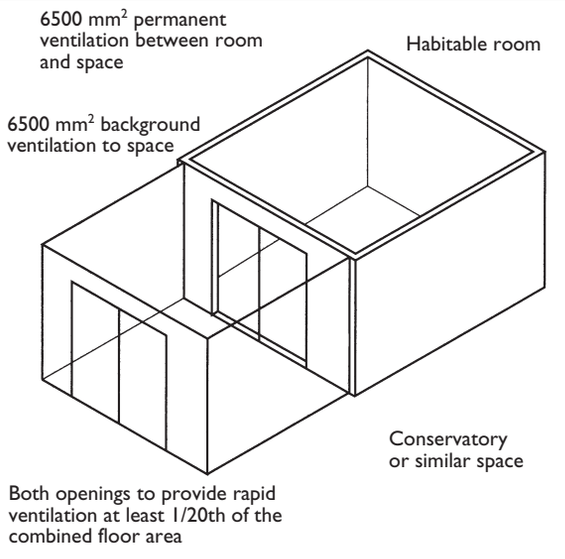


Diagram 3 **A habitable room ventilated through an adjoining space** *Par. 1.10*



(c) provision is made for-

(i) background ventilation to the space, and

(ii) one or more permanent openings for ventilation purposes between the room and the space consisting of a wall or window ventilator,

each having a total area not less than 6500 mm² and located so as to avoid undue drafts, and

(d) provision is made for rapid ventilation to the space with a total area not less that 1/20th of the combined floor area of the room and space, and

(e) the space is not connected to another room which has no alternative means of natural ventilation other than through the space, and

(f) provision is made for mechanical extract or passive stack ventilation if the room contains a kitchen.

Ventilating to a Court

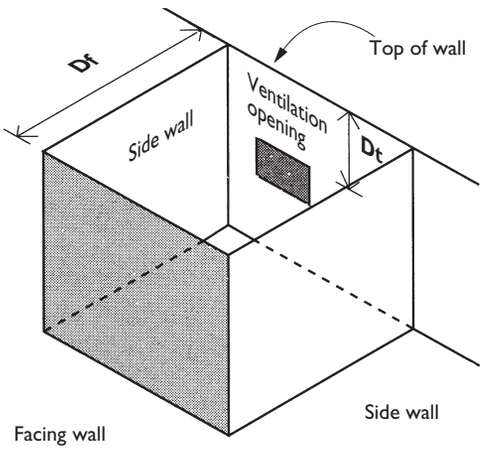
1.11 Where a building contains a court and a ventilation opening serving a habitable room in a dwelling faces a wall nearer than 15 m, the following minimum distances should be maintained:

(a) if there is a wall on each side of the opening (forming a closed court) (see Diagram 4(a)), then the vertical distance from the top of the opening to the top of the wall containing the opening, Dt, should be less than twice the horizontal distance from the opening to the facing wall, Df, or

(b) if there is a wall on only one side of the opening (forming an open court) (see Diagram 4(b)), and if the length of the facing wall, Dl, is more than twice the horizontal distance from the opening to the facing wall, Df, then either -

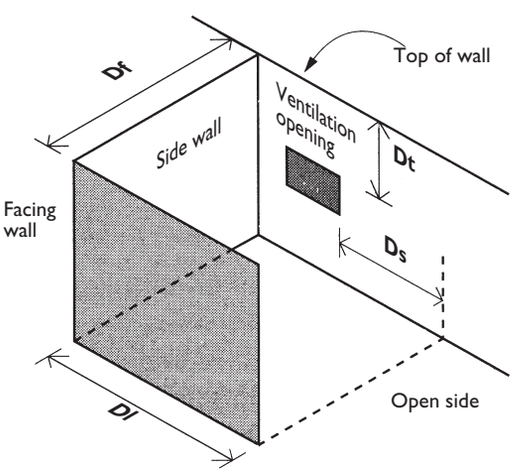
(i) the vertical distance from the top of the opening to the top of the wall containing the opening, Dt, or

Diagram 4 **Ventilating a habitable room to enclosed court** *Par. 1.11*



Dt should be less than twice **Df**

A. CLOSED COURT



If **Dl** is more than **2Df**,

Dt should be less than twice **Df**
or
Ds should be less than twice **Df**

B. OPEN COURT

(ii) the horizontal distance from the side of the opening to the open side of the court, Ds,

should be less than twice the horizontal distance from the opening to the facing wall, Df.

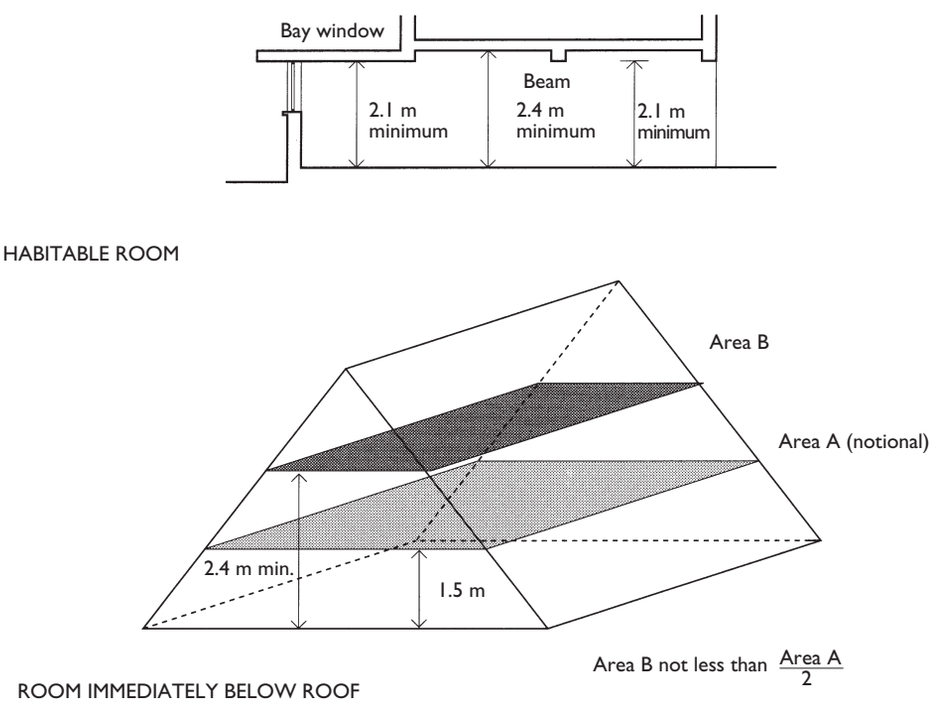
Rooms with Open Flued appliances

1.12 Where habitable rooms or kitchens contain an open-flued appliance, reduced rates of extraction may be appropriate. Reference should be made to BRE Information Paper IP 7/94 Spillage of flue gases from solid-fuel combustion appliances and BRE Information Paper IP 21/92, spillage of flue gases from open-flued combustion appliances.

Height of Habitable Rooms

1.13 Ceiling height is one of a number of factors which affect ventilation of habitable rooms. The suggested dimensions in Diagram 5 are consistent with good room design, the use of standard materials and good building practice.

Diagram 5 **Suggested height of habitable rooms** *Par. 1.13*



BUILDINGS OTHER THAN DWELLINGS

1.14 In any building other than a dwelling, any occupiable room, kitchen, bathroom and sanitary accommodation shall have ventilation openings in accordance with Table 1 and where appropriate par. 1.16.

Non-occupiable Internal Rooms

1.15 Where a kitchen, bathroom or sanitary accommodation is an internal room, it shall have mechanical extract ventilation to extract air at a rate of not less than that given in Table 2, and a permanently open air inlet having a clear opening area of at least 9000 mm^2.

Rest Rooms

1.16 In rest rooms where smoking is permitted, mechanical extract ventilation at a rate of not less than 16 litres/second per person shall be provided in addition to the provisions in Table 1.

1.17 Certain types of buildings such as offices, shops, factories, etc. may be subject to specific legislative requirements. The relevant legislation should be consulted.

Table 1 **Ventilation of room direct to external air**

Room (1)	**Rapid ventilation**	**Background ventilation**	**Mechanical extract ventilation** (2)
Occupiable room	1/20 of floor area	(i) Floor area up to 10 m^2 - 6500 mm^2 (ii) Floor area over 10 m^2 - 650 mm^2/m^2 floor area	-
Kitchen (3)	1/20 of floor area	6500 mm^2	60 litres/second or 30 litres/second (4)
Bathrooms (including shower-rooms)	1/20 of floor area	6500 mm^2 per bath/shower	15 litres/second per bath/shower
Sanitary accommodation (and/or washing facilities)	1/20 of floor area (5)	6500 mm^2 per WC	

Notes to Table
1. For rooms where smoking is permitted, see par. 1.16.
2. Where an open-flued appliance is provided in a building with mechanical extract ventilation, 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 par. 1.12.
3. This provision is for a domestic size kitchen where the appliances and usage are of a domestic nature. Guidance on the ventilation required for commercial kitchens is given in CIBSE Guide B. Table B2.3 and B2.11.
4. Incorporated within a cooker hood.
5. As an alternative, mechanical extract ventilation at 6 litres/second per WC or 3 air changes per hour may be provided.

Table 2 **Ventilation of non-occupiable internal rooms**

Room	**Mechanical extract ventilation (1)(2)**
Kitchen (3)	60 litres/second or 30 litres/second (4)
Bathroom (including shower rooms)	15 litres/second per bath/shower
Sanitary accommodation (and/or washing facilities)	6 litres/second per WC or 3 air changes per hour

Notes to Table
1. This ventilation shall have at least a 15 minute overrun and shall be activated either automatically or manually (e.g. by the operation of a light switch).
2. Where an open-flued appliance is provided in a building with mechanical extract ventilation, 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 par. 1.12.
3. This provision is for a domestic size kitchen where the appliances and usage is of a domestic nature. Guidance on the ventilation required for commmercial kitchens is given in CIBSE Guide B, Tables B2.3 and B2.11.
4. Incorporated within a cooker hood.

Section 2
Condensation in Roofs

Condensation in roofs.	F2	Adequate provision shall be made to prevent excessive condensation in a roof or in a roof void above an insulated ceiling.

General

2.1 Condensation in a roof and in the spaces above insulated ceilings should be 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.

2.2 The traditional method of limiting condensation in roof spaces is through the provision of adequate ventilation for cavities or attic spaces on the cold side of the roof insulation. Alternatively, where such cavities or spaces are absent, an effective vapour barrier is provided on the warm side of the insulation so that vapour from the building cannot permeate the insulation. Paragraphs 2.3 to 2.19 give some guidance on good practice in relation to non-complex buildings of normal design and construction, where the primary mechanism for achieving the limitation of condensation is the ventilation of roof voids or cavities. Effective limitation of condensation can also be achieved by other means including the use of vapour permeable or breathable roofing membranes. Where such methods are used, regard should be had to the requirements of Part D of the Building Regulations with regard to the use of proper materials and the guidance given in the Technical Guidance Document to Part D in that regard.

2.3 Roofs where the moisture from the building can permeate the insulation, e.g. cold deck roofs, should be ventilated in accordance with pars. 2.10 to 2.13 or in accordance with pars. 2.14 to 2.18 depending on the roof type and slope.

2.4 In addition to ensuring adequate ventilation, transfer of water vapour to cold roof voids should be limited as far as practicable. Care should be taken to seal around all penetrations of pipes, ducts, wiring, etc., through the ceilings, including provision of an effective seal to the attic access hatch.

Use of a vapour control layer at ceiling level, on the warm side of the insulation, will assist in limiting vapour transfer, but cannot be relied on as an alternative to ventilation. In particular, a vapour control layer should be used where the roof pitch is less than 15°, or where the shape of the roof is such that there is difficulty in ensuring adequate ventilation, e.g. room-in-the-roof.

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.

2.5 Roofs where the moisture from the building cannot permeate the insulation e.g. warm deck roofs or inverted roofs, need not be ventilated.

2.6 Guidance is given for pitched roofs with a pitch greater than 15° in pars. 2.10 to 2.13. Guidance is given for flat roofs and pitched roofs with a pitch less than 15° in pars. 2.14 to 2.19. However, if the ceiling of a room follows the pitch of the roof, ventilation should be provided as if it were a flat roof, irrespective of the slope of the roof.

2.7 Although a part of a roof which has a pitch of 70° or more may be insulated as though it were a wall (see Technical Guidance Document L), Requirement F2 applies to roofs of any pitch.

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

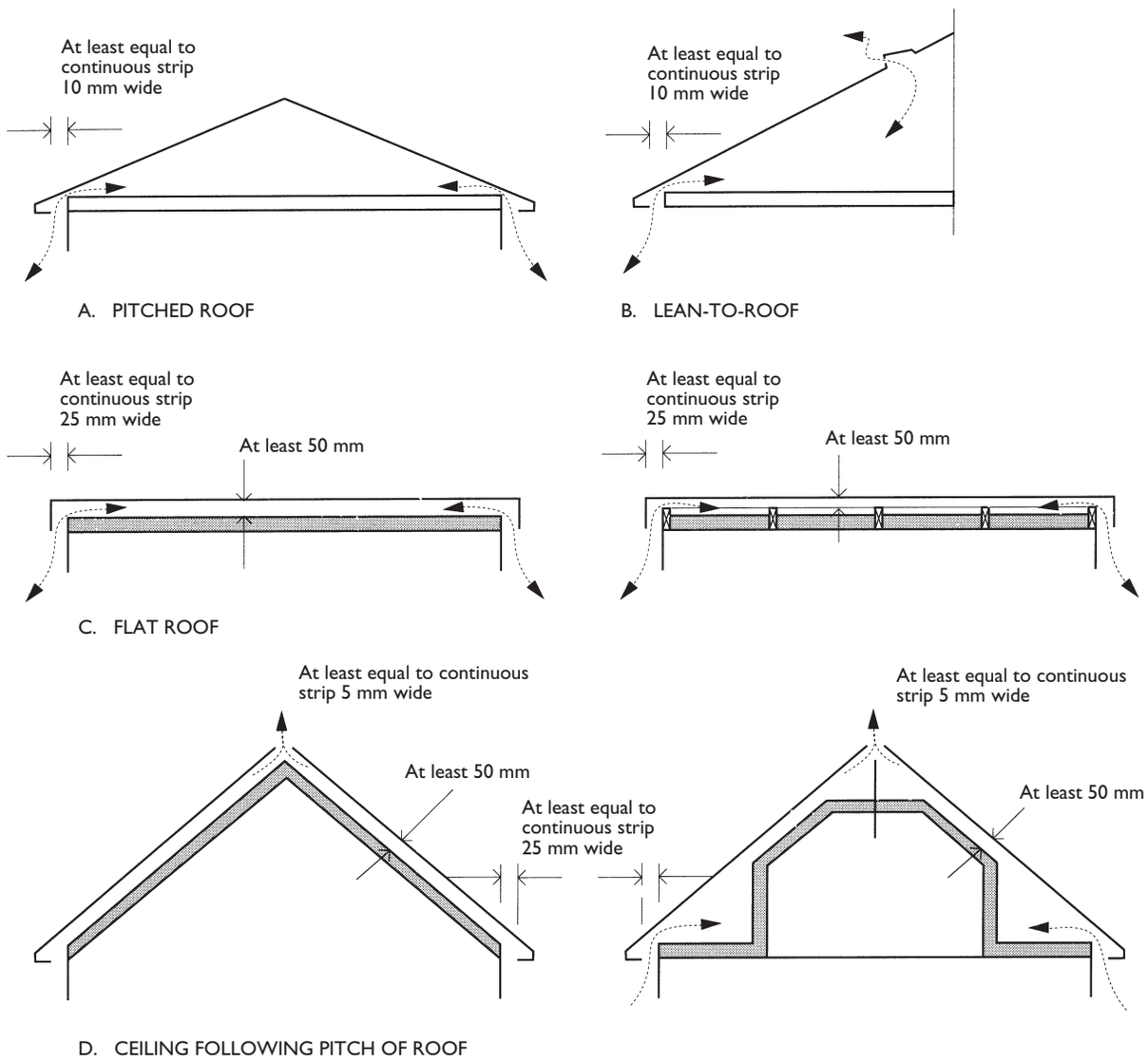
2.9 Further guidance in relation to condensation in roofs is contained in BS 5250 : 2002 : Code of practice for control of condensation in buildings. Additional guidance is given in the BRE publication "Thermal Insulation - avoiding risks".

Roofs with a pitch of 15° or more (Pitched Roofs)

2.10 If the ceiling follows the pitch of the roof, see pars. 2.14 to 2.19.

2.11 Pitched roof spaces should have ventilation openings at eaves level to promote cross-ventilation.

Diagram 6 **Ventilating roof voids** *Par. 2.11*



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

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

2.13 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 5 mm wide (see Diagram 6(b)).

Roofs with a pitch of less than 15° and roofs of any pitch where the ceiling follows the pitch of the roof

2.14 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 25 mm wide (see Diagram 6(c)).

2.15 Roofs with a span exceeding 10 m, or with a plain shape other than a simple rectangle, may require its ventilation to be increased to 0.6% of the roof area.

2.16 The void should have a free air space of at least 50 mm 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.

2.17 Where the insulation follows the pitch of the roof, ventilation at the ridge, at least equal to continuous ventilation running the length of the ridge and 5 mm wide, is also needed (see Diagram 6(d)).

2.18 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 par. 2.5).

2.19 A vapour control layer on the warm side of the insulation should generally be installed in the case of flat roof and roofs with a pitch of 15° or less.

Standards and other references

BS 5250 : 2002 Code of practice for control of condensation in buildings

BS 5720 : 1979 Code of practice for mechanical ventilation and air conditioning in buildings

BS 5925 : 1991 Code of practice for ventilation principles and designing for natural ventilation

Building Research Establishment, IP 21/92 “Spillage of flue gases from open-flued combustion appliances”

Building Research Establishment, IP 7/94 “Spillage of flue gases from solid-fuel combustion appliances”

Building Research Establishment, IP 13/94 “Passive stack ventilation systems: design and installation”

Building Research Establishment, BR 262 "Thermal Insulation - avoiding risks"

CIBSE Guide B2: Ventilation and Air Conditioning, 2001.