

# Building Regulations 1997

## Technical Guidance Document F

### Ventilation

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(Teil: 01-6613111, fo-líne 4040/4045: Fax: 01-475 2760)  
nó trí aon díoltóir leabhar.

**DUBLIN:**  
**PUBLISHED BY THE STATIONERY OFFICE.**

To be purchased directly from the  
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SUN ALLIANCE HOUSE, MOLESWORTH STREET, DUBLIN 2,  
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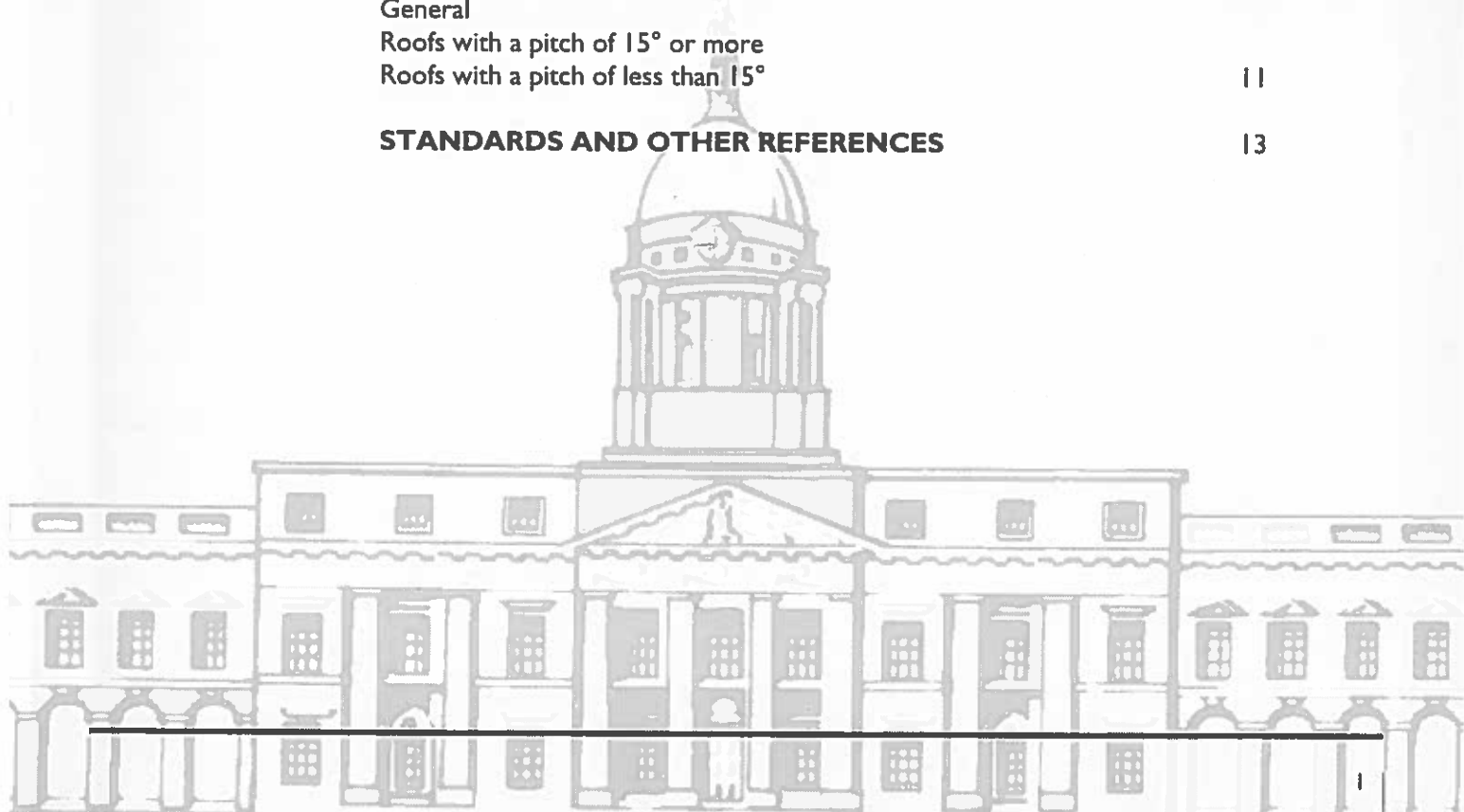


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# Building Regulations, 1997

## Technical Guidance Document F

### Ventilation

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#### Introduction

This document has been published by the Minister for the Environment under article 7 of the Building Regulations, 1997. It provides guidance in relation to Part F of the Second Schedule to the Regulations. 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, 1998. Technical Guidance Document F - VENTILATION, dated 1991, also ceases to have effect from that date. However, the latter document may continue to be used in the case of 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, before 1 January, 1998,
- in respect of which a Fire Safety Certificate under the Building Control Regulations, 1991 to 1994, has been granted, where the works or change of use commence or takes place, as the case may be, not later than 31 December, 2002.

#### 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 changes 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 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.

# Ventilation

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## Building Regulations - The Requirement

Part F of the Second Schedule to the Building Regulations, 1997, provides as follows:-

Means of ventilation.	F1	Adequate means of ventilation shall be provided for people in buildings.
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.	FI	Adequate means of ventilation shall be provided for people in buildings.
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### 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;

**“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;

**“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 may be provided by natural or mechanical means. Guidance in relation to mechanical ventilation may be found in BS 5720: 1979 Code of Practice for mechanical ventilation and air conditioning in buildings.

The guidance contained in this Technical Guidance Document relates only to non-complex buildings of normal design and construction.

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.

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

### Dwellings

#### Habitable Rooms and Utility Rooms

1.4 Habitable room means a room used for living or sleeping purposes but does not include a kitchen having a floor area of less than 6.5 m<sup>2</sup> (see par. 1.13 for height of habitable rooms).

1.5 In a habitable room, provision should be made for:

- (a) background ventilation having a total area not less than 6500 mm<sup>2</sup>, and
- (b) 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

**1.7** In a kitchen having a floor area less than 6.5 m<sup>2</sup>, provision should be made for:

- (a) (i) background ventilation having a total area not less than 6500 mm<sup>2</sup>, or
  - (ii) mechanical extract ventilation capable of operating continuously at nominally one air-change per hour, and
- (b) (i) rapid ventilation having a total area of at least 1/10th of the floor area of the kitchen, or
  - (ii) 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 is incorporated in a cooker hood), which may be operated intermittently, for instance during cooking.

### Bathrooms and Sanitary accommodation

**1.8** Provision should be made for ventilation, either by:

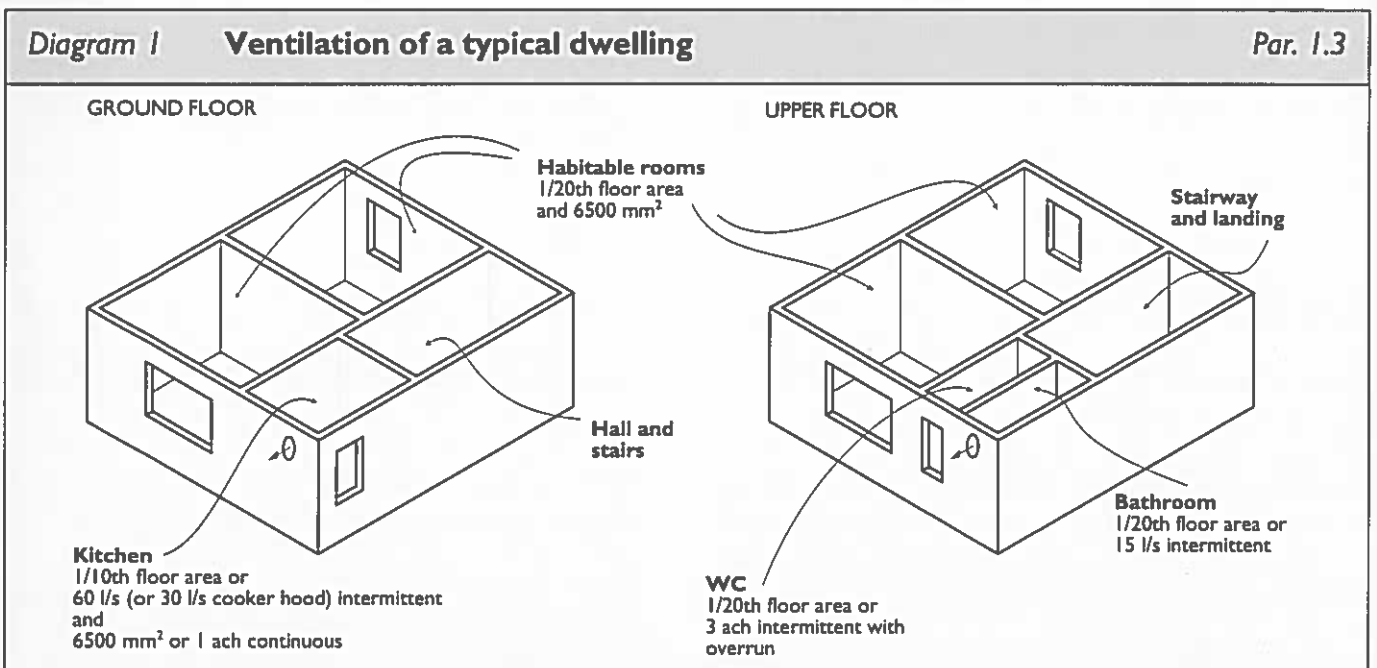
- (a) rapid ventilation having a total area of at least 1/20th of the floor area of the room, or
- (b) mechanical extract ventilation capable of extracting at a rate of 15 litres per second, which may be operated intermittently.

### 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).

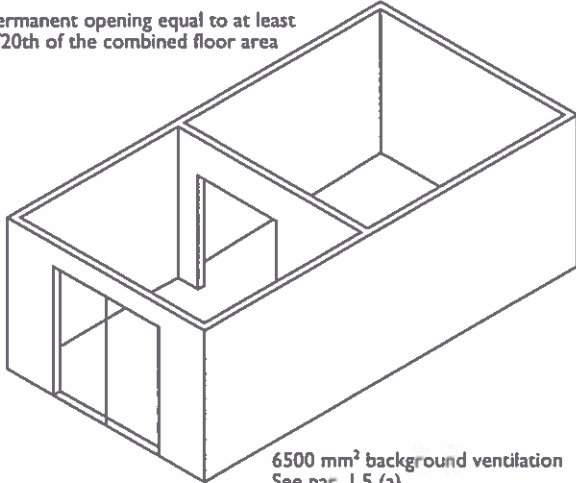
**1.10** A habitable room may be ventilated through an adjoining space (see Diagram 3) if -

- (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*

Permanent opening equal to at least 1/20th of the combined floor area

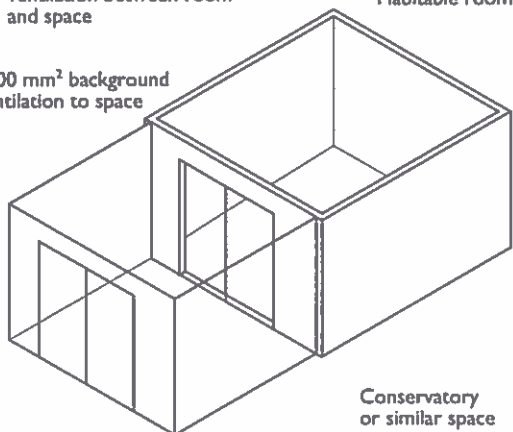


Provision for rapid ventilation at least 1/20th of the combined floor area

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

6500 mm<sup>2</sup> permanent ventilation between room and space

6500 mm<sup>2</sup> background ventilation to space



Both openings to provide rapid ventilation at least 1/20th of the combined floor area

each having a total area not less than 6500 mm<sup>2</sup> 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 than 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.

### 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,  $D_t$ , should be less than twice the horizontal distance from the opening to the facing wall,  $D_f$ , 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,  $D_l$ , is more than twice the horizontal distance from the opening to the facing wall,  $D_f$ , then either -
  - (i) the vertical distance from the top of the opening to the top of the wall containing the opening,  $D_t$ , or
  - (ii) the horizontal distance from the side of the opening to the open side of the court,  $D_s$ ,

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

### Rooms with Open Flued appliances

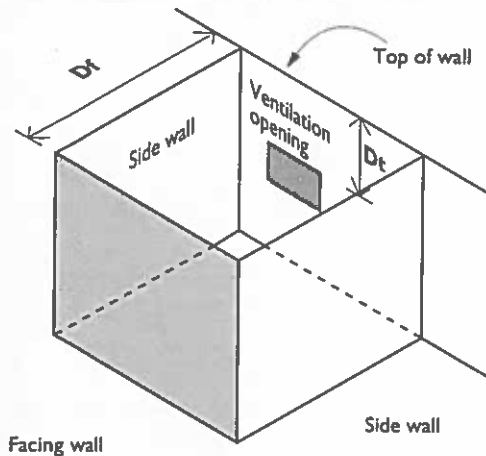
**1.12** Where habitable rooms or kitchens contain an open-flued appliance, reduced rates of extraction

- (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,



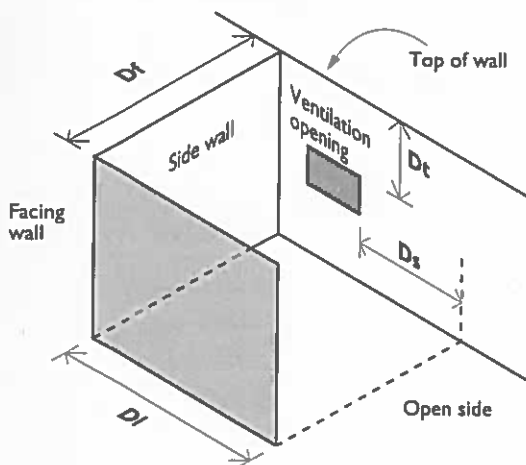
**Diagram 4 Ventilating a habitable room to enclosed court**

Par. 1.11



$D_t$  should be less than twice  $D_f$

A. CLOSED COURT



If  $D_l$  is more than  $2D_f$ ,

$D_t$  should be less than twice  $D_f$   
or  
 $D_s$  should be less than twice  $D_f$

B. OPEN COURT

may be appropriate. Reference should be made to BRE Information Paper IP 7/94 Spillage of flue gases from solid-fuel 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.

### 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.

### 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.

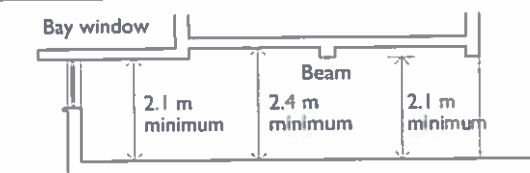
*Note:*

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

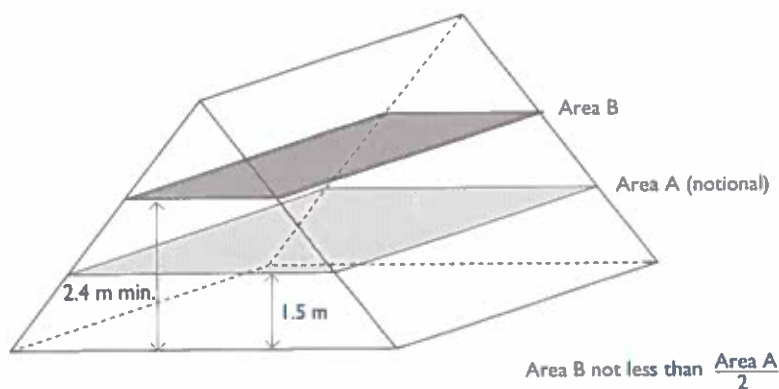
Diagram 5

## Suggested height of habitable rooms

Par. 1.13



HABITABLE ROOM



ROOM IMMEDIATELY BELOW ROOF

Table 1 Ventilation of room direct to external air

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

## Notes to Table

- For rooms where smoking is permitted, see par. 1.16.
- 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.
- 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.
- Incorporated within a cooker hood.
- As an alternative, mechanical extract ventilation at 6 litres/second per WC or 3 air changes per hour may be provided.

<b>Table 2 Ventilation of non-occupiable internal rooms</b>	
<b>Room</b>	<b>Mechanical extract ventilation (1)(2)</b>
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 commercial 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.
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### General

2.1 Paragraphs 2.2 to 2.19 give some guidance on good practice insofar as it relates on non-complex buildings of normal design and construction.

2.2 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.

2.3 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.

2.4 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.

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 in pars. 2.10 to 2.13. However, if the ceiling of a room follows the pitch of the roof, ventilation should be provided as if it were a flat roof.

2.7 Guidance is given for flat roofs in pars. 2.14 to 2.19.

2.8 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.

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

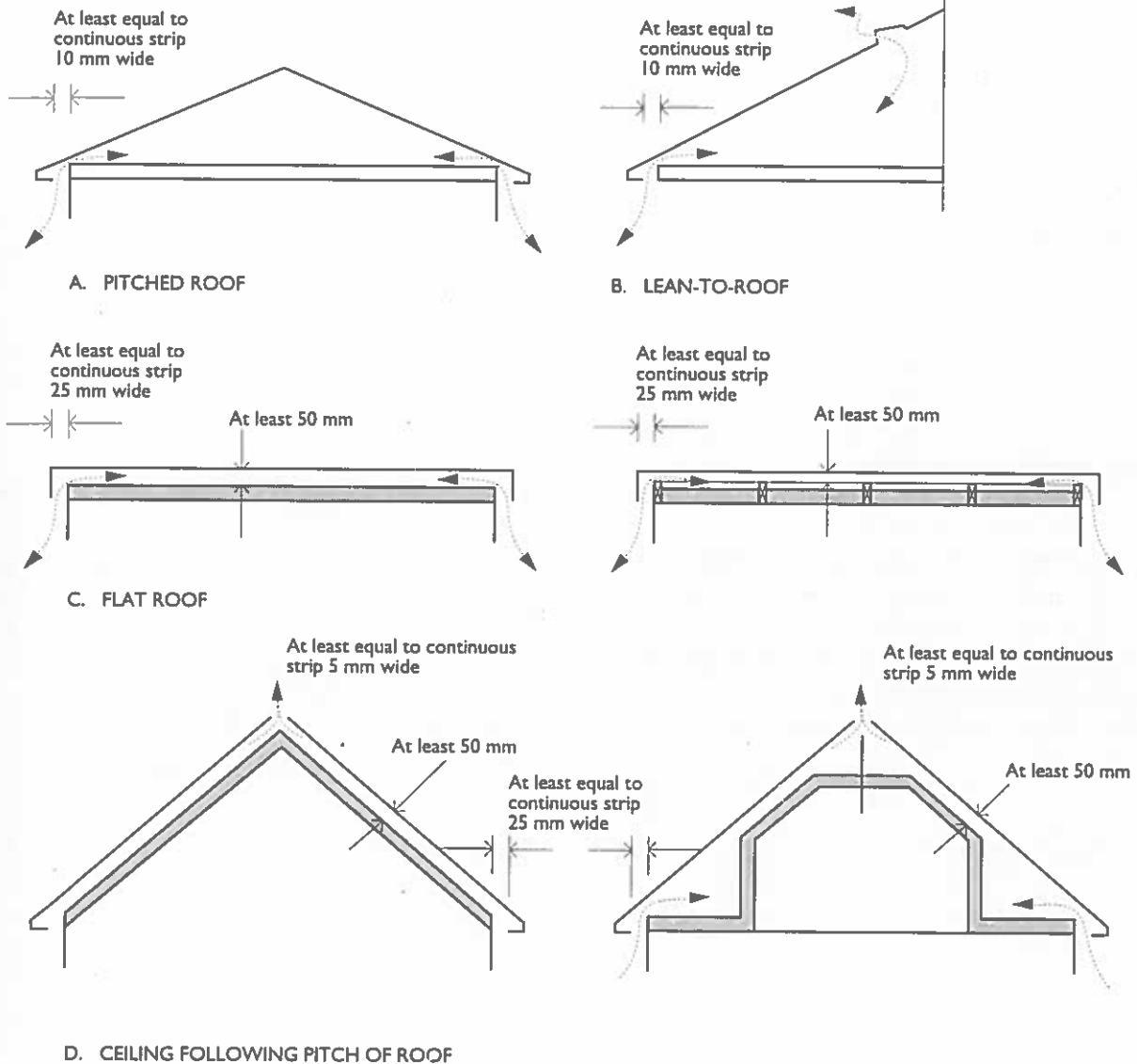
### Roofs with a pitch of 15° or more (Pitched Roofs)

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. 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.

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**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 complete barrier to moisture may be provided as an alternative to ventilation. While vapour checks can reduce the amount of moisture reaching a void, they cannot be relied upon as an alternative to ventilation.

**2.20** Further guidance in relation to condensation in roofs is contained in BS 5250 : 1989 : Code of practice for control of condensation in buildings. Additional guidance is given in the BRE publication "Thermal Insulation - avoiding risks".

# *Standards and other references*

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**BS 5250 : 1989** 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** "Thermal Insulation - avoiding risks"

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

