

# Approved Document F – Ventilation

## Volume 1: dwellings

### Consultation version – January 2021

*This draft guidance accompanies the January 2021 consultation on The Future Buildings Standard: Consultation on changes to Part L (conservation of fuel and power) and Part F (ventilation) of the Building Regulations for non-domestic buildings and dwellings; and overheating in new residential buildings. The Government is seeking views on the standards for work to existing dwellings, and the structure of the draft guidance. The standards for new dwellings are not a subject of this consultation but have been included for reference.*

# Background

## How is construction regulated in England?

The Manual to the Building Regulations gives an overview of the building regulatory system in England. You can access the most recent version of the manual [here](#).



### Manual to the Building Regulations

A code of practice for use in England



## How do you comply with the Building Regulations?

The Building Regulations are made under powers provided in the Building Act 1984. This applies in England and Wales. The majority of building projects are required to comply with them. They exist to ensure the health and safety of people in and around all types of buildings (i.e. domestic, commercial and industrial). They also provide for energy conservation, and access to and use of buildings.

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

### Building work

Building work is a legal term used to define the scope of the Building Regulations. For further information, see Volume 1 and paragraph A14 in Volume 2 of the **Manual to the Building Regulations**.

### Material change of use

Building Regulations often apply when you change the use of a building, when it is a material change of use. This is discussed in paragraphs A14, A20 and Table A2 in Volume 2 of the **Manual to the Building Regulations**.

### Materials and workmanship

Regulation 7 of the Building Regulations place requirements on materials and workmanship. Chapter 7 in Volume 1 and paragraphs F8 – F11 in Volume 2 of the **Manual to the Building Regulations** provides a summary of how to meet the regulations.

### Independent third-party certification and accreditation

For information about Competent Persons Schemes, see Chapter 5 in Volume 1 and Chapter C in Volume 2 of the **Manual to the Building Regulations**.

### Energy efficiency requirements

More information on energy efficiency requirements of the Building Regulations is given in paragraphs A12, A14 (f), A14 (g), A14 (h) A22, A23, B2 and F24 in Volume 2 of the **Manual to the Building Regulations**.

### Notification of work

It is commonly necessary to notify a building control service of the work that you are to undertake. For further information on when to notify a building control service, see Chapter B in Volume 2 of the **Manual to the Building Regulations**.

### Responsibility for compliance

Those responsible for carrying out building work (for example agents, designers, builders, installers and the building owner), must ensure that the work complies with all of the relevant requirements of the Building Regulations. For further information on this topic, see Chapter 7 in Volume 1 and paragraphs A26, B2 and F2 Volume 2 of the **Manual to the Building Regulations**.

### How to use an Approved Document

The approved documents provide guidance to help you satisfy the Building Regulations in many common situations. Following the guidance in the approved documents does not guarantee compliance. It is important to understand, when carrying out building work, the need to meet all of the relevant requirements of the Building Regulations. For further information see Chapter 1 and Chapter 7 in Volume 1 and Chapter F in Volume 2 of the Manual to the Building Regulations.

## Consultation version: not statutory guidance

In this consultation version of the Approved Document technical differences to the Approved Document F 2010 edition incorporating 2010 and 2013 amendments are generally highlighted in yellow.

Guidance for work on existing dwellings is highlighted on a blue background.

Guidance for new dwellings is provided for reference and incorporates the changes made as a result of the *Future Homes Standard* consultation. For a full explanation of policy changes since the *October 2019 Future Homes Standard Consultation* edition, please see *Future Homes Standard: Summary of Responses Received and Government Response* published alongside this document.

This text is subject to change before it becomes statutory guidance in 2021.

### User requirements

The approved documents provide technical guidance. Users of the approved documents should have adequate knowledge and skills to understand and apply the guidance correctly to the building work being undertaken. Users should also understand that following the approved documents does not guarantee compliance with the Building Regulations.

# Contents

Background .....	2
How is construction regulated in England?.....	2
How do you comply with the Building Regulations? .....	2
Building work .....	2
Material change of use .....	3
Materials and workmanship .....	3
Independent third-party certification and accreditation .....	3
Energy efficiency requirements.....	3
Notification of work .....	3
Responsibility for compliance .....	3
How to use an Approved Document .....	3
User requirements .....	4
Section 0: Introduction .....	8
Summary .....	8
Exemptions .....	9
Reasonable provision for historic and traditional buildings .....	10
Emergency repairs .....	11
Minor works .....	11
Live-work units .....	11
Mixed use developments .....	11
Selected key interactions with other parts of the Building Regulations.....	12
Interaction with Part B .....	12
Interaction with Part J .....	12

## Consultation version: not statutory guidance

Interaction with Part L .....	12
Interaction with Parts K and M .....	12
Interaction with Part [X] .....	13
Requirement F1(1): Means of ventilation .....	14
Section 1: Ventilation provision .....	15
General .....	15
Noise .....	15
Access for maintenance .....	16
The ventilation strategy in this Approved Document .....	16
Performance-based guidance .....	17
Equivalent area of ventilators .....	17
Extract ventilation .....	17
Whole dwelling ventilation .....	20
Purge ventilation .....	21
Performance testing .....	22
Control of ventilation .....	23
Ventilation systems for dwellings with basements .....	23
Ventilation of a habitable room through another room .....	24
System specific guidance .....	26
Natural ventilation with background ventilators and intermittent extract fans (guidance suitable only for less airtight dwellings) .....	26
Continuous mechanical extract ventilation .....	28
Ventilation rates .....	29
Background ventilators for continuous mechanical extract ventilation .....	29
Mechanical supply and extract ventilation .....	29
Installation of ventilation systems .....	30
Section 2: Minimising the ingress of external pollutants .....	32
Control of ventilation intakes .....	33
Location of exhaust outlets .....	34
<b>Section 3: Work on existing dwellings</b> .....	<b>35</b>
General .....	35
<b>Installing energy efficiency measures</b> .....	<b>36</b>
Replacing windows .....	39
Addition of a habitable room (not including a conservatory) to an existing dwelling .....	40
Addition of a conservatory to an existing building .....	41

## Consultation version: not statutory guidance

Addition of a wet room to an existing dwelling .....	41
Refurbishing a kitchen or bathroom in an existing dwelling .....	42
Requirement F1(2) and Regulations 39, 42 and 44 .....	43
Section 4: Commissioning and providing information.....	46
Air flow rate testing and commissioning of ventilation systems.....	46
Inspection requirements .....	46
Air flow rate testing .....	48
Controls.....	48
Providing information .....	50
Home User Guide.....	50
Appendix A: Key Terms .....	52
Appendix B: Performance-based ventilation .....	56
Introduction .....	56
Performance criteria for dwellings .....	56
Assumptions used in applying performance criteria for dwellings in Section 1.....	58
General .....	58
Appendix C: Completion checklist and commissioning sheet.....	60
Checking design against measured air flow rates .....	60
Demonstrating compliance .....	60
Part 1 – System details and declarations .....	61
Part 2a – Installation details .....	62
Part 3 – Commissioning details.....	63
Appendix D: Checklist for ventilation provision in existing dwellings .....	65
Appendix E: Standards referred to.....	67
Appendix F: Documents referred to .....	68
Legislation.....	68
Index .....	70

# Section 0: Introduction

## Summary

- 0.1** This approved document is **Approved Document F, volume 1: dwellings**. It gives guidance on how to comply with Part F of Schedule 1 of the Building Regulations. For guidance for non-domestic buildings, use **Approved Document F, volume 2: buildings other than dwellings**.
- 0.2** This approved document contains the following sections:

Approved Document Section	Related Building Regulations requirements
Section 0: Introduction	N/A
Section 1: <b>Ventilation</b> provision	Requirement F1(1)
Section 2: Minimising the ingress of external pollutants	
<b>Section 3: Work on existing dwellings</b>	
Section 4: Commissioning and providing information	Requirement F1(2) and Regulations 39, 42 and 44
Appendix A: Key terms	N/A
Appendix B: Performance-based <b>ventilation</b>	N/A
Appendix C: Completion checklist and commissioning sheet	N/A
Appendix D: Checklist for ventilation provision in existing dwellings	N/A
Appendix E: Standards referred to	N/A
Appendix F: Documents referred to	N/A

## Application

- 0.3** The guidance in this volume of **Approved Document F** applies to **dwellings** only.

**[NOTE FOR CONSULTATION:** *This consultation regards work to existing dwellings, with relevant guidance highlighted in blue and technical changes highlighted in yellow. Guidance for new dwellings is provided only for reference.*

In a mixed-use building, **Approved Document F, volume 2: buildings other than dwellings** should be consulted for building work in those parts of the building that are not



## Consultation version: not statutory guidance

dwellings.

**NOTE:** Dwellings are self-contained units. Rooms for residential purposes are not dwellings, and so **Approved Document F, volume 2: buildings other than dwellings** applies to them. Buildings that contain only rooms for residential purposes are not dwellings, and **Approved Document F, volume 2: buildings other than dwellings** applies to them.

## Exemptions

- 0.4** The following classes of buildings are exempt from the Part F requirements.
- a. Special buildings – any of the following.
    - i. Buildings controlled under the Explosives Regulations 2014.
    - ii. Buildings controlled under the Nuclear Installations Act 1965.
    - iii. Buildings included in the schedule of monuments maintained under section 1 of the Ancient Monuments and Archaeological Areas Act 1979.
  - b. Unoccupied buildings – provided that the buildings are a specified distance from buildings into which people normally go, as defined in the Building Regulations 2010 Schedule II, either of the following:
    - i. Detached buildings into which people do not normally go.
    - ii. Detached buildings into which people go only occasionally to inspect or maintain a fixed plant.
  - c. Greenhouses - provided that the main purpose of the building is not retailing, packing or exhibiting.
  - d. Agricultural buildings (as defined in the Building Regulations 2010 Schedule II). Agricultural buildings used mainly for retailing, packing or exhibiting are not exempt.
  - e. Temporary buildings – buildings that are not intended to remain where erected for more than 28 days.
  - f. Ancillary buildings – any of the following.
    - i. Buildings on site used for the disposal of buildings or building plots on site.
    - ii. Buildings on the site of construction or civil engineering works that both:
      - a. are for use only during the course of those works
      - b. contain no sleeping accommodation.
    - iii. Buildings on the site of mines and quarries, for use in connection with the mine or quarry, that both:
      - a. do not contain dwellings
      - b. are not used as offices or showrooms.
  - g. Small buildings – detached single-storey buildings with a maximum floor area of 30 m<sup>2</sup>, that contain no sleeping accommodation, and that are either of the following.
    - i. Constructed substantially of non-combustible material.
    - ii. At least 1 metre from the boundary of their curtilage.

## Consultation version: not statutory guidance

- h. Very small buildings – detached buildings with a maximum floor area of 15 m<sup>2</sup> floor area that contain no sleeping accommodation.
- i. Bomb shelters – detached buildings with a maximum floor area of 30 m<sup>2</sup> that are designed and intended to be used as shelters from nuclear, chemical or conventional weapons, and for no other purpose, provided the site of the excavation for the building is a minimum of 1 metre plus the depth of excavation from any other exposed structure.
- j. Conservatories and porches – extensions of buildings at ground level, with a maximum floor area of 30 m<sup>2</sup>, for a:
  - i. conservatory
  - ii. porch
  - iii. covered yard
  - iv. covered way
  - v. carport open on at least two sides.

### Reasonable provision for historic and traditional buildings

- 0.5** The following types of  **dwellings**  may not need to comply fully with the  **ventilation**  standards in this approved document.
- a. Those listed in accordance with section 1 of the Planning (Listed Buildings and Conservation Areas) Act 1990.
  - b. Those in a conservation area designated in accordance with section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990.
  - c. Other historic buildings that have a vapour permeable construction that both absorb and readily allows moisture to evaporate. These include: wattle and daub, cob, stone and constructions using lime render or mortar.
- 0.6** Work to a building in paragraph 0.5 should comply with the  **ventilation**  standards in this approved document to the extent that it is reasonably practicable. The work being done should not:
- a. unacceptably affect the significance of the listed building, conservation area or scheduled monument;
  - b. increase the risk of long-term deterioration of the building fabric or fittings.
- 0.7** New extensions to historic or traditional  **dwellings**  should comply fully with the standards of  **ventilation**  in this approved document unless there is a need to match the external appearance or character of the extension to that of the host building.
- 0.8** The local authority's conservation officer should be consulted when doing work to a building in paragraph 0.5a or b.

### Emergency repairs

**0.9** For emergency repairs, if it is not practicable to notify the **building control body** in advance, the **building control body** should be notified at the earliest opportunity. If the installer is registered in a competent person scheme, see **Notification of Work** in this document.

### Minor works

**0.10** Minor works must comply with the relevant requirements of the Building Regulations, but do not need to be notified to the **building control body**.

For mechanical **ventilation** and air-conditioning systems, minor works include:

- a. replacing parts
- b. adding an output or control device where testing and adjusting the system would not affect its energy efficiency or would not be possible
- c. providing a self-contained mechanical **ventilation** or air-conditioning appliance given all of the following apply.
  - i. Any electrical work is exempt from a requirement to give advance notice to a **building control body**
  - ii. Testing and adjusting the system would not affect its energy efficiency or would not be possible
  - iii. The appliance is not installed in a room that contains an open-flued combustion appliance.

### Live-work units

**0.11** A unit that contains both living accommodation and space to be used for commercial purposes (e.g. as a workshop or office) should be treated as a **dwelling**, as long as the commercial part can revert to domestic use.

**0.12** The commercial part of the building can revert to domestic use if all of the following apply.

- a. There is direct access between the commercial space and the living accommodation.
- b. The commercial space and living accommodation are within the same **thermal envelope**.
- c. The living accommodation occupies a substantial proportion of the total area of the unit. What constitutes a 'substantial proportion' should be assessed on a case-by-case basis.

**NOTE:** A large non-domestic building that contains a small flat for a manager is not treated as a **dwelling**. A **dwelling** that contains a room used as an office or utility space is still treated as a **dwelling**.

### Mixed use developments

**0.13** When constructing a **dwelling** as part of a larger building that contains other types of accommodation, sometimes called a mixed-use development, refer to the two volumes of **Approved Document F** as follows.

## Consultation version: not statutory guidance

- a. For guidance on each individual **dwelling**, use this approved document.
- b. For guidance on the non-**dwelling** parts of the building, such a common area and the commercial or retail space, use **Approved Document F, volume 2: buildings other than dwellings**.

### Selected key interactions with other parts of the Building Regulations

The approved documents set out, what in ordinary circumstances, may be accepted as one way to comply with the Building Regulations. It remains the responsibility of those designing or undertaking building work to assess, on a case-by-case basis, whether specific circumstances require additional or alternative measures to achieve compliance with the regulatory requirements. There are interactions between many of the requirements of the Building Regulations, here is guidance on some key interactions.

#### Interaction with Part B

**0.14** The requirements of Part B apply if, for example, ducts pass through any of the following:

- a. a fire-resisting wall or floor
- b. a fire compartment
- c. a protected stairway.

**0.15** This document gives guidance on window openings for **ventilation**. In addition, **Approved Document B** gives guidance on the size of escape windows. The larger of the window openings in **Approved Document B** or **F** should be applied in all cases.

#### Interaction with Part J

**0.16** **Ventilation** fans might cause combustion gases to spill from open-flued appliances – combustion gases might fill the room instead of going up the flue or chimney. This can occur even if the combustion appliance and fan are in different rooms.

**0.17** The guidance in **Approved Document J** should be followed when installing and testing **ventilation** appliances and combustion appliances must operate safely whether or not fans are running.

#### Interaction with Part L

**0.18** Energy efficiency should be considered when specifying **ventilation** systems. Energy efficiency, including the control of **infiltration**, is dealt with under Part L of the Building Regulations.

#### Interaction with Parts K and M

**0.19** Where **manual controls** are provided for a **ventilation** device, they should be within reasonable reach of the occupants, to comply with Approved Documents K and M.

### Interaction with Part [X]

**0.20** This document sets guidance on minimum standards for **purge ventilation** for the purposes of rapidly diluting indoor air pollutants and water vapour where necessary in **habitable rooms** in **dwellings**. For domestic-type buildings, **[the regulation for overheating]** may require a higher standard than given in this document for **purge ventilation** to remove excess heat. In this case, the higher of the two standards should be followed.

# Requirement F1(1): Means of ventilation

This Approved Document deals with the requirement of Part F1(1) of Schedule 1 to the Building Regulations 2010.

**Requirement [regulations will be amended as necessary in line with the intention sections below]**

<i>Requirement</i>	<i>Limits on application</i>
<b>Means of ventilation</b> <b>F1(1).</b> There shall be adequate means of ventilation provided for people in the building.	Requirement F1 does not apply to a building or space within a building: <ol style="list-style-type: none"> <li>into which people do not normally go; or</li> <li>which is used solely for storage; or</li> <li>which is a garage used solely in connection with a single dwelling.</li> </ol>

## Intention

In the Secretary of State's view, requirement F1(1) is met if the **dwelling** is provided with a means of **ventilation** which:

- extracts water vapour and indoor air pollutants from areas where they are produced in significant quantities (e.g. kitchens, **utility rooms** and **bathrooms**) before they spread through the building – by following guidance for **extract ventilation** in paragraphs 1.18 to 1.23.
- supplies a minimum level of outdoor air for occupants' health – by following guidance for **whole dwelling ventilation** in paragraphs 1.24 to 1.26.
- rapidly dilutes indoor air pollutants and water vapour when necessary in **habitable rooms** – by following guidance for **purge ventilation** in paragraphs 1.27 -1.32.
- minimises the ingress of external air pollutants – by following guidance in **Section 2**.
- provides all of the following as far as reasonably practicable:
  - low levels of noise, by following guidance in paragraphs 1.5 to 1.7;
  - is easy to maintain, by following guidance in paragraph 1.9;
  - protection from rain;
  - protection from cold draughts;
  - does not significantly risk occupants' health.

**In the Secretary of State's view, requirement F1(1) is met for work on an existing dwelling by following guidance in Section 3.**

# Section 1: Ventilation provision

## General

**1.1** The aim of requirement F1(1) is to protect the health of occupants of the building by providing adequate **ventilation**. Without adequate **ventilation**, mould and internal air pollution might become hazardous to health.

**NOTE:** The guidance in this approved document is not designed to deal with the products of tobacco smoking or vaping.

**1.2** The building should provide the **ventilation** rates given in this section.

**1.3** Other **ventilation** solutions may be used, provided it can be demonstrated to the **building control body** that they meet Requirement F1(1). For example, by showing the **building control body** that the **ventilation** solution meets the moisture and indoor air quality criteria in **Appendix B**.

**1.4** The **ventilation** rates set out in this approved document have been designed to meet the pollutant levels in **Appendix B** where the outside air is of reasonable quality. In areas where the outside air is not of reasonable quality, **Section 2** provides guidance on limiting the ingress of external air pollutants.

## Noise

**1.5** Mechanical **ventilation** systems, including both continuous and **intermittent mechanical ventilation** should be designed and installed to minimise noise. This includes all of the following.

- a. Sizing and jointing ducts correctly.
- b. Ensuring that equipment is appropriately and securely fixed, such as resilient mountings where structure-borne noise could be a problem.
- c. Selecting appropriate equipment, including following paragraph 1.6.

**1.6** For mechanical **ventilation** systems, fan units should be appropriately sized so that fans operating in normal background **ventilation** mode are not unduly noisy. This might require fans to be sized so that they do not operate near the maximum capacity of the fan when operating in normal background **ventilation** mode.

## Consultation version: not statutory guidance

- 1.7 Account should be taken of outside noise when considering the suitability of opening windows for **purge ventilation**.

**NOTE:** Although there is no requirement to undertake noise testing, meeting the following informative guidance would ensure good acoustic conditions. The average A-weighted sound pressure level for a ventilator operating under normal conditions and not at boost rates should not exceed both of the following:

- a. 30 dB  $L_{Aeq,T}^*$  for noise sensitive rooms (i.e. bedrooms and living rooms) when a continuous mechanical ventilation system is running on its minimum low rate.
- b. 45 dB  $L_{Aeq,T}^*$  in less sensitive rooms (i.e. kitchens and bathrooms) when a **continuous** system is running at the minimum high rate or an **intermittent** system is running.

Methods for measuring the sound power level produced by the fan unit of decentralised **extract**, centralised **extract**, and balanced **mechanical supply and extract ventilation systems** are described in **BS EN 13141**.

\* The noise index  $L_{Aeq,T}$  is used in **BS 8233**, where T is the duration of the measurement. If the noise from the sound source is steady (e.g. fluctuating by up to 3 dB) a measuring time of 1 minute will be adequate and the  $L_{Aeq, 1 \text{ min}}$  level will be similar to the dB(A) level used elsewhere. If the noise from the sound source fluctuates more than this a longer measuring time (T) may be required, but the higher portion of the fluctuating level should be considered, and the sound may attract more attention due to the changes in level.

- 1.8 Noise testing is not required to demonstrate compliance with the functional requirements.

## Access for maintenance

- 1.9 Reasonable access should be provided for maintaining **ventilation** systems, including all of the following.
- a. Providing access to replace filters, fans and coils.
  - b. Providing access points for cleaning ductwork.
  - c. Providing access for the general maintenance of the plant.

## The ventilation strategy in this Approved Document

- 1.10 The **ventilation** strategy in this approved document relies on a combination of all of the following:
- a. **Extract ventilation** from rooms where water vapour or pollutants are likely to be released, e.g. **bathrooms** and kitchens, to minimise their spread to the rest of the building. **Ventilation** fans may be either **intermittent** or **continuous**.



## Consultation version: not statutory guidance

- b. **Whole building ventilation** to provide fresh air to the building and to dilute, disperse and remove water vapour and pollutants not removed by **extract ventilation**.
- c. **Purge ventilation** to remove high concentrations of pollutants and water vapour. **Purge ventilation** is **intermittent** and required only for pollutants produced by occasional activities (e.g. fumes from painting).

**1.11** **Ventilation** may be delivered through **natural ventilation**, mechanical **ventilation** or both.

**1.12** The **ventilation** systems in this approved document are examples of systems that comply with Part F of the Building Regulations. Other **ventilation** systems may be acceptable if they can be shown to meet an equivalent level of performance.

### Performance-based guidance

**1.13** Performance criteria for acceptable levels of moisture and pollutants are given in **Appendix B**. Air flow rates necessary to meet the performance criteria are given in Table 1.1, Table 1.2 and Table 1.3.

**1.14** Ventilator sizes for the whole **dwelling** are also provided to help designers comply with Part F of the Building Regulations in common situations.

**1.15** Some **ventilation** system designs can, in some circumstances, result in lower **ventilation** rates than stated in Table 1.1 and Table 1.2. For example, systems with **automatic controls**. Where lower **ventilation** rates are proposed, it should be demonstrated through **expert advice** that the solution meets the performance standards in **Appendix B**. Where this is demonstrated, the design may be considered to meet the functional requirement.

### Equivalent area of ventilators

**1.16** The size of **background ventilators** (including trickle ventilators) is given in this Approved Document as an **equivalent area** in mm<sup>2</sup>, not **free area**. **BS EN 13141-1** includes a method of measuring the **equivalent area** of **background ventilator** openings.

**1.17** **Background ventilators** should have the **equivalent area** marked where it will be easily visible from inside the **dwelling** when installed, to aid verification by **building control bodies**.

### Extract ventilation

**1.18** **Extract ventilation** to outside should be provided in all of the following spaces.

- a. Kitchens.

## Consultation version: not statutory guidance

- b. Utility rooms.
- c. Bathrooms.
- d. Sanitary accommodation.

**1.19** Extract ventilation can be intermittent or continuous.

**1.20** Minimum extract ventilation rates for intermittent extract systems are specified in Table 1.1. Minimum extract ventilation rates for continuous extract systems are specified in Table 1.2.

**1.21** Mechanical extract ventilation terminals and fans, not including cooker extract hoods, should be installed both:

- a. As high as is practicable in the room.
- b. A maximum of 400 mm below the ceiling.

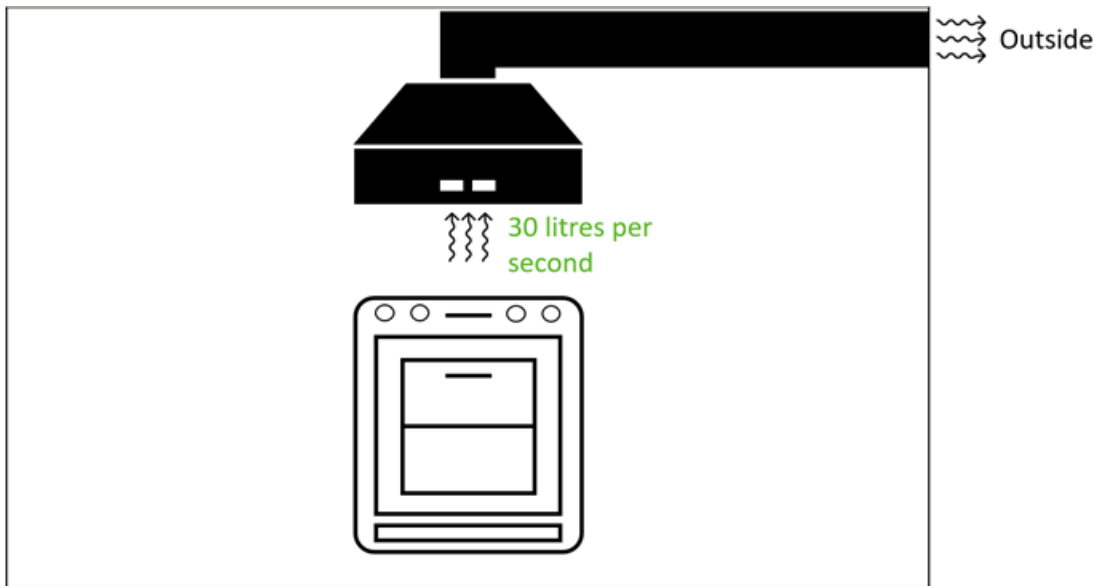
**1.22** Where a cooker hood is used to extract to the outside, the height of the extract hood above the hob surface should be either as specified in the manufacturer's instructions, or if unknown 650 mm to 750 mm.

Table 1.1 Minimum extract ventilation rates for intermittent extract systems	
Room	Intermittent extract rate, litres per second
Kitchen (cooker hood extracting to outside) <sup>1</sup>	30
Kitchen (no cooker hood or cooker hood does not extract to outside) <sup>2</sup>	60
Utility room	30
Bathroom	15
Sanitary accommodation <sup>3</sup>	6

**Notes:**

- 1. See Diagram 1.1.
- 2. See Diagram 1.2.
- 3. As an alternative for sanitary accommodation, the purge ventilation guidance may be used.

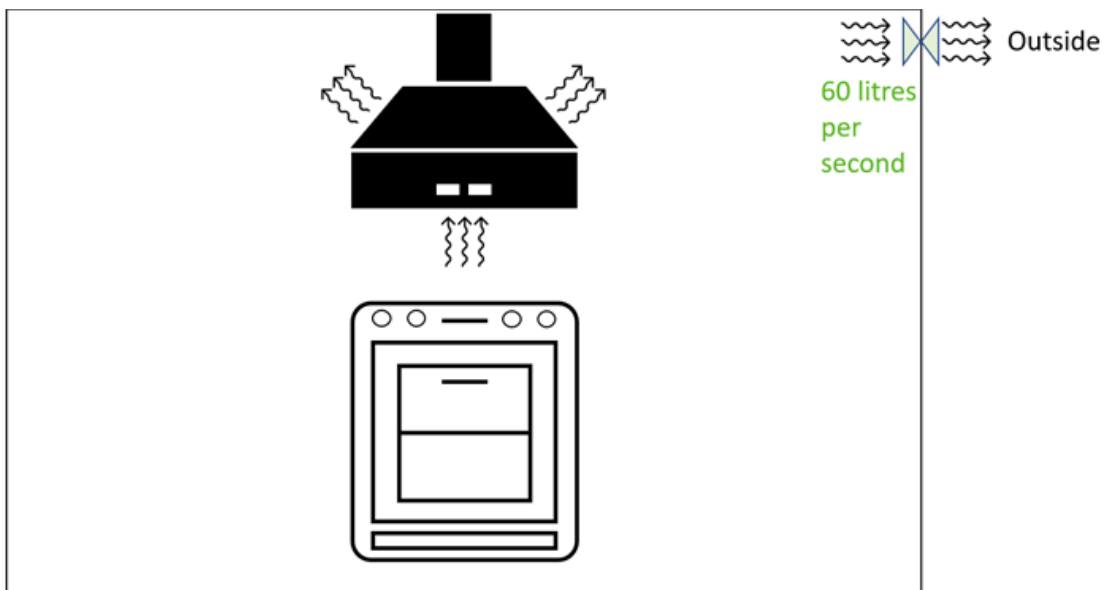
Diagram 1.1 Minimum kitchen **extract ventilation** rate for where a cooker hood extracts to outside<sup>1</sup>



**Notes:**

1. The cooker hood should span at least the full width of the cooker.

Diagram 1.2 Minimum **ventilation** rate for kitchen extract where cooker hood does not extract to outside<sup>1</sup>



## Consultation version: not statutory guidance

### Notes:

1. The diagram includes a recirculating cooker hood for illustration. A recirculating cooker hood by itself does not provide a means of ventilation for compliance with Part F of the Buildings regulations.

**1.23** Minimum **extract ventilation** rates for **continuous** extract systems are specified in Table 1.2. A **continuous** rate is given for the general operation of the fan, and a 'high' rate for use during periods when additional extract is required.

Table 1.2 Minimum <b>extract ventilation</b> rates for continuous extract systems		
Room	High rate, litres per second	<b>Continuous</b> rate
Kitchen	13	The sum of all <b>extract ventilation</b> in the <b>dwelling</b> on its continuous rate should be at least the <b>whole dwelling ventilation</b> rate given in Table 1.3
<b>Utility room</b>	8	
<b>Bathroom</b>	8	
<b>Sanitary accommodation</b>	6	

## Whole dwelling ventilation

**1.24** Supply air for the **dwelling** should be delivered through either of the following.

- a. **Continuous** supply fans.
- b. **Background ventilators** (further guidance is given in **Section 2**).

**1.25** The minimum **whole dwelling ventilation** rate for the supply of air to the **habitable rooms** in a **dwelling** should meet both of the following.

- a. A minimum rate of 0.3 litres per second per m<sup>2</sup> of internal floor area (this includes all floors, e.g. for a two-storey building add the ground and first floor areas).
- b. A minimum rate by the number of bedrooms as specified in Table 1.3.

Table 1.3 Minimum whole dwelling ventilation rates by the number of bedrooms	
Number of bedrooms	Minimum <b>ventilation</b> rate by number of bedrooms, litres per second

## Consultation version: not statutory guidance

1	19
2	25
3	31
4	37
5	43

### Notes:

1. If the dwelling only has one **habitable room**, a minimum **ventilation** rate of 13 litres per second should be used.
2. For each additional bedroom, add 6 litres per second to the values in Table 1.3.

**1.26** To allow air to flow throughout the **dwelling**, internal doors should allow air to move within the **dwelling** by providing a minimum **free area** equivalent to a 10mm undercut in a 760mm wide door. Doors should be undercut to either of the following.

- a. If the floor finish is fitted: 10 mm above the floor finish.
- b. If the finish is not fitted: 20 mm above the floor surface.

## Purge ventilation

**1.27** A system for **purge ventilation** should be provided in each **habitable room**.

**1.28** **Purge ventilation** should be capable of extracting a minimum of four air changes per hour per room directly to outside, following paragraph 1.31.

**NOTE:** In order to demonstrate compliance with **[the regulation for overheating (1)]** using it is likely that higher **purge ventilation** rates than those in paragraph 1.31 will be required.

**1.29** **Purge ventilation** should be delivered through either of the following.

- a. Openings (e.g. windows or doors).
- b. A **mechanical extract ventilation** system.

**1.30** Where **purge ventilation** in a **habitable room** is delivered through openings in that room, the minimum opening areas in Table 1.4 should be achieved. The values in Table 1.4 are based on **BS5925:1991**, which assumes all of the following:

- a. Single-sided ventilation.
- b. An urban environment.
- c. A wind speed of 2.1 metres per second.

## Consultation version: not statutory guidance

d. A temperature difference of 3°C between the air inside and outside of the building.

**1.31** Depending on the dwelling design or the external climate, it may be possible in other circumstances to achieve 4 air changes per hour with smaller openings. If smaller openings than Table 1.4 are specified, expert advice should be sought.

Table 1.4 Purge ventilation openings	
Opening type	Minimum total area of openings
Hinged or pivot windows with an opening angle of 15 to 30 degrees	1/10 <sup>th</sup> of floor area of room
Hinged or pivot windows with an opening angle of greater than or equal to 30 degrees	1/20 <sup>th</sup> of floor area of room
Opening sash windows	
External doors	

**1.32** Hinged or pivot windows with an opening angle of less than 15 degrees are not suitable for **purge ventilation**.

## Performance testing

**1.33** The air flow resistance of all components should be considered when specifying **ventilation** systems. The complete assembly, as installed, should be designed to meet the performance requirements of this approved document. The performance of the separate components should be measured according to the relevant parts of **BS EN 13141** and other relevant standards. The relevant test standards for common equipment types are given in Table 1.5.

Table 1.5 Performance testing standards	
Equipment type	Test standard
<b>Intermittent extract fans</b>	<b>BS EN 13141-4</b>
Cooker hoods	<b>BS EN 13141-3</b>
<b>Background ventilators without humidity control</b>	<b>BS EN 13141-1</b> clauses 5.1 and 5.2

## Consultation version: not statutory guidance

	<p><b>Background ventilators</b> should meet the performance requirements for both of the following.</p> <ol style="list-style-type: none"><li>Air flow from outside to inside the <b>dwelling</b>.</li><li>Air flow from inside to outside.</li></ol>
Continuous <b>mechanical extract ventilation</b> systems	<b>BS EN 13141-6</b>
<b>mechanical supply and extract ventilation</b>	<b>BS EN 13141-7</b>
	<b>BS EN 13141-8</b> . For internal and external leakage and for mixing, the unit should meet at least Class U4.

## Control of ventilation

**1.34** **Ventilation** should be controllable. Controls may be either **manual** (i.e. operated by the occupant) or **automatic**.

**1.35** **Background ventilators** should be a minimum of 1.7 m above floor level, to reduce cold draughts, but still be within easy reach of the occupant.

**NOTE:** **Background ventilators** are intended to normally be left open.

**1.36** Continuously running fans should be set up to operate without occupant intervention but may have **manual** or **automatic controls** to select the high rate. Any **manual** high rate controls should be provided locally to the spaces being served, e.g. **bathrooms** and kitchens. **Automatic controls** might include sensors for humidity, occupancy/usage and pollutant release.

**1.37** Controls based on humidity sensors may be installed in moisture-generating rooms (e.g. kitchen or **bathroom**) but should not be used for **sanitary accommodation**, where odour is the main pollutant.

**1.38** Other types of **automatic control** might be suitable. Where present, **automatic controls** should operate according to the need for **ventilation** in the space. **Background ventilators** with **automatic controls** should also have manual override.

**NOTE:** Where a combustion appliance is installed, any **automatic controls** must also ensure that **ventilation** provided meets the requirements of Part J.

## Ventilation systems for dwellings with basements

**1.39** In addition to paragraphs 1.13-1.38, the performance required for ventilation systems for

## Consultation version: not statutory guidance

**dwelling**s with basements would be achieved by following paragraphs 1.40 to 1.42.

**1.40** A **dwelling** that includes a **basement** connected to the rest of the **dwelling** by a large **permanent opening** (e.g. an open stairway), may be treated as a multi-storey **dwelling** following the guidance in this approved document for **dwelling**s without **basements**.

**NOTE:** If a **basement** has only one exposed façade, the guidance for **natural ventilation** given in this approved document would not be appropriate. In such cases, **expert advice** should be sought.

**1.41** A **dwelling** that includes a **basement** not connected to the rest of the **dwelling** above ground by a large **permanent opening** should be considered as follows.

- a. The part of the **dwelling** above ground should be considered separately.
- b. The **basement** should be treated separately as a single-storey **dwelling** above ground level.
- c. If the **basement** has no bedrooms, assume it has one bedroom to determine the **ventilation** required for the purposes of meeting the **ventilation** standards.

**1.42** A **dwelling** that comprises *only* a **basement** should be treated as a single-storey **dwelling** above ground level. In such circumstances, the guidance for **dwelling**s without **basements** should be followed. The guidance on **natural ventilation**, however, is not appropriate for a **dwelling** that comprises only a **basement**.

## Ventilation of a habitable room through another room

**1.43** If a **habitable room** does not contain openable windows (i.e. an internal room), the requirement for adequate **ventilation** can be met using paragraphs 1.44 and 1.45. This guidance can be used if the room is ventilated through either of the following.

- a. Another **habitable room**.
- b. A conservatory.

**1.44** The **habitable room** or conservatory should have openings to outside to provide both of the following.

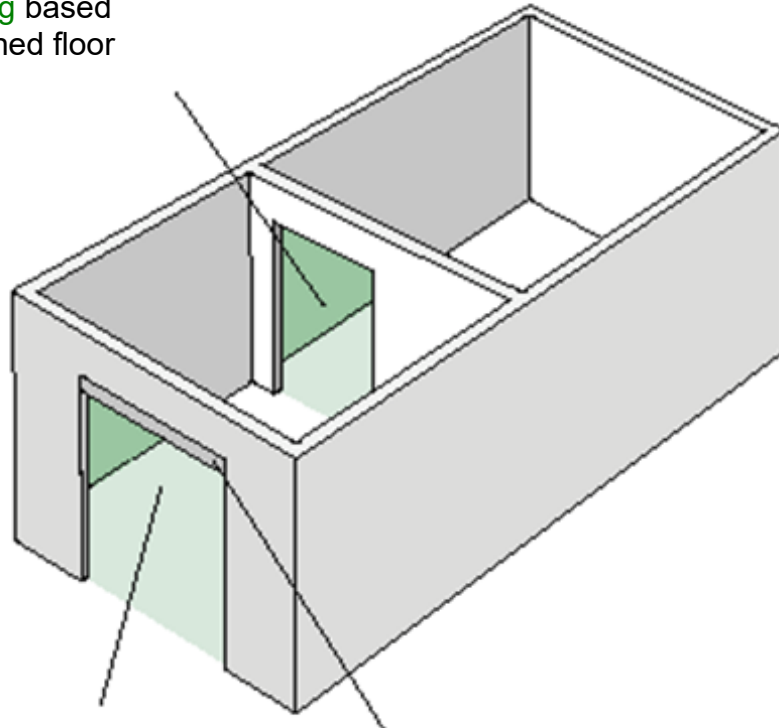
- a. **Purge ventilation** with a minimum total area given in [the approved document for **overheating**] based on the combined floor area of the **habitable rooms** (or the **habitable room** and the conservatory).
- b. **Background ventilation** of at least 10,000 mm<sup>2</sup> **equivalent area**.

**1.45** Between the two rooms there should be a **permanent opening** with a minimum area of 1/20<sup>th</sup> the combined floor area of the two rooms (see **Diagram 1.6**).



Diagram 1.6 Two **habitable rooms** treated as one room for **ventilation** purposes

Permanent opening based on 1/20<sup>th</sup> of combined floor area.



Purge **ventilation opening**, see paragraphs 1.27 -1.32.

10000 mm<sup>2</sup> background ventilator

## System specific guidance

1.46 Paragraphs 1.47 to 1.73 give guidance for the following types of ventilation system:

Table 1.7	
System Type	Dwellings covered by the guidance
Natural Ventilation (paragraphs 1.48 to 1.59)	Less airtight dwellings.
Continuous mechanical extract ventilation (paragraphs 1.60 to 1.66)	All dwellings.
mechanical supply and extract ventilation (paragraphs (1.67 to 1.73)	All dwellings.

**NOTE:** For situations outside the scope of Table 1.7, expert advice should be sought for the design, sizing and position of ventilators to provide effective ventilation.

**NOTE:** As defined in Appendix A, less airtight dwellings are dwellings with either:

- a design air permeability higher than  $5 \text{ m}^3/(\text{h.m}^2)$  at 50 Pa;
- an as-built air permeability of higher than  $3 \text{ m}^3/(\text{h.m}^2)$  at 50 Pa.

1.47 Where a dwelling has natural ventilation and has a measured air permeability that differs from the design air permeability such that it is defined as a highly airtight dwelling, either:

- expert advice should be sought
- a continuous mechanical extract ventilation system should be installed by following the guidance in paragraphs 1.60 to 1.66.

**NOTE:** Continuous mechanical extract ventilation systems are available as de-centralised options. A de-centralised continuous mechanical extract ventilation system fan may be interchanged with an intermittent extract fan.

## Natural ventilation with background ventilators and intermittent extract fans (guidance suitable only for less airtight dwellings)

### Intermittent extract

1.48 Intermittent extract fans should be fitted in all wet rooms. For kitchens, utility rooms, bathrooms and sanitary accommodation, the extract rates in Table 1.1 can be met using an intermittent extract fan.

## Consultation version: not statutory guidance

- 1.49** If a **wet room** has no external walls, the **intermittent extract** fan should extract at four air changes per hour to provide the **purge ventilation** given in paragraph 1.27-1.32.
- 1.50** For **sanitary accommodation**, as an alternative, extract rates can be met using windows by following the **purge ventilation** guidance in paragraph 1.27-1.32.
- 1.51** Any **automatic controls** (e.g. humidity control) for **intermittent extract** should have a manual override to allow the occupant to turn the **extract ventilation** on or off.
- 1.52** In a room with no openable window, an **intermittent extract** fan should be provided with controls which continue to operate the fan for a minimum of 15 minutes after the room is vacated.

### Background ventilators

- 1.53** All rooms with external walls should have **background ventilators**. If a **habitable room** has no external walls, paragraphs 1.43 to 1.45 should be followed.

**NOTE:** A window with a night latch position is not adequate for **background ventilation**, due to:

- a. the risk of draughts
- b. security issues
- c. the difficulty of measuring **equivalent area**.

- 1.54** If the **dwelling** has more than one exposed façade, the area of **background ventilators** on each façade should be similar, to allow **cross-ventilation**.
- 1.55** If fans and **background ventilators** are fitted in the same room, they should be a minimum of 0.5 m apart.
- 1.56** The minimum total area of **background ventilators** in each room should be as in Table 1.8.
- 1.57** The minimum total number of ventilators installed in the dwelling's habitable rooms and kitchens should be a minimum of the following.
- a. 4 ventilators if the dwelling has one bedroom.
  - b. 5 ventilators if the dwelling has more than one bedroom.
- 1.58** If the dwelling has a kitchen and living room which are not separate rooms, a minimum of 3 ventilators of the same area as for other habitable rooms in Table 1.8 should be provided in the open plan space.

Table 1.8 Minimum equivalent area of background ventilators for natural ventilation <sup>1</sup>		
Room	Minimum equivalent area of background ventilators for dwellings with multiple floors	Minimum equivalent area of background ventilators for single-storey dwellings
Habitable rooms <sup>3,4</sup>	8,000 mm <sup>2</sup>	10,000 mm <sup>2</sup>
Kitchen <sup>3,4</sup>	8,000 mm <sup>2</sup>	10,000 mm <sup>2</sup>
Bathroom <sup>2</sup>	4,000 mm <sup>2</sup>	4,000 mm <sup>2</sup>
Sanitary accommodation	No minimum	No minimum

**Notes:**

- The use of this table is not appropriate in either of the following situations and expert advice should be sought:
  - If the dwelling has a single exposed façade.
  - If the dwelling has at least 70% of its openings on the same façade.
  - If a kitchen has no windows or external façade through which a ventilator can be installed.
- If a bathroom has no window or external façade through which a ventilator can be installed, the minimum equivalent area specified should be added to ventilator sizes specified in other rooms.
- Where a kitchen and living room accommodation are not separate rooms (i.e. open plan), no less than 3 ventilators of the same equivalent area as for other habitable rooms should be provided within the open plan space.
- The total number of ventilators installed in a dwelling in habitable rooms and kitchens should be no less than 5, with the exception of one bedroom properties which should be no less than 4.

## Purge ventilation

1.59 For purge ventilation follow paragraphs 1.27-1.32.

## Continuous mechanical extract ventilation

1.60 A continuous mechanical extract ventilation system could comprise of one of the following.

- A central extract system.
- Individual room extract fans.
- A combination of both a central extract system and individual room extract fans.

1.61 If an exhaust air terminal is on the façade exposed to the prevailing wind, measures should be taken to minimise likely wind effects. Solutions could include:

## Consultation version: not statutory guidance

- a. ducting to another façade
- b. use of constant volume flow rate units
- c. seeking expert advice.

### Ventilation rates

**1.62** The total combined continuous rate of mechanical extract ventilation in the dwelling should be a minimum of the whole dwelling ventilation rate in Table 1.3.

**1.63** Each wet room should have a minimum mechanical extract ventilation high rate as given in Table 1.2.

### Background ventilators for continuous mechanical extract ventilation

**1.64** Where continuous mechanical extract ventilation is used, background ventilators should satisfy all of the following.

- a. Not be in wet rooms.
- b. Provide a minimum equivalent area of 4,000 mm<sup>2</sup> for each habitable room in the dwelling.
- c. Provide a minimum total number of ventilators equalling the number of bedrooms plus two ventilators (i.e. a one bedroom dwelling should have 3 background ventilators, a two bedroom dwelling would require 4 ventilators; etc.).

**1.65** If a habitable room has no external walls, paragraphs 1.43 to 1.45 should be followed.

### Purge ventilation

**1.66** For purge ventilation follow paragraph 1.27-1.32.

## Mechanical supply and extract ventilation

### Ventilation rates

**1.67** For dwellings using mechanical supply and extract ventilation, each habitable room should have mechanical supply ventilation. The total supply air flow should be distributed proportionately to the volume of each habitable room.

**1.68** Mechanical supply terminals should be located and directed to avoid draughts.

**1.69** The minimum total continuous rate of mechanical supply and extract ventilation is the whole dwelling ventilation rate in Table 1.3.

**1.70** For dwellings using mechanical supply and extract ventilation, each wet room should have a minimum mechanical extract ventilation high rate as given in Table 1.2.

**1.71** Mechanical supply and extract ventilation systems should be designed to avoid the recirculation of moist air from the wet rooms to the habitable rooms.

## Background ventilators

1.72 To avoid unintended air pathways, **background ventilators** should not be installed with **mechanical supply and extract ventilation**.

## Purge ventilation

1.73 For **purge ventilation** follow paragraph 1.27- 1.32.

**NOTE:** The efficiency of mechanical supply and extract ventilation systems should improve as the dwelling becomes more airtight.

## Installation of ventilation systems

1.74 **Ventilation** systems should be installed in a way both:

- a. to comply with the guidance in this approved document;
- b. that does not compromise the performance of the system in-use.

1.75 Adequate space should be available for access to maintain **ventilation** equipment.

1.76 Rigid ducts should be used wherever possible. Where flexible ductwork is installed this should only be used for final connections, but their lengths should be kept to a minimum as given in paragraph 1.78. All flexible ductwork should meet the standards of BSRIA's *BG 43/2013*.

1.77 The maximum lengths of flexible duct connected to axial fans should be 1.5 metres.

1.78 Any flexible ducts should be installed so that the full internal diameter is obtained, and flow resistance is minimised. This includes both:

- a. pulling the duct taut
- b. ensuring that ductwork does not pass through orifices with a smaller diameter than the duct itself.

1.79 Ductwork installations should be designed and installed to minimise the overall pressure losses within the system through all the following.

- a. Minimising the overall length of duct.
- b. Minimising the number of bends required.
- c. Installing appropriately sized ducts for the air flow rate.

1.80 Each air terminal should have a **free area** of at least 90% of the **free area** of its associated duct.

## Consultation version: not statutory guidance

- 1.81** Duct connections should be both mechanically secured and adequately sealed to prevent uncontrolled losses. For flexible ducting, rigid connectors and jubilee clips should be used to ensure a good seal.
- 1.82** A visual inspection should be made by the installer to confirm that both:
- a. there are no obvious defects
  - b. all packaging has been removed.
- 1.83** Mechanical **ventilation** systems must be commissioned in accordance with an approved procedure. **Appendix C** of this approved document includes a completion checklist and commissioning sheet, which the system installer should complete to demonstrate compliance. See **Section 4** of this approved document.

## Section 2: Minimising the ingress of external pollutants

**2.1 Ventilation** systems should be designed to minimise the intake of external air pollutants following paragraphs 2.2 to 2.9 if either of the following apply.

- a. The location of the dwelling exceeds limit values in Table 2.1. This may have been determined through an air quality assessment.
- b. The dwelling is located near to any of the following sources of significant local pollution.
  - i. Road traffic, including traffic junctions and underground car parks.
  - ii. Combustion plant (such as heating appliances) running on conventional fuels, most commonly natural gas.
  - iii. Other combustion processes (for example, waste incineration, thermal oxidation abatement systems).
  - iv. Discharges from industrial processes.
  - v. Fugitive (i.e. not effectively controlled) discharges from industrial processes and other sources.
  - vi. Exhaust discharges from building **ventilation** systems.
  - vii. Construction and demolition sites, which are a source of particles and vaporous discharges.

**Table 2.1 Limit Values from Schedule 2 of the Air Quality Standards Regulations 2010**

Pollutant	Exposure Limit	Exposure Time
Carbon Monoxide	10 mg/m <sup>3</sup>	8 hour average
Sulphur Dioxide	350 µg/m <sup>3</sup>	1 hour average
	125 µg/m <sup>3</sup>	1 day average
Nitrogen Dioxide	200 µg/m <sup>3</sup>	1 hour average
	40 µg/m <sup>3</sup>	1 year average



## Consultation version: not statutory guidance

Benzene	5 µg/m <sup>3</sup>	1 year average
Lead	0.5 µg/m <sup>3</sup>	1 year average
PM 2.5	25 µg/m <sup>3</sup>	1 year average
PM 10	50 µg/m <sup>3</sup>	1 day average
	40 µg/m <sup>3</sup>	1 year average

**NOTE:** This section only gives guidance for typical situations. **Expert advice** may be needed for situations outside of this scope.

### Control of ventilation intakes

**2.2** **Ventilation** intakes should be located away from the direct impact of the sources of local pollution.

**NOTE:** CIBSE's *TM 64* and *TM 40* give further guidance.

**2.3** Where urban traffic is a source of pollution, the air intakes for buildings next to busy urban roads should be both:

- a. as high as possible
- b. located on the less polluted side of the building.

Mechanical **ventilation** may be the most practical means of achieving this requirement.

Where modelling or monitoring data is required to assess risks, **expert advice** should be sought.

**2.4** If practicable, **ventilation** intakes should not be located in courtyards and enclosed urban spaces where air pollutants are discharged. If this is unavoidable, intakes should be both:

- a. as far as possible from the source of pollutants
- b. in an open or well-ventilated area.

**2.5** In areas where wind often comes from opposing directions (e.g. a valley location), the air intakes and outlets should point in opposite directions.

**2.6** Where sources of pollution fluctuate with the time of day, such as urban road traffic, it may be acceptable, for time limited periods to either:

- a. reduce the flow of external air into **ventilation** intakes;
- b. close **ventilation** intakes when the concentrations of external pollutants are highest.

In these circumstances, **expert advice** should be sought.

## Location of exhaust outlets

2.7 Exhaust outlets should be located so that both:

- a. Re-entry of exhaust into a building, or entry into other nearby buildings, is minimised;
- b. There is no adverse effect on the surrounding area.

2.8 Where there is a prevailing wind direction, exhaust outlets should be downwind of intakes.

2.9 Exhaust outlets should not discharge into any of the following:

- a. Courtyards;
- b. Enclosures;
- c. Architectural screens.

**NOTE:** Chapter 13 of the McGraw Hill's *Indoor Air Quality Handbook* provides further guidance.

## Section 3: Work on existing dwellings

### General

- 3.1** When building work is carried out on an existing **dwelling**, both of the following should apply.
- The work should comply with the applicable requirements of the Building Regulations.
  - The rest of the building, including the provision of **ventilation**, should not be made less satisfactory than before the work was carried out.

**NOTE:** Ventilation through infiltration should be considered to be part of the ventilation provision of a building where it is providing advantageous ventilation. Reducing infiltration might reduce the indoor air quality of the building below the standards given in **Appendix B**.

- 3.2** For common types of work, the requirements of paragraph 3.1 may be demonstrated through the following:
- For installing energy efficiency measures excluding window replacement, paragraphs 3.5 to 3.12.
  - For installing energy efficiency measures including window replacement, paragraphs 3.5 -3.12 and 3.13-3.15.
  - For replacing windows only, paragraphs 3.13 to 3.15.
  - For addition of a **habitable room**, paragraphs 3.16 to 3.19.
  - For addition of a conservatory, paragraphs 3.20 to 3.23.
  - For addition of a **wet room**, paragraphs 3.24 to 3.28.
  - For refurbishing a kitchen or **bathroom**, paragraphs 3.29 to 3.31.
- 3.3** Other **ventilation** solutions may be used, provided it can be demonstrated to a **building control body** that they comply with the requirements of paragraph 3.1.
- 3.4** When a building undergoes a **material change of use**, Part F applies to the building or part of the building that has been subject to the change of use. Guidance in **Section 1** should be followed.

**NOTE:** **Ventilation** equipment is considered to be a “controlled service or fitting” and the provision or extension of such equipment in or in connection with a building is building work.

**NOTE:** Some building work does not need to be notified to the local authority. This is set out in Schedule 4 of the Building Regulations 2010.

## Installing energy efficiency measures

**3.5** Many existing buildings are ventilated through infiltration rather than purposeful ventilation. Energy efficiency measures carried out on existing buildings might reduce infiltration and cause the dwelling to become under-ventilated.

Building work should not reduce the ventilation provision of the dwelling, unless it can be demonstrated that the ventilation provision in the dwelling after the work is carried out meets the minimum standards of F1(1).

**3.6** When carrying out energy efficiency measures to an existing dwelling, an assessment should be carried out to determine what, if any, additional ventilation provision is required, based on the estimated impact of the work. The assessment should be carried out by either of the following.

- a. *Simplified method:* paragraphs 3.7 to 3.12 and the chart in Diagram 3.1 should be followed.
- b. Seeking expert advice, which may include carrying out an air permeability test. The air permeability test should follow the procedures given in **Approved Document L, volume 1: dwellings**.

**NOTE:** Following **PAS 2035** is considered to be an adequate means of demonstrating compliance with paragraph 3.5.

### Simplified Method

**NOTE:** The simplified method set out in paragraphs 3.7 to 3.12 is designed to apply to an existing dwelling, assumed to have adequate means of ventilation through a combination of purpose provided ventilation and advantageous infiltration.

If the property is significantly different from this, the requirements of paragraph 3.5 must still be met. This should be demonstrated through seeking expert advice or another suitable method.

**3.7** When carrying out energy efficiency measures on an existing dwelling, Table 3.1 should be used to calculate the number of major and minor energy efficiency measures. This calculation should include all of the following.

- a. Energy efficiency measures fitted since the original dwelling was constructed, to consider accumulation of measures.
- b. Energy efficiency measures planned.

## Consultation version: not statutory guidance

**NOTE:** Where energy efficiency measures are not included in Table 3.1, the most similar category in Table 3.1 should be chosen.

**3.8** The total number minor and major measures should then be used in the chart in Diagram 3.1 to determine what category the works result in.

<b>Table 3.1. Energy Efficiency Measures</b>	<b>Category of measure</b>
<b>Roof Insulation</b>	
a. Renewing loft insulation, including careful edge sealing at junctions and penetrations	Minor
b. Loft conversions or works that include changing a cold loft (insulation at ceiling level) to a warm loft (insulation at roof level)	Minor
<b>Wall Insulation</b>	
c. Cavity wall insulation to any external wall façade	Minor
d. External or Internal wall insulation to less than or equal to 50% of the external wall area	Minor
e. External or Internal wall insulation to greater than 50% of the external area	<b>Major</b>
<b>Replacement of windows and doors<sup>1</sup></b>	
f. Replacement of less than or equal to 30% of the total existing windows or door units	Minor
g. Replacement of greater than 30% of the total existing windows or door units	<b>Major</b>
<b>Draught-proofing (other than openings)<sup>2</sup></b>	
h. Replacement of loft hatch with a sealed/insulated unit	Minor
i. Sealing around structural or service penetration through walls, floors or ceiling/roof	Minor
j. Sealing and/or insulating suspended ground floor	<b>Major</b>
k. Removal of chimney or other means of sealing over chimney, internally or externally	<b>Major</b>
<b>Notes:</b>	
1. If the energy efficiency works involve <i>only</i> replacing windows, then the guidance in paragraphs 3.13 to 3.15 may be followed as an alternative means of demonstrating compliance.	
2. Draught-proofing measures might not, on their own, constitute building work. Such work may be controllable under the Building Regulations if carried out as part of other building work.	

**Diagram 3.1. Chart for ventilation when carrying out works in existing dwellings**

		Number of minor measures							
		0	1	2	3	4	5	6	7
Number of major measures	0	Category A			Category B				
	1	Category B				Category C			
	2	Category C			Category C				
	3	Category C		Category C					
	4	Category C							

**3.9** If using the method in Diagram 3.1 results in the work being categorized in a **Category A**, it is likely that the energy efficiency measures have *not* reduced ventilation provision of the dwelling below the requirements of F1(1) and no further ventilation provision is necessary.

**3.10** If using the method in Diagram 3.1 results in the work being categorized in a **Category B**, it is likely that ventilation provision of the dwelling has been reduced below the requirements of F1(1). Further ventilation provision should be provided through one of the following.

- a. For natural ventilation, follow system specific advice in paragraphs 1.48 to 1.59. It is assumed any existing purpose-built ventilators are in working order and the equivalent area has not been compromised.
- b. For continuous mechanical extract ventilation, follow system specific advice in paragraphs 1.60 to 1.66.
- c. For mechanical supply and extract ventilation, follow system specific advice in paragraphs 1.67 to 1.73. To avoid unintended air pathways, existing background ventilators should be covered or sealed shut.

**3.11** If using the method in Diagram 3.1 results in the work being categorized in a **Category C**, it is likely that ventilation provision of the building has been reduced *significantly* below the requirements of F1(1). Further ventilation provision is necessary through one of the following.

- a. For natural ventilation, follow expert advice for the design, sizing and positioning of ventilators to ensure adequate ventilation provision.
- b. For continuous mechanical extract ventilation, follow system specific advice in paragraphs 1.60 to 1.66.
- c. For mechanical supply and extract ventilation, follow system specific guidance in paragraphs 1.67 to 1.73. To avoid unintended air pathways, existing background ventilators should be covered or sealed shut.

**3.12** The checklist in **Appendix D** may aid in checking the ventilation provision in an existing dwelling. It may be used before energy efficiency measures are carried out to determine whether your existing dwelling complies with the requirement for adequate means of ventilation.

## Replacing windows

**3.13** If the existing windows have background ventilators, the replacement windows should include background ventilators. The new background ventilators should both:

- not be smaller than the background ventilators in the original window;
- be controllable either automatically or by the occupant.

If the size of the background ventilators in the existing window is not known, the ventilator sizes in paragraph 3.14 may be selected.

**3.14** If the existing windows have no background ventilators, replacing windows is likely to increase the airtightness of the dwelling. If ventilation is not provided via a mechanical supply and extract ventilation system, then increasing the airtightness of the building may reduce useful ventilation in the building. In these circumstances, it should be ensured that the ventilation provision in the dwelling is no worse than it was before the work was carried out. This may be demonstrated in any of the following ways:

- Adopting the following background ventilators in the replacement windows equivalent to the following:
  - habitable rooms – minimum 8,000 mm<sup>2</sup> equivalent area
  - kitchen – minimum 8,000 mm<sup>2</sup> equivalent area.
  - bathroom (with or without a toilet) – minimum 4,000 mm<sup>2</sup> equivalent area.
- If the dwelling will have continuous mechanical extract ventilation, install background ventilators for any replacement windows which are not in wet rooms, with a minimum equivalent area of 4,000 mm<sup>2</sup> in each habitable room.
- Other ventilation provisions, provided it can be demonstrated to a building control body that they comply with the requirements of paragraph 3.1.

**NOTE:** If it is not technically feasible to adopt the equivalent areas set out in paragraph 3.14, the background ventilators should adopt equivalent areas as close to the minimum value as is feasible.

**3.15** When windows are replaced as part of the work connected with a material change of use, **Section 1** of this approved document should be followed in addition to paragraphs 3.13 and 3.14.

## Addition of a habitable room (not including a conservatory) to an existing dwelling

**3.16** The requirement for adequate ventilation can be met if background ventilators are used as follows:

- a. if the additional room is connected to an existing habitable room which now has no windows opening to outside, paragraphs 1.43 to 1.45 should be followed
- b. If the additional room is connected to an existing habitable room that still has windows opening to outside:
  - i. If the existing habitable room has a total background ventilator equivalent area of less than 5000 mm<sup>2</sup>, paragraphs 1.43 to 1.45 should be followed.
  - ii. If the existing habitable room has a total background ventilator equivalent area of at least 5000 mm<sup>2</sup>, there should be both:
    - i. background ventilators of at least 12,000 mm<sup>2</sup> equivalent area between the two rooms
    - ii. background ventilators of at least 12,000 mm<sup>2</sup> equivalent area between the additional room and outside.

**3.17** As an alternative to paragraph 3.16, to ventilate the additional habitable room, either:

- a. a single-room heat recovery ventilator could be used. The supply rate to that room should be determined as follows:

First, determine the whole building ventilation rate from Table 1.3.

Second, calculate the room supply rate required from:

$$\frac{(\text{Whole building ventilation rate} \times \text{Room volume})}{(\text{Total volume of all habitable rooms})}$$

- b. If you already have mechanical ventilation, the centralised system could be extended into the additional room.

**3.18** For purge ventilation in a new habitable room in a dwelling, paragraphs 1.27 -1.32 should be followed.

**3.19** For a new habitable room in a dwelling, ventilation location should follow paragraphs 1.10 to 1.32, performance testing should follow paragraph 1.33 and controls should follow paragraphs 1.34 to 1.38.



## Addition of a conservatory to an existing building

- 3.20** The guidance in this section applies to conservatories with a minimum floor area of 30 m<sup>2</sup>. As described in paragraph 0.4 conservatories with a floor area that does not exceed 30 m<sup>2</sup> are exempt from the Part F requirements.
- 3.21** The general **ventilation** rate for a new conservatory and, if necessary, adjoining rooms could be achieved using **background ventilators**. Follow paragraphs 1.43 to 1.45 whatever the **ventilation** provisions are in the existing room adjacent to the conservatory.
- 3.22** For **purge ventilation** in a new conservatory, follow paragraphs 1.27-1.32.
- 3.23** For a new conservatory, **ventilation** location should follow paragraphs 1.10 to 1.32, performance testing should follow paragraph 1.33 and controls should follow paragraphs 1.34 to 1.38.

## Addition of a wet room to an existing dwelling

- 3.24** When a **wet room** is added to an existing **dwelling**, **whole building ventilation** should be extended, and **extract ventilation** should be provided through *any* of the following:
- Intermittent extract**, as given in **Table 1.1**, and a **background ventilator** of at least **5000 mm<sup>2</sup> equivalent area**;
  - Continuous extract fan, as given in **Table 1.2**;
  - Single-room heat recovery ventilator, as given in paragraph 3.25.
- 3.25** If a continuously running single room heat recovery ventilator is used in a **wet room**, it should use the minimum high rate given in **Table 1.2** and 50% of this value as the continuous rate. No **background ventilator** is required in the same room as the single room heat recovery ventilators.
- 3.26** For any **ventilation** strategy, internal doors should allow air to move within the **dwelling** by providing a **free area equivalent** to a 10mm undercut in a 760mm wide door. Doors should be undercut either:
- If the floor finish is fitted: 10 mm above the floor finish;
  - If the finish is not fitted: 20 mm above the floor surface.
- 3.27** For **purge ventilation** in a new **wet room**, follow paragraphs 1.27.

- 3.28** For a new **wet room**, **ventilation** location should follow paragraphs 1.10 to 1.32, performance testing should follow paragraph 1.33 and controls should follow paragraphs 1.34 to 1.38.

### Refurbishing a kitchen or bathroom in an existing dwelling

**NOTE:** If a combustion appliance is installed in a kitchen or **bathroom** where building work is carried out, Part J of the Building Regulations must be considered.

- 3.29** Where building work is carried out in a kitchen or **bathroom**, any existing fans (including cooker hoods, where they extract to outside) should be retained or replaced. **Appropriate checks should be made to determine whether existing ventilation devices retained are functional and working correctly.**
- 3.30** If there is no **ventilation** system in the original room, it is not necessary to provide one in the refurbished room. **However, additional ventilation may be necessary if refurbishment work is likely to make the building less compliant with the ventilation requirements of the Building Regulations than it was before the work was carried out.**
- 3.31** If an extract fan or cooker hood is replaced with a similar type, and using the existing cabling, this need not be notified to a **building control body**, see a) and f) of Schedule 4 of the Building Regulations.

# Requirement F1(2) and Regulations 39, 42 and 44

Requirement [regulations will be amended as necessary in line with the intention sections below]	
Requirement	Limits on application
<p><b>F1(2).</b> Fixed systems for mechanical ventilation and any associated controls must be commissioned by testing and adjusting as necessary to secure that the objective referred to in sub-paragraph (1) is met.</p>	<p>Requirement F1 does not apply to a building or space within a building:</p> <ul style="list-style-type: none"> <li>a. into which people do not normally go; or</li> <li>b. which is used solely for storage; or</li> <li>c. which is a garage used solely in connection with a single dwelling.</li> </ul>
<p><b>Requirements in the Building Regulations 2010</b></p> <p><b>Information about ventilation</b></p> <p>39.—(1) This regulation applies where Part F1(1) of Schedule 1 imposes a requirement in relation to building work.</p> <p>(2) The person carrying out the work shall not later than five days after the work has been completed give sufficient information to the owner about the building’s ventilation system and its maintenance requirements so that the ventilation system can be operated in such a manner as to provide adequate means of ventilation.</p> <p><b>Mechanical ventilation air flow rate testing</b></p> <p>42.—(1) This regulation applies where paragraph F1(1) of Schedule 1 imposes a requirement in relation to the creation of a new dwelling by building work.</p> <p>(2) The person carrying out the work shall, for the purpose of ensuring compliance with paragraph F1(1) of Schedule 1—</p> <ul style="list-style-type: none"> <li>(a) ensure that testing of the mechanical ventilation air flow rate is carried out in accordance with a procedure approved by the Secretary of State; and</li> <li>(b) give notice of the results of the testing to the local authority.</li> </ul> <p>(3) The notice referred to in paragraph (2)(b) shall—</p> <ul style="list-style-type: none"> <li>(a) record the results and the data upon which they are based in a manner approved by the Secretary of State; and</li> <li>(b) be given to the local authority not later than five days after the final test is carried out.</li> </ul> <p><b>Commissioning</b></p> <p>44.—(1) This regulation applies to building work in relation to which paragraph F1(2) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed system for mechanical ventilation or any associated controls where testing and adjustment is not possible.</p> <p>(2) This regulation applies to building work in relation to which paragraph L1(b) of Schedule 1 imposes a</p>	

## Consultation version: not statutory guidance

requirement, but does not apply to the provision or extension of any fixed building service where testing and adjustment is not possible or would not affect the energy efficiency of that fixed building service.

(3) Where this regulation applies the person carrying out the work shall, for the purpose of complying with paragraph F1(2) or L1(b) of Schedule 1, give to the local authority a notice confirming that the fixed building services have been commissioned in accordance with a procedure approved by the Secretary of State.

(4) The notice shall be given to the local authority –

(a) not later than the date on which the notice required by regulation 16(4) is required to be given; or

(b) where the regulation does not apply, not more than 30 days after the completion of the work.

**NOTE:** Where the **building control body** is an approved inspector, see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

### Intention

In the Secretary of State's view, requirement F1(2) and regulation 44 are met if building work that involves installing a mechanical **ventilation** system, for a new or **existing dwelling**, follows paragraphs 4.1 to 4.11 to achieve all of the following.

- a. All fixed mechanical **ventilation** systems for which testing and adjustment is possible are tested and commissioned.
- b. Commissioning results show that systems are operating as required to achieve adequate **ventilation**, including achieving the flowrates specified in this approved document.
- c. Commissioning results show that controls are operating as required to achieve adequate **ventilation**.
- d. The person carrying out the work gives notice to the **building control body** and **building owner** that commissioning has been carried out in accordance with the procedure given in this document.

In the Secretary of State's view, when building work that affects **ventilation** is carried out on a new or **existing dwelling**, regulation 39 is met if the installer provides clear and simple written guidance for the **building owner** on how to operate and maintain their **ventilation** system, as per paragraphs 4.12 to 4.16.

In the Secretary of State's view, when a new **dwelling** is created by building work, regulation 42 is met if the installer complies with all of the following.

- a. Measures and records the mechanical **ventilation** flowrates by following **paragraph 4.9**.
- b. Gives notice of **ventilation** flowrates to the **building control body** not later than five days after the final test.



## Section 4: Commissioning and providing information

### Air flow rate testing and commissioning of ventilation systems

- 4.1** Mechanical **ventilation** systems must be commissioned to provide adequate **ventilation**. A commissioning notice must be given to the **building control body**.
- 4.2** Air flow rates for mechanical **ventilation** in new **dwellings** must be measured. A notice of the measured air flow rates must be given to the **building control body**.
- NOTE:** this includes **intermittent extract** as well as continuous mechanical **ventilation** systems.
- 4.3** The person responsible for commissioning should complete air flow measurement test and commissioning sheets including, as a minimum, all information in the example sheet in **Appendix C**.
- NOTE:** When mechanical **ventilation** is commissioned, the use of fuel and power should also be considered in accordance with Part L of the Building Regulations (L1(b) of Schedule 1). Installers may provide notice of commissioning to cover Part F (F1(2) of Schedule 1) and Part L in the same document.

### Inspection requirements

- 4.4** **Ventilation** systems should be inspected and tested in accordance with paragraphs 4.5 to 4.11.

### Background ventilators and intermittent extract

- 4.5** For **background ventilators**, the following should be observed and recorded using the checklist in **Appendix C**:
- Identify and record minimum **equivalent area** for **background ventilators** from Table 1.8.
  - Record actual **equivalent area** and location of installed **background ventilators**.
  - Check whether **background ventilator** controls work and that they open and close correctly.
  - Check the quality of the installation of the ventilator product to ensure it is correctly mounted within the wall or window aperture
- 4.6** For **intermittent extract** fans, the installer should:
- Check that the fan operates correctly.
  - Check that the fan or fans respond correctly to the controls provided with the installation
  - Check that any run-on timers are set to at least 15 minutes.

## Ducted systems

4.7 For all ductwork and terminals, the following should be observed and recorded in the checklist in **Appendix C**:

- a. Check that the system has been installed both:
  - in accordance with the design criteria
  - to a standard that will not adversely affect its performance.
- b. Number and size of air terminals satisfy Table 1.4.
- c. All ductwork and terminals are in good condition with no obvious defects that will affect the performance of the system.
- d. Air flow direction is correct at each room terminal.
- e. There are no abnormal noises from the **ventilation** system, including all of the following:
  - i. On start-up.
  - ii. When running in background **ventilation** mode.
  - iii. When running at the high rate.

4.8 For continuous mechanical **ventilation** systems, such as continuous **mechanical extract** or **mechanical supply and extract ventilation**, the system should be balanced to achieve design air flow rates at each room terminal. The fan manufacturer's instructions should be followed to balance the system. If specific details are not included, the relevant set of instructions from list a-e in this paragraph should be followed:

- b. For adjustable terminals with a fixed (stepped) speed fan:
  - i. The fan speed should be set to achieve the desired continuous flow rate.
  - ii. The index terminal flow rate should be set to full open and all other terminals should be adjusted to achieve the required flows at each terminal.
  - iii. If the total flow rate cannot be achieved through all the terminals, then the fan speed should be increased.
  - iv. If all the terminals have to be closed significantly to achieve only the required air flow rate, then the fan speed should be reduced and the terminals rebalanced.
- c. For adjustable terminals with a controllable speed fan:
  - i. The fan speed should be set approximately to achieve the desired continuous flow rate.
  - ii. The index terminal flow rate should be set with the terminal fully open and all other terminals should be adjusted to achieve the required flows at each terminal.
  - iii. If the index terminal has to be closed to achieve only the required air flow rate, then the fan speed should be reduced and the terminals rebalanced.
- d. For fixed terminals with flow adjustment by duct damper or similar device at the fan unit, follow a. or b. above, depending on the type of fan speed control.
- e. For adjustable terminals with a fixed volume flow fan:
  - i. The fan speed should be set to achieve the desired continuous flow rate.
  - ii. The index terminal flow rate should be set with the terminal full open, and all other terminals should be adjusted to achieve the required flows at each terminal.
  - iii. **NOTE:** Adjusting the terminals achieves balancing only. Total flow rate is governed by the fan control setting. Care should be taken not to close the terminals too far, because the fan unit will always maintain a constant volumetric flow rate. Closing

- the terminals will only require the fan to work harder to achieve a given air flow rate.
- f. For fixed terminals with automatic flow adjustment at the fan unit, the fan speed should be set to achieve the desired continuous flow rate. The flows are balanced by automatic devices within the fan unit, so cannot be adjusted.

## Air flow rate testing

**4.9** The air flow rate of all mechanical **ventilation** fans should be tested. This includes any of the following:

- a. **Intermittent extract** fans
- b. Cooker hoods
- c. Continuous extract fans and/or terminals
- d. Continuous supply fans and/or terminals

A calibrated air flow device with proprietary hood should be used to measure the air flow rates at each room terminal. The following procedure should be followed:

- a. The design airflow rates should be determined in accordance with Table 1.2.
- b. It should be ensured that both:
  - i. all intended **background ventilators** or other air transfer devices are open.
  - ii. all internal and external doors and windows are closed.
- c. Airflow measurements should be performed using an airflow device that:
  - i. has a proprietary hood attachment.
  - ii. has an accuracy of  $\pm 5\%$ .
  - iii. has been calibrated within the last 12 months at a UKAS accredited calibration centre.
- d. The airflow for each extract/supply fan or terminal should be recorded in litres per second (l/s) on the commissioning sheet (see **Appendix C**).

**NOTE:** In exceptional circumstances, the configuration of some fan units may prevent air flow rates being measured. In those circumstances, evidence should be provided to the **building control body** to give assurance that the flow-rate can be determined by following manufacturer's guidance.

## Controls

**4.10** The correct operation of each control function should be tested as far as practical. **Ventilation** controls should be inspected to ensure the following:

- a. All local controls have been installed following the manufacturer's instructions.
- b. All local controls are adequately labelled to indicate their function clearly.
- c. If sensors have been installed separately from the fan unit, the manufacturer's installation instructions were followed.
- d. Where control of the fan is automated, the controls are configured to ensure that **automatic controls** are not disturbing to occupants, for example, rapid changes in fan speed.

**4.11** If **manual controls** are provided, clear and detailed instructions should be provided to the occupier as part of the information package in paragraphs 4.12 to 4.16.





## Providing information

- 4.12** Sufficient information about the **ventilation** system and its maintenance requirements must be given to the building owner so that the system can be operated effectively. This should include both design flow rates and maintenance requirements. **The information should be provided in a clear manner, for a non-technical audience.**
- 4.13** **A copy of the completed commissioning sheet in Appendix C should be provided to the owner of the dwelling.**
- 4.14** The operation and maintenance information should contain specific instructions for the end user on how and when to use the **ventilation** system, including information on the intended use of available fan settings. Information should also be provided to suggest when, and how, the system components should be cleaned and maintained.
- 4.15** The following information should be provided where relevant:
- manufacturer's contact details;
  - that **background ventilators** allow fresh air into the home and should be left open
  - location of and setting of **automatic controls** (e.g. humidity and timer controls);
  - location and use of on/off and high rate settings for mechanical **ventilation** system
  - how to adjust extract air terminals on vertical passive stack ducts;
  - how cleaning and maintenance should be carried out, including replacing filters;
  - location of filters, if not installed within the fan unit. If no filters are installed on extract terminals, describe how to access ducts for cleaning, how to undertake cleaning and at what interval;
  - the location of sensors and how to recalibrate them;
  - design flow rates.
- 4.16** The operation and maintenance information should also contain relevant manufacturers' literature, including, where relevant:
- components specifications
  - installation guidance
  - operating instructions
  - maintenance schedules
  - guarantees
  - registration card
  - spare part lists
  - means of obtaining spare parts

## Home User Guide

**4.17** A Home User Guide should be provided for a new dwelling as described in **Approved Document L, volume 1: dwellings**. (Section 9 – Providing Information). The Home User Guide should contain a section on 'Ventilation', which provides non-technical advice on the **ventilation** systems provided within the new **dwelling**. The **ventilation** systems provided to comply with Part F

of the Building Regulations should be taken into account when completing this section of the Home User Guide.

**4.18** The Home User Guide is in addition to the Operating and Maintenance instructions. The Home User Guide is intended to be a non-technical overview for the occupiers, which is expected to include some basic details on the operation and maintenance of the system. The Operating and Maintenance instructions provide further details as required.

**NOTE:** Information about overheating and the conservation of fuel and power are required under different Regulations and guidance is given in **Approved Documents [X] (overheating)** and **L (conservation of fuel and power)**. Where the system provides more than one function the owner should be informed of each.

# Appendix A: Key Terms

The definitions below are for this document only, and are not intended to be applied in other circumstances. Fuller definitions of the various terms are given in the relevant British Standards listed in **Appendix D**.

**Air permeability** is the physical property used to measure the airtightness of the building fabric. It is defined as air leakage rate per hour per square metre of envelope area at a test reference pressure differential across the building envelope of 50 Pascals. The **design air permeability** is the target value set at the design stage.

**Airtightness** describes the resistance of the building envelope to **infiltration** with ventilators closed. The greater the **airtightness** at a given pressure difference across the envelope, the lower the **infiltration**.

**Automatic control** is where a ventilation device is adjusted by a mechanical or electronic controller that responds to a relevant stimulus. That stimulus usually relates to the humidity of the air in a room, pollutant levels, occupancy of the space or pressure difference across the device.

**Background ventilator** is a small **ventilation opening** designed to provide controllable **whole building ventilation**.

**Basement (in relation to dwellings)** is a dwelling or a usable part of a dwelling (i.e. a **habitable room**), that is partly or entirely below ground level. Note that a **cellar** is distinct from a basement

**Bathroom** is a room containing a bath or shower and, in addition, can also include **sanitary accommodation**.

**Building Control Body** is a local authority or an approved inspector.

**Cellar** is a part of a dwelling that is partly or entirely below ground level, and is used only for storage, heating plant or purposes other than habitation. Note that a **basement** is distinct from a cellar.

## Consultation version: not statutory guidance

**Continuous operation** is when a mechanical ventilation device runs all the time, e.g. **mechanical extract ventilation (MEV)** and **mechanical supply and extract ventilation**. The air flow rate provided by mechanical ventilation need not be constant but may be varied, under either **manual** or **automatic control**, in response to the demand for removal of pollutants or water vapour.

**Dwelling** means a self-contained unit, including a house or a flat, designed to be used separately to accommodate a single household.

**Equivalent area** is a measure of the aerodynamic performance of a ventilator. It is the area of a sharp-edged circular orifice through which air would pass at the same volume flow rate, under an identical applied pressure difference, as through the opening under consideration. The equivalent area of a background ventilator is determined at 1 Pa pressure difference in accordance with Table 1.5.

**Extract ventilation** is the removal of air directly from a space or spaces to outside. **Extract ventilation** may be by natural means or by mechanical means (e.g. by an extract fan or central system).

**Expert advice** is advice from a suitably qualified competent person. Examples from the ventilation industry include a chartered or professional engineer, a building services specialist, a specialist ventilation manufacturer or members of professional trade bodies.

**Free area** is the geometric open area of a ventilator.

**Habitable room** is a room used for dwelling purposes but which is not solely a kitchen, **utility room**, **bathroom**, **cellar** or **sanitary accommodation**.

**Highly airtight dwellings** are those with either:

- a. a design air permeability lower than  $5 \text{ m}^3/(\text{h}\cdot\text{m}^2)$  at 50 Pa
- b. an as-built air permeability of lower than  $3 \text{ m}^3/(\text{h}\cdot\text{m}^2)$  at 50 Pa.

**Infiltration** is the uncontrolled exchange of air between inside a building and outside, through cracks, porosity and other unintentional openings in a building, caused by pressure difference effects of the wind and/or **stack effect**.

**Intermittent operation** is when a mechanical ventilator does not run all the time, usually running only when there is a particular need to remove pollutants or water vapour (e.g. during cooking or bathing). **Intermittent operation** may be under either **manual control** or **automatic control**.

**Less airtight dwellings** are those which are not **highly airtight dwellings**.

**Manual control** is where a ventilation device is opened and closed, or switched on and off, or its performance is adjusted by the occupants of a room or building (see **automatic control**).

**Mechanical extract ventilation** is mechanically driven **ventilation** that continuously extracts indoor air and discharges it to outside.

## Consultation version: not statutory guidance

**Mechanical supply and extract ventilation** is any mechanically driven ventilation that both continuously supplies outdoor air to the inside of the dwelling and continuously extracts indoor air and discharges it to outside. This includes decentralised supply and extract ventilation, and **Mechanical ventilation with heat recovery (MVHR)**.

**Mechanical ventilation with heat recovery (MVHR)** is a mechanical supply and extract system that includes a heat recovery mechanism.

**Natural ventilation** is ventilation provided by thermal, wind or diffusion effects through doors, windows or other intentional openings without the use of mechanically driven equipment. For the purposes of this approved document, natural ventilation refers to a ventilation strategy using **background ventilators** and intermittent extract ventilation.

**Permanent opening** is a **ventilation opening** that is permanently fixed in the open position.

**Purge ventilation** is manually controlled ventilation of rooms or spaces at a relatively high rate to rapidly dilute pollutants and/or water vapour. **Purge ventilation** may be provided by natural means (e.g. an openable window) or mechanical means (e.g. a fan).

**Purpose-provided ventilation** is that part of the ventilation of a building provided by ventilation devices designed into the building (e.g. **background ventilators**, extract fans, mechanical ventilation or air-conditioning systems).

**Sanitary accommodation** is a space containing one or more water closets or urinals. **Sanitary accommodation** containing one or more cubicles counts as one space if there is free circulation of air throughout the space.

**Stack effect** is the pressure differential between inside and outside a building, caused by differences in the density of the air due to an indoor/outdoor temperature difference.

**Surface water activity** is a measure of the availability of water to micro-organisms. Surface water activity is determined from the ratio of the vapour pressure of the water in the substrate to the vapour pressure of pure water at the same temperature and pressure. This ratio, in steady-state conditions, is numerically equal to the equilibrium relative humidity of the air, except that the latter is commonly expressed as a percentage.

**Thermal envelope** is the combination of **thermal elements** of a building which enclose a particular conditioned indoor space or groups of indoor spaces.

**Utility room** is a room containing a sink or other feature or equipment that may reasonably be expected to produce significant quantities of water vapour.

**Ventilation** is the supply and removal of air (by natural and/or mechanical means) to and from a space or spaces in a building. It normally comprises a combination of **purpose-provided ventilation** and **infiltration**.

**Ventilation opening** is any means of **purpose-provided ventilation** (whether permanent or closable) that opens directly to external air, such as the openable parts of a window, a louvre

## Consultation version: not statutory guidance

or a **background ventilator**. It also includes any door that opens directly to external air.

**Wet room** is a room used for domestic activities (such as cooking, clothes washing and bathing) that produce significant amounts of airborne moisture, e.g. a kitchen, **utility room** or **bathroom**. For the purposes of Part F of the Building Regulations, **sanitary accommodation** is also regarded as a **wet room**.

**Whole building ventilation (general ventilation)** is nominally **continuous** ventilation of rooms or spaces at a relatively low rate to dilute and remove pollutants and water vapour not removed by **extract ventilation**, **purge ventilation** or **infiltration**, as well as to supply outdoor air into the building. For an individual dwelling, this is referred to as **whole dwelling ventilation**.

# Appendix B: Performance-based ventilation

## Introduction

**B.1** This Appendix sets out the levels of moisture and other pollutants that the provisions in this approved document are designed to control. The provisions are designed to control all of the following:

- Moisture levels as described in paragraph B.2
- Indoor air pollutants as described in paragraph B.4
- Bio-effluents as described in paragraph B.6

**NOTE:** the guidance in this approved document may not be adequate to address pollutants from flueless combustion space heaters. This approved document does not address the airborne spread of infection and does not directly address contamination from outdoor sources.

**NOTE:** A strategy for achieving good indoor air quality includes reducing the release of water vapour and air pollutants. This approved document does not provide guidance on this strategy.

## Performance criteria for dwellings

**B.2** The performance criterion for moisture is that there should be no visible mould on external walls, windows, rooflights and doors in a properly heated **dwelling** with typical moisture generation.

**B.3** Mould can grow whether the **dwelling** is occupied or unoccupied, so the performance criterion for moisture (as in Table B.3) should be met at all times, regardless of occupancy. The other pollutants listed in Table B.1 are only of concern when the **dwelling** is occupied.

**NOTE:** that the moisture criteria to meet to avoid house dust mite allergens are more complex and demanding than that to meet to avoid mould. This document does not give guidance on the control of house dust mite allergens.

**B.4** The performance criteria for indoor air pollutants are given in Table B.1. These are based on **World Health Organisation** (2010) and **Public Health England** (2019) guidance.





Table B.1 Indoor air pollutants guidance values <sup>1</sup>		
Pollutant	Exposure limit	Exposure time
Carbon monoxide	100 mg/m <sup>3</sup>	15 minute average
	30 mg/m <sup>3</sup>	1 hour average
	10 mg/m <sup>3</sup>	8 hour average
Nitrogen dioxide (NO <sub>2</sub> )	200 µg/m <sup>3</sup>	1 hour average
	40 µg/m <sup>3</sup>	1 year average
Formaldehyde	100 µg/m <sup>3</sup>	30 minute average
	10 µg/m <sup>3</sup>	1 year average
TVOC <sup>2</sup>	300 µg/m <sup>3</sup>	8 hour average

**Notes:**

1. There are no safe levels that can be recommended for benzene and trichloroethylene and as such they have not been considered for defining ventilation rates in dwellings. Source control may be the optimal strategy for reducing their concentration indoors.
2. Total volatile organic compound (TVOC) metric is representative of all airborne indoor air VOC concentrations and should not be used as a direct indicator of health. The simplified metric is used as an indicator for ventilation control strategies. As an alternative to the TVOC limit, individual VOC limits may be used where justified according to paragraph B.5.
3. The designer and builder may choose source control as the optimal strategy of reducing VOC levels in buildings. However, the ventilation requirements must still be met.

**B.5** As an alternative to using TVOC, the individual VOCs may be used where supported by robust independent evidence. Public Health England's *Indoor Air Quality Guidelines for selected Volatile Organic Compounds (VOCs) in the UK* should be used. Testing against these metrics is likely to be more complex than testing against TVOC.

**B.6** Control of bio-effluents (body odours) for people who have been exposed to the environment for a period of time will be achieved by an air supply rate of 4 litres per second per person (**BS EN 16798-1:2019**).

## Assumptions used in applying performance criteria for dwellings in Section 1

### General

**B.7** Where the guidance for less airtight buildings is followed, dwellings are assumed to have an infiltration rate of 0.15 air changes per hour.

## Consultation version: not statutory guidance

- B.8** Where the guidance for **highly airtight dwellings** is followed, **dwellings** are assumed to have no **infiltration**.
- B.9** **Ventilation** effectiveness is assumed to be 1.0 – that is, it is assumed that supply air is fully mixed with room air.
- CIBSE's *Guide A* provides further information on **ventilation** effectiveness.
- B.10** For the purpose of this Approved Document, for all **dwellings** (new, and existing where Part F applies), the moisture criterion is likely to be met if, during the colder months of the year, the moving average **surface water activity** of the internal surfaces of external walls is always less than the value in Table B.2, evaluated over each moving average period.

Table B.2 is the primary basis for demonstrating compliance with the moisture criterion.

Table B.2 Surface water activity	
Moving average period	Surface water activity
1 month	0.75
1 week	0.85
1 day	0.95

- B.11** For new **dwellings**, for the purpose of this Approved Document, the moisture criteria in Table B.2 are likely to be met if, during the colder months of the year the moving average relative humidity in a room is always less than the value given in Table B.3, evaluated over each moving average period.

Table B.3 Indoor air relative humidity water activity	
Moving average period	Indoor air relative humidity water activity
1 month	65%
1 week	75%
1 day	85%

# Appendix C: Completion checklist and commissioning sheet

- C.1** This installation and commissioning checklist is divided into three parts:
- Part 1** contains the particulars of the system, installation address and installer's details.
  - Part 2a** functions as an installation checklist.
  - Part 2b** is a visual inspection, or pre-commissioning, checklist.
  - Part 3** is for recording air flow measurements from fans.

## Checking design against measured air flow rates

- C.2** Measured air flow rates for all fans should be recorded on Part 3: Commissioning details, as part of the commissioning procedures given in **Section 4** of this Approved Document. The measured values should be compared with their respective design values. Either:
- If the measured rate for each fan is equal to or greater than the design value: the design is complied with.
  - If any measured value is lower than the design value: adjustment should be made to correct the system. All air flows should then be re-measured. If necessary, further adjustments should be made until air flows meet the design values.

## Demonstrating compliance

- C.4** All three parts of the installation and commissioning checklist should be completed. The relevant parts of Parts 2 and 3 should be signed by a person who is both competent to install the system and responsible for installing and commissioning the system.
- C.5** The three-part form should be completed for each installation address. A copy should be submitted to the **building control body** as evidence that the system is correctly installed and has been correctly inspected and commissioned.

## Part 1 – System details and declarations

The installer should complete this section and include details of the commissioning engineer.

<b>1.1 Installation Address Details</b>	
Dwelling name/number	
Street	
Locality	
Town	
County	
Post Code	
<b>1.2 System Details</b>	
System classification*	
<i>Enter natural ventilation, mechanical extract ventilation or as defined by Approved Document F</i>	
Manufacturer	
Model numbers	
Serial number (where available)	
Location of fan units	1.
	2.
	3.
	4.
	5.
	6.
	7.
<b>1.3 Installation Engineer's Details</b>	
Engineer's Name	
Company	
Address Line 1	
Address Line 2	
Telephone Number	
Post Code	
<b>1.4 Commissioning Engineer's Details (if different to 1.3)</b>	
Engineer's Name	
Company	
Address Line 1	
Address Line 2	
Telephone Number	
Post Code	

\*Note. If a system has been installed that is not defined in Approved Document F, further installation checks and commissioning procedures may be required. Seek guidance from the manufacturer for these systems.

## Consultation version: not statutory guidance

### Part 2a – Installation details

The installer should complete this section before commissioning is carried out.

<b>2.1</b>	<b>Installation Checklist – General (all Systems)</b>	<b>Tick as appropriate</b>	
	Has the system been installed in accordance with manufacturer's requirements?	<b>Yes</b>	<b>No</b>
	Have paragraphs 1.15 to 1.74 of <b>Approved Document F, volume 1: dwellings</b> been followed (if relevant)?	<b>Yes</b>	<b>No</b>
	If there are any deviations from paragraphs 1.15 to 1.74 of <b>Approved Document F, volume 1: dwellings</b> , these should be detailed here.		
	Description of installed controls (e.g. timer, central control, humidistat, occupancy sensor, thermal bypass if applicable, etc)		
	Location of manual / override controls		
<b>2.2</b>	<b>Installation Engineer's Declaration</b>		
	Engineer's Signature		
	Registration Number (if applicable)		
	Date of Inspection		

### Part 2b – Inspection of installation

The commissioning engineer should complete this section before completing Part 3.

<b>2.3a</b>	<b>Visual Inspections – General (all systems)</b>		
	What is the total installed equivalent area of background ventilators in dwelling?		<b>mm<sup>2</sup></b>
	What is the total floor area of dwelling?		<b>m<sup>2</sup></b>
	Does the total installed equivalent ventilator area meet the requirements given in Table 1.6 or paragraph 1.56, as appropriate, in <b>Approved Document F, volume 1: dwellings</b> ?	<b>Yes</b>	<b>No</b>
	Have all background ventilators been left in the open position?	<b>Yes</b>	<b>No</b>
	Have the correct number and location of extract fans/terminals been installed that satisfy Table 1.1 or Table 1.2 as appropriate in ADF?	<b>Yes</b>	<b>No</b>
	Is the installation complete, with no obvious defects?	<b>Yes</b>	<b>No</b>
	Do all internal doors have sufficient undercut to allow air transfer between rooms (e.g 10 mm over and above final floor finish)?	<b>Yes</b>	<b>No</b>
	Has all protection/packaging been removed (including background ventilators), such that system is fully functional?	<b>Yes</b>	<b>No</b>
	For ducted systems, has the ductwork been installed so that air resistance and leakage is kept to a minimum?	<b>Yes</b>	<b>No</b>
	Has the entire system been installed so that there is sufficient access for routine maintenance and to repair/replace components?	<b>Yes</b>	<b>No</b>
<b>2.3b</b>	<b>Visual Inspections – General (Mechanical extract ventilation and Mechanical supply and extract ventilation systems only)</b>		
	Have appropriate air terminal devices been installed to allow system balance?	<b>Yes</b>	<b>No</b>
	Have the heat recovery unit (MVHR) and all ductwork been effectively insulated for all heated and unheated spaces?	<b>Yes</b>	<b>No</b>
	Condensate connection is complete and condensate drains to an appropriate location (Mechanical supply and extract ventilation only)?	<b>Yes</b>	<b>No</b>

## Consultation version: not statutory guidance

<b>2.3c Other Inspections – General (all systems)</b>		
Upon initial start-up, was there any abnormal sound or vibration, or unusual smell?	<b>Yes</b>	<b>No</b>
During continuous operation, was there any excessive noise?	<b>Yes</b>	<b>No</b>

## Part 3 – Commissioning details

The commissioning engineer should complete this section after completing Part 2b.

<b>3.1 Commissioning Equipment</b>	
Schedule of air flow measurement equipment used (model and serial)	Date of last UKAS calibration
1.	
2.	
3.	

<b>3.2 Air Flow Measurements – Intermittent extract fans only</b>		
Fan reference (as 1.2)	Measured Extract Rate (l/s)	Design Extract Rate (l/s) Refer to Table 1.1 in ADF
Extract Fan 1.		
Extract Fan 2.		
Extract Fan 3.		
Extract Fan 4.		

*For cooker hoods, only the highest setting needs to be recorded.*

<b>3.3 Air Flow Measurements (Extract) – Mechanical extract ventilation and Mechanical supply and extract ventilation only</b>				
Room reference (location of terminals)	Measured Air Flow High Rate (l/s)	Design Air Flow High Rate (l/s) Refer to Table 1.2 in ADF	Measured Air Flow Continuous rate (l/s)	Design Air Flow Continuous Rate (l/s) Refer to Table 1.3 in ADF
Kitchen				
Bathroom				
En Suite				
Utility				
Other...				
Other...				
Other...				

<b>3.4 Air Flow Measurements (Supply) – mechanical supply and extract ventilation only</b>				
Room reference (location of terminals)	Measured Air Flow High Rate (l/s)	Design Air Flow High Rate (l/s) Refer to Table 1.2 in ADF	Measured Air Flow Continuous Rate (l/s)	Design Air Flow Continuous Rate (l/s) Refer to Table 1.3 in ADF
Living Room 1				
Living Room 2 (if present)				
Dining Room				
Bedroom 1				

**Consultation version: not statutory guidance**

Bedroom 2				
Bedroom 3				
Bedroom 4				
Bedroom 5				
Study				
Other...				

**3.5 Commissioning Engineer's Declaration**

Engineer's Signature	
Registration Number (if applicable)	
Date of Commissioning	



## Appendix D: Checklist for ventilation provision in existing dwellings

**D.1** This checklist, in Table D.1, may be used when installing energy efficiency measures in an existing dwelling, following paragraphs 3.5 to 3.12.

**D.2** The checklist may aid in checking the ventilation provision in an existing dwelling. It may be used before energy efficiency measures are carried out to help determine compliance with paragraph 3.5. The relevant section of this checklist should be selected depending on the chosen ventilation strategy. If any questions are answered 'No', further ventilation provisions may need to be installed, as described in paragraph 3.9 to 3.10.

**NOTE:** Although it may go beyond the requirements of paragraph 3.5, following the checklist in Table D.1 is considered to be an adequate means of demonstrating compliance with paragraph 3.5.

Table D.1. Checklist for ventilation provision in existing dwellings		
<b>Natural Ventilation<sup>1</sup></b>		
Total equivalent area of background ventilators currently in dwelling?		mm <sup>2</sup>
Does each habitable room satisfy the minimum equivalent area in Table 1.6?	Yes	No
Have all background ventilators been left in the open position?	Yes	No
Are fans and background ventilators in the same room at least 0.5 m apart?	Yes	No
Are there working intermittent extract fans in all wet rooms?	Yes	No
Are there the correct number of intermittent extract fans to satisfy Table 1.1?	Yes	No
Does the location of fans satisfy paragraph 1.19?	Yes	No
Do all automatic controls have a manual override?	Yes	No
Does each room have a system for purge ventilation (e.g. Windows)?	Yes	No
Do openings in that room satisfy the minimum opening areas in Table 1.4?	Yes	No
Do all internal doors have sufficient undercut to allow air transfer between rooms as detailed in paragraph 1.26 (e.g. 10 mm above final floor finish)?	Yes	No
<b>Continuous mechanical extract ventilation<sup>1</sup></b>		
Does the system comprise of a central, individual room extract fans or both?		
Does the total combined continuous rate of mechanical extract ventilation satisfy Table 1.3?	Yes	No
Does each wet room minimum mechanical extract ventilation high rate satisfy Table 1.2?	Yes	No
Confirm there are no background ventilators in wet rooms?	Yes	No

## Consultation version: not statutory guidance

Do habitable rooms have a minimum equivalent area of 5,000 mm <sup>2</sup> ?	Yes	No
Does each room have a system for purge ventilation (e.g. Windows)?	Yes	No
Do openings in that room satisfy the minimum opening areas in Table 1.4?	Yes	No
Do all internal doors have sufficient undercut to allow air transfer between rooms as detailed in paragraph 1.24 (e.g. 10 mm above final floor finish)?	Yes	No
<b>mechanical supply and extract ventilation <sup>1</sup></b>		
Does each habitable room have mechanical supply ventilation?	Yes	No
Does the total continuous rate of mechanical supply and extract ventilation satisfy Table 1.3?	Yes	No
Does each wet room mechanical extract ventilation high rate satisfy Table 1.2?	Yes	No
Have all background ventilators been removed or sealed shut?	Yes	No
Does each room have a system for purge ventilation (e.g. Windows)?	Yes	No
Do openings in that room satisfy the minimum opening areas in Table 1.4?	Yes	No
Do all internal doors have sufficient undercut to allow air transfer between rooms as detailed in paragraph 1.24 (e.g. 10 mm above final floor finish)?	Yes	No
<b>Note:</b>		
1. A visual check for mould or condensation should be made. If either are present additional ventilation provisions should be installed or specialist advice sought.		

## Appendix E: Standards referred to

**BS 5925:1991** Code of practice for ventilation principles and designing for natural ventilation. AMD 8930 1995.

**BS 7913:2013** Guide to the conservation of historic buildings

**BS 8233:2014** Guidance on sound insulation and noise reduction for buildings

**BS EN 13141-1:2019** Ventilation for buildings. Performance testing of components/products for residential ventilation. Externally and internally mounted air transfer devices.

**BS EN 13141-3:2017** Ventilation for buildings. Performance testing of components/products for residential ventilation. Range hoods for residential use.

**BS EN 13141-4:2011** Ventilation for buildings. Performance testing of components/products for residential ventilation. Fans used in residential ventilation systems.

**BS EN 13141-6:2014** Ventilation for buildings. Performance testing of components/products for residential ventilation. Exhaust ventilation system packages used in a single dwelling.

**BS EN 13141-7:2010** Ventilation for buildings. Performance testing of components/products for residential ventilation. Performance testing of a mechanical supply and exhaust ventilation units (including heat recovery) for mechanical ventilation systems intended for single family dwellings.

**BS EN 13141-8:2014** Ventilation for buildings. Performance testing of components/products for residential ventilation. Performance testing of unducted mechanical supply and exhaust ventilation units [including heat recovery] for mechanical ventilation systems intended for a single room.

**BS EN 13986:2004+A1:2015** Wood-based panels for use in construction. Characteristics, evaluation of conformity and marking.

**BSRIA BG 43/2013.**

**PAS 2035** Retrofitting Dwellings for Improved Energy Efficiency – Specification and Guidance (2019)

# Appendix F: Documents referred to

## Legislation

Ancient Monuments and Archaeological Areas Act 1979, Chapter 46

Explosives Regulations 2014.

Nuclear Installations Act 1965.

## Documents

### BSRIA

**Flexible Ductwork - A guide to specification, procurement, installation and maintenance (BG 43/2013) (2013)**

### Chartered Institution of Building Services Engineers (CIBSE)

CIBSE Guide A: *Environmental design*, 2016. ISBN 978 1 90328 766 8.

**Technical Memorandum 64** *Operational Performance: Indoor Air Quality – Emissions Sources and Mitigation Measures* (2020).

**Technical Memorandum 40** *Health and Wellbeing in Building Services* (2020).

### Health and Safety Executive (HSE)

HSG 193. *COSHH Essentials*.

L24 Workplace (Health, Safety and Welfare) Regulations 1992. *Approved Code of Practice and guidance*, 2001. ISBN 978 0 71760 413 5.

### International Energy Agency (IEA)

*Energy conservation in buildings and community systems*. Annex 14: Condensation and energy. Volume 1: Source book (IEA) (1991)

### McGraw-Hill Education

John Spengler, John McCarthy, Jonathan Samet, *Indoor Air Quality Handbook*. McGraw-Hill Education (2001). ISBN: 978-0074455494

### Ministry of Housing, Communities and Local Government

**Approved Document L, Volume 1: Dwellings [to be added at implementation stage]**

*Manual to the Building Regulations: A Code of Practice for Use in England* (2020). Available at:

**Consultation version: not statutory guidance**

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/901517/Manual to building regs - July 2020.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/901517/Manual_to_building_regs_-_July_2020.pdf)

**Public Health England (PHE)**

*Indoor Air Quality Guidelines for selected Volatile Organic Compounds (VOCs) in the UK.*

Available at: <https://www.gov.uk/government/publications/air-quality-uk-guidelines-for-volatile-organic-compounds-in-indoor-spaces> [accessed 02.11.20]

**World Health Organisation (WHO)**

*WHO Guidelines for indoor air quality, selected pollutants (2010)*

# Index

*[Note for consultation: This index will be provided at implementation stage]*