HM Government

Domestic Ventilation Compliance Guide

2010 Edition

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Section 1

Introduction

This guide provides detailed guidance to help persons comply with requirements in building regulations for installation, inspection, testing, commissioning and provision of information when installing fixed ventilation systems in new and existing dwellings. The aim is to ensure the provision of adequate ventilation while minimising energy use and environmental problems such as noise and thermal discomfort.

It is important to note that the guide covers a range of frequently occurring situations but it is not exhaustive and alternative means of achieving compliance with the ventilation requirements in the Building Regulations may be possible.

1.1 Status of guide

Building regulations contain functional requirements, such as requirements that buildings must be structurally stable, must be constructed and fitted out to ensure reasonable levels of fire protection, and must be reasonably energy efficient. These functional requirements are often drafted in broad terms, and so it may not always be immediately clear to a person carrying out building work how to comply with the relevant requirements. Consequently documents are often issued by the government department responsible for building regulations which provide practical guidance on ways of complying with specific aspects of building regulations in some of the more common building situations. In England and Wales, these documents are called Approved Documents.

Approved Documents are intended to provide practical guidance but they are not intended to be comprehensive. Consequently there may be references in Approved Documents to other documents which will provide more detailed information and assistance on parts of the guidance. This guide is one of those documents. It provides additional detail in relation to the guidance about compliance with the requirements for installation, inspection, testing, commissioning and provision of information in Approved Documents F, L1A and L1B which apply when installing fixed ventilation systems in new and existing dwellings.

It is important to note that following the guidance in an Approved Document or any guidance referred to by that document does not guarantee compliance with building regulations. If you follow relevant guidance in an Approved Document and in any document referred to which provides additional advice or information to help you follow that guidance (such as this guide), there is a legal presumption that you have complied with building regulations. However, in every case it is for the building control body, whether a private sector approved inspector or the local authority, to decide whether work complies with building regulations. So, you should always check with the building control body before you start work what they consider it is necessary for you to do to comply with building regulations.

1.2 Requirements on air flow testing, commissioning and information provision

In England and Wales, requirements for ventilation and energy efficiency are contained in Part F, *Ventilation*, and Part L, *Conservation of fuel and power*, of Schedule 1 to the Building Regulations. This guide provides appropriate guidance for the four types of ventilation system discussed in detail in Approved Document F. It is referenced by Approved Document F (ADF), Approved Document L1A (ADL1A), and Approved Document L1B (ADL1B) as providing guidance on meeting those requirements for ventilation systems.

Specific statutory requirements in the Building Regulations for England and Wales which this guide addresses are:

- The requirement to commission mechanical ventilation systems (where they can be tested and adjusted) in accordance with an approved procedure, and to provide a notice confirming that commissioning has been carried out to the building control body not later than five days after the work has been completed where a person has had to submit a building notice or full plans or, in other cases, not later than 30 days after the completion of work.
- For mechanical ventilation systems in new dwellings only, the requirement to measure air flow rates in accordance with an approved procedure, and to provide a notice recording the results and the data on which they are based in an approved manner to the building control body not later than five days after the final test is carried out.
- The requirement to provide sufficient information about the ventilation system and its maintenance requirements to owners or occupiers so that the ventilation system can be operated to provide adequate air flow. This guide contains recommendations on the range of information that could be given to dwelling owners on completion to satisfy this requirement.

The approved procedures for commissioning mechanical ventilation systems in dwellings and air flow testing of such systems in new dwellings are set out in Tables 2, 6 and 8 according to which ventilation system has been adopted.

The manner in which the results of air flow testing and the data on which they are based are to be recorded and given to the building control body is given in Part 3 of Section 5 of this document. A downloadable copy of this form is available at www.planningportal.gov.uk/approveddocuments > *Part F (Ventilation)* > *Associated documents*, for the use of those carrying out the air flow testing.

In addition to specifying how the above statutory requirements in the Building Regulations should be met, this guide also contains recommendations for an inspection checklist and for recording the equivalent area of background ventilators.

The inspection checklist and air flow measurement test and commissioning sheet in Section 5 should be completed by installers and test and commissioning engineers, and should form part of the information pack given to dwelling owners to satisfy the information requirement.

1.3 How to use this guide

The guide refers to Systems 1 to 4 as specified in Approved Document F.

Section 2 provides guidance on installation, inspection and testing of natural ventilation and intermittent extract systems; and **Section 3** provides guidance on installation, inspection, testing and commissioning of continuous mechanical ventilation systems.

The testing and commissioning procedures set out in this guide are the approved methods by which a system must be checked and assessed before handover to the end user. For mechanical ventilation (both intermittent and continuous), air flow measurement tests are included as part of the commissioning process. For natural ventilation openings, the recommendation is to carry out a visual inspection and record the ***equivalent area***.

Supplementary information appears in some places in the guide in *italic font with a grey background*. It is intended to assist understanding of the guidance or to direct readers to sources of additional information, but is not part of the guidance. In some cases there are links to best practice guidance that goes beyond the recommended minimum requirements.

BS EN 14134: 2004 *Ventilation for buildings – Performance testing and installation checks of residential ventilation systems* may be referred to for further guidance on installation, inspection, testing and commissioning procedures.

Section 4 details the information that it is recommended should be left with the building owner on completion of the installation of the system. This information is to aid the user to correctly operate and maintain the system.

Section 5 contains in Part 1 a form for recording details of the installation; in Part 2a an installation checklist; in Part 2b a form for recording the results of a visual inspection of the installation; and in Part 3 the air flow measurement test and commissioning sheet to be given to the ***building control body***.

1.4 Key terms

The following key terms where used in this guide are shown in ***bold italic*** font. For other terms, reference should be made to Approved Document F.

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

BCB or building control body is a local authority or an approved inspector.

Continuous mechanical extract ventilation (MEV) is a ventilation system comprising a central ducted continuously running extract fan (or a set of local continuously running extract fans in the wet rooms for de-centralised systems), air being supplied via background ventilators into the habitable rooms.

Continuous mechanical balanced ventilation with heat recovery (MVHR) is a ventilation system that comprises central ducted supply and extract fans, air being supplied into the habitable rooms via a heat recovery unit.

Equivalent area is a measure of the aerodynamic performance of a ventilator. It is the area of a sharp-edged circular orifice which air would pass through at the same volume flow rate, under an identical applied pressure difference, as the opening under consideration.

Free area is the geometric open area of a ventilator or terminal.

Intermittent extract fan is a mechanical ventilator that does not run all the time, usually only running 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.

Passive stack ventilation (PSV) is a ventilation system using ducts from terminals in the ceilings of rooms to terminals on the roof that extract air to outside by a combination of the natural stack effect and the pressure effects of wind passing over the roof of the building.

Single room heat recovery ventilator (SRHRV) is a ventilation system comprising local continuously running balanced supply and extract fans in a single room.

Section 2

Natural ventilation and intermittent extract systems

2.1 System 1 – Background ventilators and intermittent extract fans

The information provided in Tables 1 and 2 gives guidance on good installation practice and on procedures for the inspection and air flow measurement testing of systems comprising ***background ventilators*** and ***intermittent extract fans*** (including cooker hoods) for dwellings. The relevant design guidance is given in ADF, in particular Table 5.2a.

2.2 System 2 – Passive stack ventilation

The information provided in Tables 3 and 4 gives guidance on good installation practice and the procedures for the inspection of passive stack systems for dwellings. The relevant design guidance is given in ADF, in particular Table 5.2b.

Note:

If intermittent extract fans are installed in dwellings where the ventilation system follows System 2, air flow measurement testing should be carried out and recorded as for System 1.

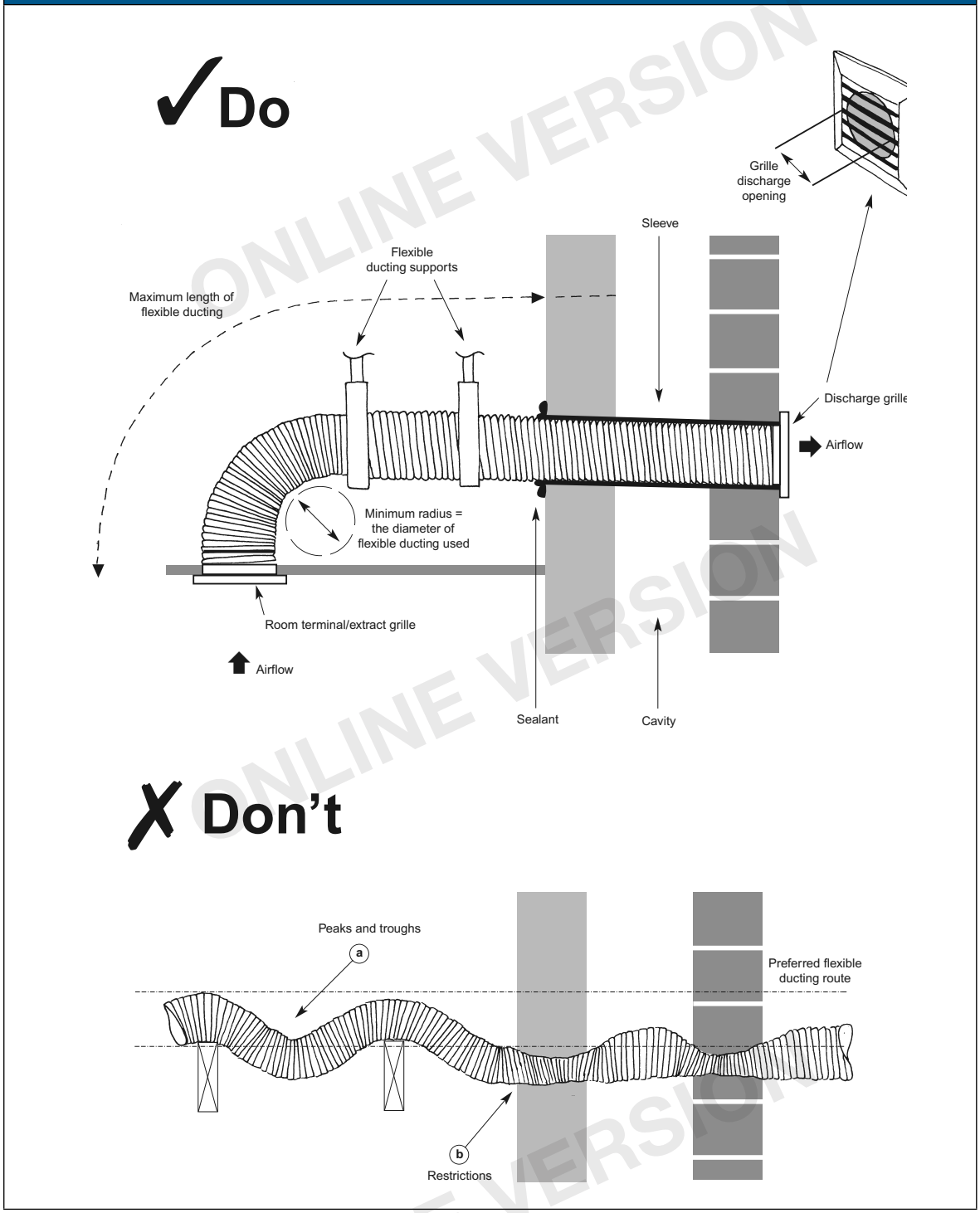
Table 1: System 1 installation guidelines		
	Installation clauses	**Supplementary information**
1.0 Intermittent extract fans (including cooker hoods)	**Manufacturer's details and specific instructions** a. The information provided in this Table sets out the minimum recommended procedures for typical System 1 installations. b. For further product-specific information, refer to the manufacturer's installation instructions.	
	Preparation a. Ensure the final location of equipment offers sufficient space to allow access for maintenance. b. For through-wall units, core a hole of a suitable dimension through the fabric of the building for the installation of the duct. The hole should have a slight downward angle towards the outside to prevent water ingress. c. For ceiling mounted fans/terminals, the holes should be cut to the minimum required size such that the fan/grille spigot fits snugly into the hole. d. Where ductwork penetrates a building's air barrier, the continuity of the barrier must be maintained. The nature of the barrier and ease of achieving an effective seal should be considered before holes are drilled. e. It is important to consider the planning and installation of ductwork in co-ordination with other trade activities and installations, such that routes are designed without compromise to the required ventilation air flow rates.	
	Installation – through wall a. The duct sleeve connecting the fan outlet to the terminal/grille should be at least the same diameter as the fan outlet. b. The duct sleeve should be rigid. In situations where this is not possible, flexible ductwork may be used, providing extract ventilation rates are not compromised. Flexible ductwork should be pulled taut. c. The installed duct sleeve should be sealed to the external and internal wall to maintain air tightness. This is of particular importance for cavity walls. d. Ensure that there are no obstructions in the duct prior to fitting the fan.	

Table 1: System 1 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
1.0 Intermittent extract fans (including cooker hoods) ***(continued)***	**Installation – through window** a. Check the suitability of the window and obtain a suitable window mounting kit from the manufacturer for the proposed fan unit.	*For window mounted fans, do not plan to install in opening lights. The minimum advisable glass thickness is 4 mm, but seek specialist advice from glazier for mounting suitability.*
	Installation – ducted a. Rigid ducts, rectangular or circular, should be used wherever possible. Where necessary, flexible ducts may be used, but their lengths should be kept to a minimum, connecting to rigid ductwork at the earliest opportunity. b. For flexible duct connected to axial fans the length is limited to 1.5 metres; for centrifugal fans the length limit is 6 metres (for extract rates 6 to 30 l/s), and 3 metres (for extract rates 31 to 60 l/s). c. The number of bends is limited to two for up to 30 l/s, and reduces to one bend for higher extract rates. d. Flexible duct should be pulled taught to ensure that the full internal diameter is obtained and flow resistance minimised. This is considered to have been achieved if the duct is extended to 90% of its maximum length. e. Ducting should be insulated where it passes through unheated areas and voids (e.g. loft spaces) with the equivalent of at least 25 mm of a material having a thermal conductivity of ≤0.04 W/(m.K) to reduce the possibility of condensation forming. f. Horizontal ducting, including ducting in walls, should be arranged to slope slightly downwards away from the fan to prevent backflow of any moisture into the product. g. Vertical ducting will require a condensate trap in order to prevent backflow of any moisture into the product. Follow the manufacturer's recommendations in these instances. h. Where ducting passes through a fire-stopping wall or fire compartment, the required measures to ensure compliance with Part B of the Building Regulations should be taken.	*Exceptions to duct limits will be accepted providing evidence from the manufacturer is available that confirms that the specified performance will not be affected.* *For in-line fans, refer to manufacturer's data.* *For duct installations, see Diagram 1.* *Where possible, connect straight lengths of ductwork to fan spigot.*

Table 1: System 1 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
	Cooker hoods a. Cooker hoods should be installed so that access is easy for changing and cleaning of the filter/filters.	*Re-circulating cooker hoods do not provide extract ventilation. To provide extract ventilation in a kitchen for the purposes of Part F, an extract fan to outside should have an installed capacity of at least 60 l/s.*
2.0 Ventilation air inlets and discharge terminals/ grilles	**Background ventilators** a. Background ventilators should be provided to meet the minimum required equivalent area of ventilation specified by Table 5.2a of ADF. b. For wall mounted background ventilators make an opening in the wall in accordance with the manufacturer's instructions for the size required. Ensure that there are no obstructions in the opening. c. Install the wall or window ventilator product in accordance with the manufacturer's instructions. d. Ensure that wall or window ventilator products are sealed to their surrounds using a proprietary sealant as recommended by the manufacturer.	*Background ventilators fitted in windows are usually installed during manufacture. Close co-ordination between supplier and installer is recommended to ensure correct location of ventilators. Background ventilators installed in walls may require a proprietary wind cowl to reduce wind noise and prevent over-ventilation.*
	Discharge terminals/grilles – roof and wall mounted a. Only proprietary terminals should be used. b. Ensure that the free area of the terminal/grille opening is a minimum of 90 per cent of the free area of the ducting being used.	

Table 1: System 1 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
3.0 Miscellaneous	**Air transfer** a. To ensure good transfer of air throughout the dwelling, there should be an undercut of minimum area 7600 mm^2 in all internal doors above the floor finish. This is equivalent to an undercut of 10 mm for a standard 760 mm width door. b. Ensure that the air transfer provision is unrestricted after floor finishes have been laid (e.g. carpets should not encroach). This should be achieved by making an undercut of 10 mm above the floor finish if the floor finish is fitted, or by a 20 mm undercut above the floorboards, or other surface, if the finish has not been fitted.	
4.0 Controls	**General** a. Refer to Table 5.2a of ADF. b. Ensure that a local manual override control is provided for any extract fan operated by automatic controls.	*Humidity controls should not be used for sanitary accommodation where odour is the main pollutant.*

Diagram 1: Duct installations



The inner radius of any bend should be greater or equal to the diameter of the ducting being used. If the radius is reduced, the resistance of the bend will increase and the volume of air being extracted will decrease (see "Do" diagram above).

Ensure flexible ducting is installed without peaks or troughs (see "Don't" diagram above).

Table 2: System 1 inspection and testing		
	Recommendations and minimum requirements	**Supplementary information**
1.0 Intermittent extract fans (including cooker hoods)	**Visual inspections** Carry out the following checks and record the results in Section 5: a. Does the system installation comply with the installation clauses in Table 1? b. Does the number of extract points and terminals satisfy Table 5.2a in ADF? c. Is all equipment in good condition with no obvious defects that will be hazardous or affect the system performance?	
	Functional checks a. Temporary protection and packaging should be removed from all products. b. Check fan operates correctly when activated by manual control (e.g. light switch), or automatic control (e.g. PIR). c. Ensure fan switches off after controls are de-activated and, in the case of run-on timers, that these are set to a minimum of 15 minutes.	*Unless the timer control is graduated in minutes, run-on timers should be checked against a timed test and adjusted if run time is less than 15 minutes.*
	Air flow measurement testing a. Ensure that all intended background ventilators or other air transfer devices are open. b. Ensure all internal and external doors and windows are closed, including rooms in which measurements are being carried out. c. Air flow measurements should be performed using a calibrated air flow device with proprietary hood attachment and results recorded in litres per second (l/s). Reference should be made to Table 5.1a of ADF for design air flow rates. d. Record the extract air flow for each extract fan onto the commissioning sheet (see Section 5). e. The instrument should be calibrated annually and be capable of achieving an accuracy of ± 5 per cent.	***Note: This is the approved procedure for measuring the air flow of intermittent extract fans and cooker hoods as required by the Building Regulations.*** *The most common method is the use of a vane anemometer, or similar, placed in a hood which covers the terminal to measure the extract air flow rate.* *Calibration of measurement equipment should be undertaken annually by returning the instrument to a UKAS accredited calibration centre.*

Table 2: System 1 inspection and testing *(continued)*		
2.0 Background ventilators	**Visual inspections** Carry out the following checks and record the results in Section 5: a. Does the equivalent area and location of air inlets satisfy Table 5.2a in ADF? b. Has temporary protection and packaging been removed from all background ventilators, and do the shutters open and close correctly? c. Is there an adequate seal between the ventilator product and the wall/ window frame?	*The equivalent area should be displayed on the air inlet product.*

Table 3: System 2 installation guidelines		
	Installation clauses	**Supplementary information**
1.0 Ductwork preparation and installation	**Manufacturer's details and specific instructions** a. The information provided in this Table sets out the minimum recommended procedures for typical System 2 installations. b. For further product-specific information, refer to the manufacturer's installation instructions. c. Internal duct diameters and/or cross sectional areas should be no less than the sizes given in ADF, Table 5.2b.	
	Preparation a. Ducting routes and offsets should be planned such that their final installation is in accordance with the illustrated guidance given in Diagrams 2 and 3. b. Separate ducts should be taken from the ceilings of the kitchen, bathroom, utility room or WC to separate terminals on the roof. Do not use common outlet terminals or branched ducts. c. Where ductwork penetrates a building's air barrier, the continuity of the barrier must be maintained. The nature of the barrier and ease of achieving an effective seal should be considered before holes are drilled. d. It is important to consider the planning and installation of ductwork in co-ordination with other trade activities and installations, such that routes are designed without compromise to the required ventilation air flow rates.	*Ideally, all ducts should be installed as near vertical as site constraints allow. Both rigid ducting and flexible ducting are suitable for PSV systems and have similar resistance to air flow at typical PSV system air flow rates.*

Table 3: System 2 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
1.0 Ductwork preparation and installation *(continued)*	**Installation** a. Carefully measure the length of duct to be used such that it is just sufficient to fit between the ceiling terminal and the outlet terminal. Flexible ducting should be fully extended but not taut, allowing approximately 300 mm extra to make smooth bends in an offset system. b. Ducting should be properly supported along its length to ensure that the duct can run straight without distortion or sagging and that there are no kinks at any bends or the connections to ceiling terminals and outlet terminals. Flexible ducting generally requires more support than rigid ducting. c. In the roof space the duct should be secured to a wooden strut that is securely fixed at both ends. A flexible duct should be allowed to curve gently at each end of the strut to attach to the ceiling terminal and roof outlet terminal. d. A rigid duct should be used for system stability for the part of a PSV system which is outside, above the roof slope. It should project down into the roof space far enough to allow firm support. e. Ensure that the duct is securely fixed to the roof outlet terminal so that it cannot sag or become detached. f. Ducting should be insulated where it passes through unheated areas and voids (e.g. loft spaces) with the equivalent of at least 25 mm of a material having a thermal conductivity of ≤0.04 W/(m.K) to reduce the possibility of condensation forming. g. Where a duct extends externally above roof level the section above the roof should be insulated or a condensate trap should be fitted just below roof level.	

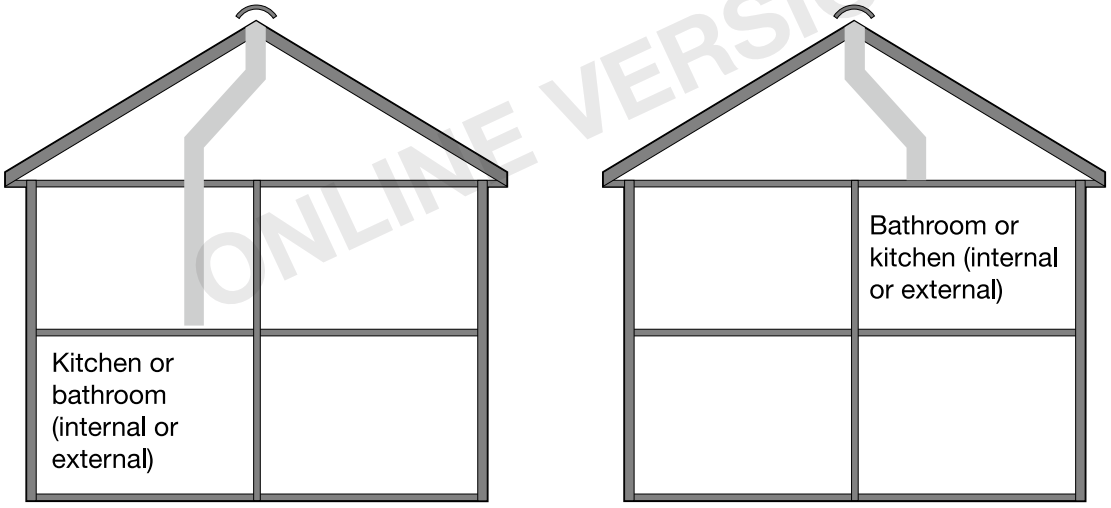
Table 3: System 2 installation guidelines *(continued)*		
2.0 Ventilation air inlets and discharge terminals	**Background ventilators** a. Background ventilators should be provided to meet the minimum required equivalent area of ventilation specified by Table 5.2b of ADF. b. For wall mounted background ventilators make an opening in the wall in accordance with the manufacturer's instructions for the size required. Ensure that there are no obstructions in the opening. c. Install the wall or window ventilator product in accordance with the manufacturer's instructions. d. Ensure that wall or window ventilator products are sealed to their surrounds using a proprietary sealant as recommended by the manufacturer.	*Background ventilators fitted in windows are usually installed during manufacture. Close co-ordination between supplier and installer is recommended to ensure correct location of ventilators. Background ventilators installed in walls may require a proprietary wind cowl to reduce wind noise and prevent over ventilation.*
	Extract terminals – wall and ceiling mounted a. PSV extract terminals should be located in the ceiling or on a wall less than 400 mm below the ceiling. b. The extract terminal should have a free area of not less than the duct cross-sectional area. If a conversion fitting is required to connect the duct to the terminal then the duct cross-sectional area should be maintained (or exceeded) throughout the conversion fitting so as not to restrict the flow.	*In non-sanitary accommodation, humidity controlled terminals may be used to increase the air flow during periods of increased humidity, and to reduce the air flow during periods of low humidity. Humidity controls should not be used for sanitary accommodation where odour is the main pollutant.*

Table 3: System 2 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
2.0 Ventilation air inlets and discharge terminals *(continued)*	**Discharge terminals** a. Proprietary products should be used that are compatible with the PSV duct system that has been installed. b. The roof terminal should not allow ingress of large insects or birds and should be designed so that rain is not likely to enter the duct and run down into the dwelling. c. The terminal should also be designed such that any condensation forming inside it cannot run down into the dwelling but will run off externally onto the roof. d. A tile ventilator used to terminate a PSV system on the roof slope should be positioned no more than 0.5 m from the roof ridge. If the duct penetrates the roof more than 0.5 m from the ridge, it should extend above the roof slope to at least ridge height.	*Refer to Diagram 2 for further details.*
3.0 Miscellaneous	**Air transfer** a. To ensure good transfer of air throughout the dwelling, there should be an undercut of minimum area 7600 mm^2 in all internal doors above the floor finish. This is equivalent to an undercut of 10 mm for a standard 760 mm width door. b. Ensure that the air transfer provision is unrestricted after floor finishes have been laid (e.g. carpets should not encroach). This should be achieved by making an undercut of 10 mm above the floor finish if the floor finish is fitted, or by a 20 mm undercut above the floorboards, or other surface, if the finish has not been fitted.	

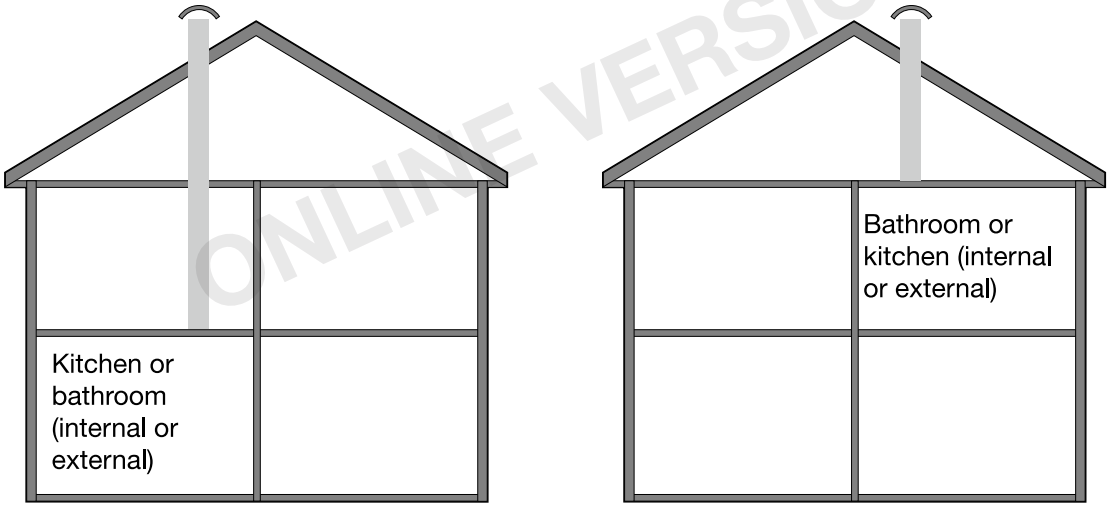
Table 4: System 2 inspection		
	Recommended minimum requirements	**Supplementary information**
1.0 Ductwork and terminals	**Visual inspections** Carry out the following checks and record the results in Section 5: a. Does the system installation comply with the installation clauses in Table 3? b. Does the number and size of terminal points satisfy Table 5.2b in ADF? c. Is all ductwork and are all terminals in good condition with no obvious defects that will be hazardous or affect system performance?	
2.0 Background ventilators	**Visual inspections** Carry out the following checks and record the results in Section 5: a. Does the size, number, orientation and location of air inlets satisfy Table 5.2b in ADF? b. Has any temporary protection and packaging been removed from all background ventilators, and do shutters open and close correctly? c. Is there an adequate seal between the ventilator product and the wall/ window frame?	*The equivalent area should be displayed on the background ventilator product.*

Diagram 2: Suitable layouts for PSV systems

(a) Kitchen and bathroom ducts with ridge terminals

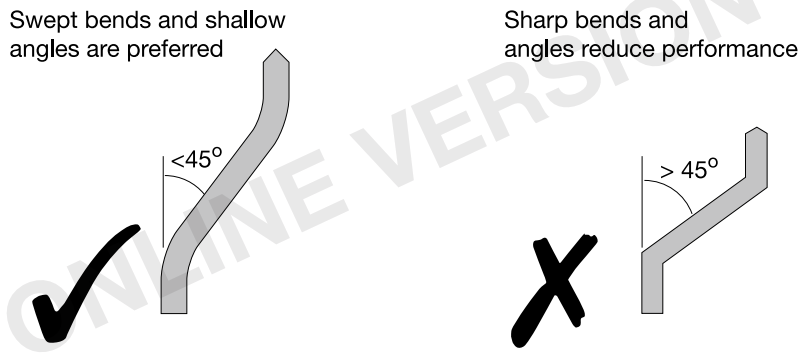


(b) Kitchen and bathroom ducts penetrating roof with terminals at ridge height



The layouts shown in Diagram 2 are considered to be suitable for the majority of dwellings of up to four storeys. Placing the outlet terminal at the ridge of the roof (Diagram 2(a)) is the preferred option for reducing the adverse effects of wind gusts and certain wind directions. A tile ventilator may be used to terminate a ***PSV*** system on the roof slope but the terminal should be positioned no more than 0.5 m from the roof ridge. If the duct penetrates the roof more than 0.5 m from the ridge, it should extend above the roof slope to at least ridge height to ensure that the duct terminal is in the negative pressure region above the roof (Diagram 2(b)).

Diagram 3: Suitable and unsuitable bends for passive stack ducts



Ducts should use no more than one offset (i.e. no more than two bends) and these should be of the "swept" rather than "sharp" type to minimise flow resistance. Offsets at an angle should be no more than 45° to the vertical (Diagram 3).

Section 3

Continuous mechanical ventilation systems

3.1 System 3 – Continuous mechanical extract: centralised and de-centralised

The information provided in Tables 5 and 6 gives guidance on good installation practice and the procedures for the inspection, air flow measurement testing and commissioning of ***continuous mechanical extract ventilation*** (MEV) systems for dwellings. The relevant design guidance is given in ADF, in particular, Table 5.2c.

3.2 System 4 – Continuous mechanical balanced systems with heat recovery: centralised and single room

The information provided in Tables 7 and 8 gives guidance on good installation practice and the procedures for the inspection, air flow measurement testing and commissioning of ***continuous mechanical balanced ventilation with heat recovery*** (MVHR) systems for dwellings. The relevant design guidance is given in ADF, in particular, Table 5.2d. The installation and inspection guidance is also suitable for ***single room heat recovery ventilators*** (SRHRV).

Table 5: System 3 installation guidelines		
	Installation clauses	**Supplementary information**
1.0 Continuous extract fans: centralised **Continuous extract fans: decentralised**	**Manufacturer's details and specific instructions** a. The information provided in this Table sets out the minimum recommended procedures for typical System 3 installations. b. For further product-specific information, refer to the manufacturer's installation instructions. c. The suitability of connection of a continuous fan system to a cooker hood must follow the manufacturer's guidance.	
	Location of fan unit a. The fan unit should be located in accordance with the manufacturer's specifications. b. Ensure the final location of equipment offers sufficient space to allow access for maintenance. c. The fan unit should be installed to allow sufficient space for end of life replacement of the whole unit or key mechanical/electrical components. This should be achievable without the need to remove fixed structures or significant lengths of connected ductwork. d. The fan unit should be installed on a sound structure, which is stable and level.	*The location of the fan unit should be chosen to minimise overall duct run length, both from the internal extract terminals/grilles to the fan unit and from the fan unit to the external discharge terminal.* *Unconditioned spaces, e.g. lofts, may become very hot in summer, which may have implications for both mechanical and electronic component life.* *Refer to the manufacturer's specification for appropriate environmental conditions.* *The fan unit spigot arrangement may dictate the location and orientation of installation: to ensure optimum performance refer to the manufacturer's instructions.* *If a fan unit is installed in an unheated space, it may need to be insulated to minimise the risk of condensation forming within the fan unit casing.*

Table 5: System 3 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
1.0 Continuous extract fans: centralised **Continuous extract fans: decentralised** ***(continued)***	**Preparation for installation** a. A hole of a suitable dimension through the fabric of the building will be required for the installation of the duct. The hole will need a slight downward angle towards the outside to prevent water ingress. b. Where ductwork penetrates a building's air barrier, the continuity of the barrier must be maintained. The nature of the barrier and ease of achieving an effective seal should be considered before holes are drilled. c. For ceiling mounted fans or terminals/grilles, the holes should be cut to the minimum required size such that the fan/grille spigot fits snugly into the hole. d. It is important to consider the planning and installation of ductwork in co-ordination with other trade activities and installations, such that routes are designed without compromise to the required ventilation air flow rates.	
	Installation a. The fan unit should be installed using the manufacturer's supplied or recommended fixing brackets.	*Acoustic/anti-vibration isolation may be required. This will depend on the nature of the mounting structure: refer to the manufacturer's instructions.*

Table 5: System 3 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
2.0 Ductwork	**Duct installation – general notes** a. Ducts should be sized to minimise pressure loss and noise generation. This is achieved by sizing of the ducts to limit the air velocity. b. The routing of ducts should minimise overall duct length and minimise the number of bends required. It is particularly important to minimise bends in main ducts operating at higher air velocities. c. The need for privacy (acoustic separation) between rooms should be considered when planning duct layout. d. Where room air extract terminals/grilles are not fitted with filters, sufficient space to allow access for cleaning ducts should be provided. e. Ducting should be insulated where it passes through unheated areas and voids (e.g. loft spaces) with the equivalent of at least 25 mm of a material having a thermal conductivity of ≤0.04 W/(m.K) to reduce the possibility of condensation forming. Where a duct extends above roof level the section above the roof should be insulated or a condensate trap should be fitted just below roof level. f. Horizontal ducting, including ducting in walls, should be arranged to slope slightly downwards away from the fan to prevent backflow of any moisture into the product. g. Vertical ducting will require a condensate trap in order to prevent backflow of any moisture into the product. h. Perforated insulated flexi duct, used to minimise airborne acoustic transmission, should not be used between the fan unit and external discharge terminal to prevent condensation occurring within the insulation material. i. Where ducts pass through fire barriers, they must be appropriately fire stopped in accordance with the requirements of Part B of the Building Regulations (Fire Safety).	*The duct size and type specified by the system designer should always be used, to minimise pressure loss and noise generation. Main ducts should be run at the same size as the fan unit spigot. Duct size should then be reduced for branch ducts.* *A radial layout may achieve acoustic separation more effectively than a branched layout.* *The performance of the ventilation system relies on efficient air distribution and it is vital that duct installation is not left until the last moment when the only means of overcoming obstructions is to install flexible ducts where rigid ducts had been specified.*

Table 5: System 3 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
2.0 Ductwork *(continued)*	**Installation of ducts – rigid** a. Ducts should not be installed where they can be easily damaged, for example across open loft areas where they may be stood on or have items placed on them, breaking seals and possibly crushing the duct. b. Connection of components should not result in significant air flow resistance. Components should be proprietary and fit easily together without distortion. c. Rigid duct runs must be adequately supported.	*Distortion of rectangular duct may result in significant reduction of the free internal area of the duct, increasing the flow resistance and making sealing more difficult.*
	Installation of ducts – flexible a. Ducts should not be installed where they can be easily damaged, for example across open loft areas where they may be stood on or have items placed on them, crushing the duct and restricting or preventing all air flow through the duct. b. Flexible duct should be pulled taught to ensure that the full internal diameter is obtained and flow resistance minimised. This is considered to have been achieved if the duct is extended to 90% of its maximum length. c. Flexible ductwork should be supported at suitable intervals to minimise sagging. d. Bends in flexible duct should have a minimum inside radius equal to the diameter of the duct – see Diagram 1. If tighter bends are required, rigid bends should be used.	*It is suggested that flexible ducts should be supported at intervals not exceeding 600 mm.*

Table 5: System 3 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
2.0 Ductwork *(continued)*	**Duct connections** a. All duct connections require sealing. Where ducts are installed against a solid structure this can be difficult to achieve. In such locations preassembly of duct sections should be considered. This will require that connections are permanent to ensure the seal is maintained during installation. b. Where access to ducts will not be possible after construction is complete, i.e. ductwork is within floor and wall voids, consideration should be given to permanent connection and sealing with an appropriate non-hardening sealant, and not using duct tape to achieve connection and sealing. c. Connection of lengths of flexible duct must use a rigid connector and jubilee clips or similar to ensure a long term seal is achieved. Connections of lengths of flexible duct should not be taped-only.	
3.0 Ventilation air inlets and internal air transfer	**Background ventilators** a. Background ventilators should be provided to meet the minimum required equivalent area of ventilation specified by Table 5.2c of ADF. b. For wall mounted background ventilators make an opening in the wall in accordance with the manufacturer's instructions for the size required. Ensure that there are no obstructions in the opening. c. Install the wall or window ventilator product in accordance with the manufacturer's instructions. d. Ensure that wall or window ventilator products are sealed to their surrounds using a proprietary sealant as recommended by the manufacturer.	

Table 5: System 3 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
3.0 Ventilation air inlets and internal air transfer *(continued)*	**Air transfer** a. To ensure good transfer of air throughout the dwelling, there should be an undercut of minimum area 7600 mm^2 in all internal doors above the floor finish. This is equivalent to an undercut of 10 mm for a standard 760 mm width door. b. Ensure that the air transfer provision is unrestricted after floor finishes have been laid (e.g. carpets should not encroach). This should be achieved by making an undercut of 10 mm above the floor finish if the floor finish is fitted, or by a 20 mm undercut above the floorboards, or other surface, if the finish has not been fitted.	
4.0 Room extract air terminals/ grilles	**Extract terminals/grilles – general notes** a. All room air extract terminals should be installed as detailed by the system designer. b. Room air extract terminals should be installed as close to ceiling level as practical, to ensure warm moist air is removed from each space.	
	Fixed terminals – grilles or louvers a. If the room extract air terminals are fixed, ensure that effective balancing of the system can be achieved. If a facility is not provided within the fan unit then dampers should be installed within the duct system to allow balancing when the system is commissioned.	
	Adjustable terminals/grilles a. Ensure each terminal/grille can be locked in its commissioned position once system balance has been achieved. It is vital for the correct operation of the system that the system remains balanced in its commissioned state.	

Table 5: System 3 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
5.0 External discharge terminal	**Discharge terminals – roof and wall mounted** a. Proprietary terminals should be used. b. Ensure that the free area of the terminal opening is a minimum of 90% of the free area of the ducting being used. c. The location of the external discharge terminal should ensure that the potential for recirculation of extract air through ventilation air inlets is minimised.	
6.0 Controls	**Controls – general notes** a. Continuous ventilation systems should not allow the occupier to turn off the fan other than at the local isolator. Provision of an on/off function will result in the fans being operated intermittently and the required continuous air flow ventilation rates not being achieved. b. Where sensors are not pre-installed within the fan unit, or additional optional sensors can be installed, only the sensors specified by the manufacturer of the fan unit should be installed. c. If sensors are duct mounted, their location should be noted and provision for access for maintenance or replacement made. d. If control of the fan speed is undertaken manually, the operation of the fan in boost mode should be made obvious. This will minimise the likelihood of it being left in this mode unnecessarily. e. Humidity control should not be used in sanitary accommodation, where odour is the main pollutant.	*Installation of alternative sensors may result in control functions not performing correctly.*

Table 5: System 3 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
6.0 Controls *(continued)*	**Controls – location and configuration** a. Installation of manual controls for the system must meet the requirements of Part M of the Building Regulations. b. Installation of room sensors should follow the manufacturer's guidance on positioning. c. Where control of the fan speed is undertaken manually, switching should be provided locally to the spaces being served, i.e. bathrooms and kitchen. Provision of a single centrally located switch is not sufficient and will result in fans being left in inappropriate modes of operation.	*Approved Document M, Section 8.3, recommends that switches should be located between 450 mm and 1200 mm from finished floor level.*
7.0 Continuous extract fans: decentralised	**In-duct installation** a. The fan unit should be adequately supported using the manufacturer's supplied or recommended fixing brackets. b. Access should be provided to the fan unit for maintenance and replacement at the end of its operational life.	

Table 6: System 3 inspection, testing and commissioning		
	Recommended minimum requirements	**Supplementary information**
1.0 System overview	**Visual inspections** Carry out the following checks and record the results in Section 5: a. Does the system installation comply with the installation clauses in Table 5? b. Is the system installed in accordance with design criteria? c. Is all ductwork and are all terminals in good condition with no obvious defects that will be hazardous or affect system performance?	
	Initial start-up a. Is the air flow direction correct at each room terminal? b. Are there any abnormal noises on start-up or when the system is running in normal background ventilation mode?	*Some fan units have a start-up diagnostic sequence that runs the fans at maximum speed for a period before reverting to normal operation – refer to the manufacturer's operating instructions.*

Table 6: System 3 inspection, testing and commissioning		
	Minimum requirements	**Supplementary information**
2.0 Commissioning: air flow balancing and measurement	**Air flow balancing** a. The system should be balanced to ensure that design air flow rates are achieved at each room terminal/grille. As there are several combinations of room terminal/grille (referred to as a terminal from here on) and fan control that may be used in domestic systems, the fan manufacturer's instructions should be followed to achieve balancing. If specific details are not included the following procedure should be adopted: **i. Adjustable terminals and a fixed (stepped) speed fan.** The fan speed should be set to achieve the desired continuous flow rate. The index terminal flow rate is set to fully open and all other grilles are adjusted to achieve the required flows at each terminal. If the total flow rate cannot be achieved through all the terminals then the fan speed should be increased. If all the terminals have to be closed significantly to achieve only the required air flow rate then reduce the fan speed and rebalance the terminals. **ii. Adjustable terminals and controllable speed fan.** The fan speed should be set approximately to achieve the desired continuous flow rate. The index terminal flow rate is set with the terminal fully open and all other terminals are adjusted to achieve the required flows at each terminal. If the index terminal has to be closed to achieve only the required air flow rate, then reduce the fan speed and rebalance the terminals.	***Note: This is the approved procedure for commissioning as required by the Building Regulations.*** *The index terminal/grille can be assumed to be the terminal furthest from the fan unit.*

Table 6: System 3 inspection, testing and commissioning *(continued)*		
	Minimum requirements	**Supplementary information**
2.0 Commissioning: air flow balancing and measurement *(continued)*	**iii. Fixed terminals with flow adjustment by duct damper or similar device at the fan unit.** As i. or ii. above depending on the type of fan speed control. **iv. Adjustable terminals and fixed volume flow fan.** The fan speed should be set to achieve the desired continuous flow rate. The index terminal flow rate is set with the terminal fully open and all other terminals are adjusted to achieve the required flows at each terminal. Adjustment of the terminals achieves balancing only; total flow rate is governed by the fan control setting. Great care should be taken not to close the terminals too far as 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. **v. 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 located within the fan unit, and no adjustment can be made.	

Table 6: System 3 inspection, testing and commissioning *(continued)*		
	Minimum requirements	**Supplementary information**
2.0 Commissioning: air flow balancing and measurement *(continued)*	**Air flow measurements** a. Ensure that background ventilators or other air transfer devices are open. b. Ensure all internal and external doors and windows are closed, including rooms in which measurements are being carried out. c. Air flow measurements should be performed using a calibrated air flow device with proprietary hood attachment and results recorded in litres per second (l/s). Reference should be made to design air flow rates. d. Record the air flow rate at each room terminal on the commissioning sheet in Section 5, along with the design air flow rate for each terminal. Measurements should be taken at both maximum rate and minimum rate fan speeds. e. It is recommended that a vane anemometer or similar device is used to balance and measure the air flow rates at each room terminal. The instrument will require a hood to be attached to allow it to cover the terminal. f. The instrument should be calibrated annually and be capable of achieving an accuracy of ± 5 per cent.	***Note: This is the approved procedure for air flow measurement as required by the Building Regulations.*** *The most common method is the use of a vane anemometer, or similar, placed in a hood which covers the terminal to measure the extract air flow rate.* *Calibration of measurement equipment should be undertaken annually by returning the instrument to a UKAS accredited calibration centre.*

Table 6: System 3 inspection, testing and commissioning *(continued)*		
	Recommended minimum requirements	**Supplementary information**
3.0 Controls	**Installation** a. Ensure all local controls have been installed following the manufacturer's instructions. b. Ensure all local controls are adequately labelled, indicating their function clearly. c. If sensors have been installed separately from the fan unit ensure installation follows the manufacturer's instructions. d. Where control of the fan is automated, the controls should be configured to minimise the occurrence of hunting. e. If manual control of, for example, heat exchanger by-pass is provided, clear and detailed instructions should be made available to the occupier.	*If hunting (the continual increase and decrease of fan speed) does occur, occupants may seek to modify the control of the system or turn it off altogether to remove the noise nuisance.*
	Testing operation a. As far as practical the correct operation of each control function should be tested.	

Table 7: System 4 installation guidelines		
	Installation clauses	**Supplementary information**
1.0 Continuous supply and extract with heat recovery: centralised **Continuous single room supply and extract with heat recovery**	**Manufacturer's details and specific instructions** a. The information provided in this Table sets out the minimum recommended procedures for typical System 4 installations. b. For further product-specific information, refer to the manufacturer's installation instructions. c. The suitability of connection of a continuous fan system to a cooker hood must follow the manufacturer's guidance.	

Table 7: System 4 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
1.0 Continuous supply and extract with heat recovery: centralised **Continuous single room supply and extract with heat recovery *(continued)***	**Location of fan unit** a. The fan unit should be located as specified by the system designer. b. Fan units should be installed to allow sufficient space to undertake routine maintenance on filters and heat exchanger block as appropriate. c. Fan units should be installed to allow sufficient space for end of life replacement of the whole unit or of key mechanical/electrical components. This should be achievable without the need to remove fixed structures or significant lengths of connected ductwork. d. The fan unit should be installed on a sound structure, which is stable and level. e. If the fan unit is not pre-insulated, insulation should be added to minimise the risk of condensation forming within, or on, the fan unit casing. f. A condensate drain should be installed from the fan unit to an appropriate drain location. The condensate pipe should be installed to have a minimum 5° fall from the fan unit. g. The condensate drain should be adequately secured and where passing through an unheated space must be adequately insulated to prevent freezing. **Additional notes for SRHRV** a. Do not install the unit in the corner of a room as this may result in short circuiting of air flows.	*The location of the fan unit should be chosen to minimise overall duct run length, both from the internal terminals/grilles to the fan unit and from the fan unit to the external discharge terminal.* *Unconditioned spaces, e.g. lofts, may become very hot in summer, which may have implications for both mechanical and electronic component life – refer to the manufacturer's specification for appropriate environmental conditions.* *The fan unit spigot arrangement may dictate the location and orientation of installation: to ensure optimum performance refer to the manufacturer's instructions.* *The rate of condensate formation may be up to several litres per day, and this should be considered when choosing the drain location.*

Table 7: System 4 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
1.0 Continuous supply and extract with heat recovery: centralised **Continuous single room supply and extract with heat recovery *(continued)***	**Preparation for installation** a. A hole of a suitable dimension through the fabric of the building will be required for the installation of the duct. The hole will need a slight downward angle towards the outside to prevent water ingress. b. Where ductwork penetrates a building's air barrier, the continuity of the barrier must be maintained. The nature of the barrier and ease of achieving an effective seal should be considered before holes are drilled. c. For ceiling mounted fans or terminals/grilles, the holes should be cut to the minimum required size such that the fan/grille spigot fits snugly into the hole. d. It is important to consider the planning and installation of ductwork in co-ordination with other trade activities and installations, such that routes are designed without compromise to the required ventilation air flow rates.	
	Installation a. The fan unit should be installed using the manufacturer's supplied or recommended fixing brackets.	*Acoustic/anti-vibration isolation may be required. This will depend on the nature of the mounting structure – refer to the manufacturer's instructions.*

Table 7: System 4 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
2.0 Ductwork	**Duct installation – general notes** a. Ducts should be sized to minimise pressure loss and noise generation. This is achieved by sizing of the ducts to limit the air velocity. b. The routing of ducts should aim to minimise overall duct length and minimise the number of bends required. It is particularly important to minimise bends in main ducts operating at higher air velocities. c. The need for privacy (acoustic separation) between rooms should be considered when planning duct layout. d. Where room air extract terminals/grilles are not fitted with filters, consideration should be given to the need to access ducts for cleaning. e. Ducting should be insulated where it passes through unheated areas and voids (e.g. loft spaces) with the equivalent of at least 25 mm of a material having a thermal conductivity of ≤0.04 W/(m.K) to reduce the possibility of condensation forming. Where a duct extends externally above roof level the section above the roof should be insulated or a condensate trap should be fitted just below roof level.	*The duct size and type specified by the system designer should always be used, to minimise pressure loss and noise generation. Main ducts should be run at the same size as the fan unit spigot. Duct size should then be reduced for branch ducts.* *A radial layout may achieve acoustic separation more effectively than a branched layout.* *The performance of the ventilation system relies on efficient air distribution and it is vital that duct installation is not left until the last moment when the only means of overcoming obstructions is to install flexible ducts where rigid ducts have been specified.*

Table 7: System 4 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
2.0 Ductwork *(continued)*	a. Ducts within the building heated envelope carrying cold air between the external supply/discharge terminals and the fan unit should be insulated and wrapped additionally with a vapour barrier outside the insulation to prevent condensation occurring within the insulation material. b. Horizontal ducting, including ducting in walls, should be arranged to slope slightly downwards away from the fan to prevent backflow of any moisture into the product. c. Vertical ducting will require a condensate trap in order to prevent backflow of any moisture into the product. d. Perforated insulated flexi duct, used to minimise airborne acoustic transmission, should not be used between the fan unit and external discharge terminal to prevent condensation occurring within the insulation material. e. Where ductwork penetrates a building's air barrier, identify on building drawings and ensure that continuity of barrier is maintained. f. Where ducts pass through fire barriers, they must be appropriately fire stopped in accordance with the requirements of Part B of the Building Regulations (Fire safety).	
	Installation of ducts – rigid a. Ducts should not be installed where they can be damaged, for example across open loft areas where they may be stood on or have items placed on them, breaking seals and possibly crushing the duct. b. Connection of components should not result in significant air flow resistance. Components should be proprietary and fit easily together without distortion. c. Rigid duct runs must be adequately supported.	*Distortion of rectangular duct may result in significant reduction of the free internal area of the duct, increasing the flow resistance and making sealing more difficult.*

Table 7: System 4 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
2.0 Ductwork *(continued)*	**Installation of ducts – flexible** a. Ducts should not be installed where they can be damaged, for example across open loft areas where they may be stood on or have items placed on them, crushing the duct and restricting or preventing all air flow through the duct. b. Flexible duct should be pulled taught to ensure that the full internal diameter is obtained and flow resistance minimised. This is considered to have been achieved if the duct is extended to 90 per cent of its maximum length. c. Flexible ductwork should be supported at suitable intervals to minimise sagging. d. Bends in flexible duct should have a minimum inside radius equal to the diameter of the duct – see Diagram 1. If tighter bends are required, rigid bends should be used.	*It is suggested that flexible ducts should be supported at intervals not exceeding 600 mm.*
	Duct connections a. All duct connections require sealing. Where ducts are installed against a solid structure this can be difficult to achieve. In such locations preassembly of duct sections should be considered. This will require that connections are permanent to ensure the seal is maintained during installation. b. Where access to ducts will not be possible after construction is complete, i.e. within floor and wall voids, consideration should be given to permanent connection and sealing with an appropriate non-hardening sealant, and not using duct tape to achieve connection and sealing. c. Connection of lengths of flexible duct must use a rigid connector and jubilee clips or similar to ensure a long term seal is achieved. Connections of lengths of flexible duct should not be taped-only.	

Table 7: System 4 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
3.0 Internal ventilation air transfer	**Air transfer** a. To ensure good transfer of air throughout the dwelling, there should be an undercut of minimum area 7600 mm^2 in all internal doors above the floor finish. This is equivalent to an undercut of 10 mm for a standard 760 mm width door. b. Ensure that the air transfer provision is unrestricted after floor finishes have been laid (e.g. carpets should not encroach). This should be achieved by making an undercut of 10 mm above the floor finish if the floor finish is fitted, or by a 20 mm undercut above the floorboards, or other surface, if the finish has not been fitted. **Additional notes for SRHRV** a. Free air movement between rooms is not required as each room contains a single room heat recovery ventilator (SRHRV) unit. These units have a balanced supply and extract air flow rate. It is however recommended that the provisions in 3a. and 3b. are maintained to minimise any imbalance of flows within rooms.	
4.0 Room supply and extract air terminals/ grilles	**Supply and extract terminals/grilles – general notes** a. All room air extract terminals should be installed as detailed by the system designer. b. Room air extract terminals should be installed as close to ceiling level as practical, to ensure warm moist air is removed from each space. c. Room supply air terminals must not be located adjacent to walls, unless designed to discharge air away from the wall, as this may result in down draughts. d. In open plan areas where both supply and extract terminals may be installed, e.g. kitchen diners, the terminals should be adequately separated to ensure short circuiting is minimised. e. The number and location of terminals installed in a space should ensure effective air distribution and ensure that air noise is not a nuisance when the system is operating at boost air flow rates.	

Table 7: System 4 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
4.0 Room supply and extract air terminals/ grilles *(continued)*	**Fixed terminals – grilles or louvers** a. If the supply and extract air terminals are fixed, ensure that effective balancing of the system can be achieved. If a facility is not provided within the fan unit then dampers should be installed within the duct system to allow balancing when the system is commissioned.	
	Adjustable terminals/grilles a. Ensure each terminal/grille can be locked in its commissioned position once system balance has been achieved. It is vital for the correct operation of the system that the system remains balanced in its commissioned state.	
5.0 External discharge terminal MVHR **External supply and discharge terminal**	**Supply and discharge terminals – roof and wall mounted** a. Proprietary terminals should be used. b. Ensure that the free area of the terminal opening is a minimum of 90 per cent of the free area of the ducting being used. c. The location of the external discharge terminal should ensure that the potential for recirculation of extract air through the supply air terminal is minimised.	*It is recommended that the supply and extract air terminals are separated by a minimum of 300 mm horizontally if placed on the same façade of a building.*

Table 7: System 4 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
6.0 Controls	**Controls – general notes** a. Continuous ventilation systems should not allow the occupier to turn off the fan other than at the local isolator. Provision of an on/off function will result in the fans being operated intermittently and the required continuous air flow ventilation rates not being achieved. b. Where sensors are not pre-installed within the fan unit, or additional optional sensors can be installed, only the sensors specified by the manufacturer of the fan unit should be installed. c. If sensors are duct mounted, their location should be noted and provision for access for maintenance or replacement made. d. If control of the fan speed is undertaken manually, the operation of the fan in boost mode should be made obvious. This will minimise the likelihood of it being left in this mode unnecessarily. e. Humidity control should not be the only control used in sanitary accommodation, where odour is the main pollutant.	*Installation of alternative sensors may result in control functions not performing correctly.*
	Controls – location and configuration a. Installation of manual controls for the system must meet the requirements of Part M of the Building Regulations. b. Installation of room sensors should follow the manufacturer's guidance on positioning. c. Where control of the fan speed is undertaken manually, switching should be provided locally to the spaces being served, i.e. bathrooms and kitchen. Provision of a single centrally located switch is not sufficient and will result in fans being left in inappropriate modes of operation.	*Approved Document M, Section 8.3, recommends that switches should be located between 450 mm and 1200 mm from finished floor level.*

Table 7: System 4 installation guidelines *(continued)*		
	Installation clauses	**Supplementary information**
7.0 Single room heat recovery ventilator (SRHRV) devices	**Ventilation of whole building** a. These products provide balanced ventilation for one room only; the ventilation of all spaces should meet the requirements of the Building Regulations.	

Table 8: System 4 inspection, testing and commissioning		
	Recommended minimum requirements	**Supplementary information**
1.0 System overview	**Visual inspections** Carry out the following checks and record the results in Section 5: a. Does the system installation comply with the installation clauses in Table 7? b. Is the system installed in accordance with design criteria? c. Is all ductwork and are all terminals in good condition with no obvious defects that will be hazardous or affect the system performance?	
	Initial start-up a. Is the air flow direction correct at each room terminal, supply and extract? b. Are there any abnormal noises on start-up or when the system is running in normal background ventilation mode?	*Some fan units have a start-up diagnostic sequence that runs the fans at maximum speed for a period before reverting to normal operation – refer to the manufacturer's operating instructions.*

Table 8: System 4 inspection, testing and commissioning *(continued)*		
	Minimum requirements	**Supplementary information**
2.0 Commissioning: air flow balancing and measurement	**Air flow balancing** a. The system should be balanced to ensure that design air flow rates are achieved at each room terminal/grille. As there are several combinations of room terminal/grille and fan control that may be used in domestic systems, the fan manufacturer's instructions should be followed to achieve balancing. If specific details are not included the following procedure should be adopted: **i. Adjustable terminals and a fixed (stepped) speed fan.** The fan speed should be set to achieve the desired continuous flow rate. The index terminal flow rate is set to fully open and all other terminals are adjusted to achieve the required flows at each terminal. If the total flow rate cannot be achieved through all the terminals then the fan speed should be increased. If all the terminals have to be closed significantly to achieve only the required air flow rate then reduce the fan speed and rebalance the terminals. **ii. Adjustable terminals and controllable speed fan.** The fan speed should be set approximately to achieve the desired continuous flow rate. The index terminal flow rate is set with the terminal fully open and all other terminals are adjusted to achieve the required flows at each terminal. If the index terminal has to be closed to achieve only the required air flow rate, then reduce the fan speed and rebalance the terminals.	***Note: This is the approved procedure for commissioning as required by the Building Regulations.*** *The index terminal/grille can be assumed to be the terminal furthest from the fan unit.*

Table 8: System 4 inspection, testing and commissioning *(continued)*		
	Minimum requirements	**Supplementary information**
2.0 Commissioning: air flow balancing and measurement *(continued)*	**iii. Fixed terminals with flow adjustment by duct damper or similar device at the fan unit.** As i. or ii. above depending on the type of fan speed control. **iv. Adjustable terminals and fixed volume flow fan.** The fan speed should be set to achieve the desired continuous flow rate. The index terminal flow rate is set with the terminal fully open and all other terminals are adjusted to achieve the required flows at each terminal. Adjustment of the terminals achieves balancing only; total flow rate is governed by the fan control setting. Great care should be taken not to close the terminals too far as 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. **v. 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 located within the fan unit, and no adjustment can be made.	

Table 8: System 4 inspection, testing and commissioning *(continued)*		
	Minimum requirements	**Supplementary information**
2.0 Commissioning: air flow balancing and measurement *(continued)*	**Air flow measurements** a. Ensure all internal and external doors and windows are closed, including rooms in which measurements are being carried out. b. Air flow measurements should be performed using a calibrated air flow device with proprietary hood attachment and results recorded in litres per second (l/s). Reference should be made to design air flow rates. c. Record the air flow rate at each room terminal on the commissioning sheet in Section 5, along with the design air flow rate for each terminal. Measurements should be taken at both maximum rate and minimum rate fan speeds. d. It is recommended that a vane anemometer or similar device is used to balance and measure the air flow rates at each room terminal. The instrument will require a hood to be attached to allow it to cover the terminal. e. The instrument should be calibrated annually and be capable of achieving an accuracy of ± 5 per cent. **Additional notes for SRHRV** a. The supply and extract configuration of some fan units may prevent measurement of the air flow rates. In such cases, if the manufacturer's installation instructions have been followed the air flow rates specified for that product must be assumed to have been achieved.	***Note: This is the approved procedure for air flow measurement as required by the Building Regulations.*** *Calibration of measurement equipment should be undertaken annually by returning the instrument to a UKAS accredited calibration centre.*

Table 8: System 4 inspection, testing and commissioning *(continued)*		
	Recommended minimum requirements	**Supplementary information**
3.0 Controls	**Installation** a. Ensure all local controls have been installed following the manufacturer's instructions. b. Ensure all local controls are adequately labelled, indicating their function clearly. c. If sensors have been installed separately from the fan unit, ensure the installation follows the manufacturer's instructions. d. Where control of the fan is automated, the controls should be configured to minimise the occurrence of hunting. e. If manual control of, for example, heat exchanger by-pass is provided, clear and detailed instructions should be made available to the occupier.	*If hunting (the continual increase and decrease of the fan speed) does occur, occupants may seek to modify the control of the system or turn it off altogether to remove the noise nuisance.*
	Testing operation a. As far as practical the correct operation of each control function should be tested.	

Section 4

System completion and handover

This section outlines the recommended minimum information to be handed over to the end user immediately after the ventilation system has been installed, tested and commissioned, as appropriate to the system type.

4.1 Documentation to be handed over to the end user

Operation and maintenance manual

The operation and maintenance manual 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 the system components should be cleaned and maintained.

The following information should be provided where relevant:

- design statement that sets out the key characteristics of the system provided along with specific, non-technical information on how and when the system should be used
- manufacturer's contact details
- use of air inlets for background ventilation
- location of and setting automatic controls (e.g. humidity and timer controls)
- location and use of on/off and boost settings for mechanical ventilation system
- adjustable extract air terminals on vertical ***PSV*** ducts
- instructions on how cleaning and maintenance should be carried out, including replacing filters
- location of filters if not installed within the fan unit
- if there are no filters on extract terminals, how ducts can be accessed for cleaning, and recommendations on how and when cleaning should be undertaken
- recalibration or checking of sensors and their location.

The operation and maintenance manual should also contain relevant manufacturers' literature which was supplied with the system or with individual components of the system. This might include component specifications, installation guidance, operating instructions, maintenance schedules, guarantees, registration card, spare part lists, means of obtaining spare parts, etc.

Completion of inspection checklist and air flow measurement test sheet

The three-part sheet detailed in Section 5 should be signed and completed and included in the Operation and Maintenance manual.

Section 5

Inspection checklist and air flow measurement test sheet

This inspection checklist and air flow measurement test sheet is divided into three parts:

- **Part 1** is for recording the particulars of the system, the installation address and the installer's details.
- **Part 2a** functions as an installation checklist.
- **Part 2b** is for recording the results of a visual inspection of the installation, and also acts as a pre-test checklist.
- **Part 3** is the approved manner for recording the results of mandatory air flow tests on both intermittent and continuous mechanical ventilation systems in new dwellings, and is the sheet that must be given to the building control body (BCB).

The three parts should be completed in full, and a copy should form part of the Operation and Maintenance manual.

5.1 Checking design against measured air flow rates

For Systems 1, 3 and 4, the measured air flow rates should be recorded on Part 3: *Air flow measurement test details*, as part of the testing and commissioning procedures given in Tables 2, 6 and 8. The measured values will need to be compared with their respective design values. Compliance with the design will be met if the measured air flow rates for each are equal to, or greater than the design value. If any measured value is less than the design value, adjustment should be made to correct the system and all air flows re-measured until they meet the design values. If it is not possible to make adjustment to increase the air flow rate then a note to this effect should be made on the sheet. This may require the person with overall responsibility for the system to carry out remedial works to rectify the cause of the under-performance. The system will need to be re-tested to confirm that the design values have been met.

5.2 Instrument calibration

Measurement of air flows should be performed using equipment that has been calibrated at a UKAS accredited calibration centre. Calibration should be performed annually for each air flow measurement device used to record final air flow rates in Part 3.

5.3 Demonstrating compliance

All three parts of the checklist and test sheet should be completed, with the relevant Parts 2 and 3 signed by a person who is responsible for the inspection and testing of the system that has been installed.

The three-part form needs to be completed for each installation address, and as a minimum a copy of Part 3 should be submitted to the BCB as evidence the installation has been correctly tested and commissioned (as relevant to the system installed).

Part 1 – System details and declarations

1.1 Installation Address Details	
Dwelling name/number	
Street	
Locality	
Town	
County	
Post Code	
1.2 Installation Details	
System classification*	System .....
Enter System 1 to 4 as defined by Approved Document F 2010	
Manufacturer	
Model numbers	
Serial number (where available)	
Location of fan units	1.
	2.
	3.
	4.
	5.

**Note. If a system has been installed that is not defined by Systems 1 to 4 in Approved Document F, further installation checks and commissioning procedures may be required. Seek particular guidance from the manufacturer for these systems.*

Part 2a – Installation details

2.1 Installation Checklist – General (all Systems)	Tick as appropriate	
Has the system been installed in accordance with manufacturer's requirements?	**Yes**	**No**
Have relevant system installation clauses been followed as detailed in Tables 1, 3, 5, and 7 as applicable?	**Yes**	**No**
Type of ductwork installed (e.g. rigid, semi-rigid)		
If any deviation from Tables 1, 3, 5 and 7, these should be detailed here.		
Description of installed controls (e.g. timer, central control, humidistat, PIR, etc)		
Location of manual/override controls		

2.2 Installation Engineer's Details	
Name	
Company	
Address Line 1	
Address Line 2	
Telephone Number	
Post Code	
Signature	
Competent Person Scheme/ Registration Number (if applicable)	
Date of Installation (completion)	

Part 2b – Inspection of installation

This section should be completed before completing Part 3.

2.3a Visual Inspections – General (all Systems)		
Total installed equivalent area of background ventilators in dwelling?		**mm**
Total floor area of dwelling?		**m^2**
Does the total installed equivalent ventilator area meet the requirements given in Tables 5.2a, 5.2b, or 5.2c in ADF?	**Yes**	**No**
Have all background ventilators been left in the open position?	**Yes**	**No**
Have the correct number and location of extract fans/terminals been installed that satisfy Table 5.2a in ADF?	**Yes**	**No**
Is the installation complete with no obvious defects present?	**Yes**	**No**
Do all internal doors have sufficient undercut to allow air transfer between rooms (i.e. 10 mm over and above final floor finish)?	**Yes**	**No**
Has all protection/packaging been removed (including from background ventilators) such that system is fully functional?	**Yes**	**No**
For ducted systems, has the ductwork installation been installed in such manner that air resistance and leakage is kept to a minimum?	**Yes**	**No**
Are the correct number and size of background ventilators provided that satisfy ADF?	**Yes**	**No**
Has the entire system been installed such that there is sufficient access for routine maintenance and repair/replacement of components?	**Yes**	**No**
2.3b Visual Inspections – General (Systems 3 and 4 only)		
Have appropriate air terminal devices been installed to allow system balance?	**Yes**	**No**
Has the heat recovery unit (System 4 only) and all ductwork been effectively insulated where installed in unheated spaces?	**Yes**	**No**
Condensate connection is complete and drains to an appropriate location (System 4 only)?	**Yes**	**No**
2.3c Other Inspections – General (Systems 1, 3 and 4 only)		
Upon initial start up, was any abnormal sound or vibration experienced, or unusual smells detected?	**Yes**	**No**

2.3d Inspector's Details	
Name	
Company	
Address Line 1	
Address Line 2	
Telephone Number	
Post Code	
Signature	
Competent Person Scheme/ Registration Number (if applicable)	
Date of Inspection (completion)	

Part 3 – Air flow measurement test and commissioning details

3.1 Test Equipment		
Schedule of air flow measurement equipment used, (model and serial)		Date of last UKAS calibration
1.		
2.		
3.		

3.2 Air Flow Measurements – System 1 only		
Fan Reference (as 1.2)	Measured Extract Rate (l/s)	Design Extract Rate (l/s) Refer to Table 5.1a in ADF
Extract Fan 1		
Extract Fan 2		
Extract Fan 3		
Extract Fan 4		
Extract Fan 5		
For kitchen extract canopies, only the highest setting needs to be recorded.		

3.3 Air Flow Measurements (Extract) – Systems 3 and 4 only				
Room Reference (location of terminals)	Measured Air Flow High Rate (l/s)	Design Air Flow High Rate (l/s) Refer to Table 5.1a in ADF	Measured Air Flow Low Rate (l/s)	Design Air Flow Low Rate (l/s) Refer to Table 5.1a in ADF
Kitchen				
Bathroom				
En Suite				
Utility				
Other...				
Other...				
Other...				

3.4 Air Flow Measurements (Supply) – System 4 only				
Room Reference (location of terminals)	Measured Air Flow High Rate (l/s)	Design Air Flow High Rate (l/s) Refer to Table 5.1b in ADF	Measured Air Flow Low Rate (l/s)	Design Air Flow Low Rate (l/s) Refer to Table 5.1b in ADF
Living Room 1				
Living Room 2 (if present)				
Dining Room				
Bedroom 1				
Bedroom 2				
Bedroom 3				
Bedroom 4				
Bedroom 5				
Study				
Other...				

3.5 Commissioning – Systems 3 and 4 only		
Have controls been set-up in accordance with the manufacturer's recommendations?	**Yes**	**No**
Have all distribution grilles been locked to prevent unauthorised adjustment?	**Yes**	**No**

3.6 Test Engineer's Details	
Name	
Company	
Address Line 1	
Address Line 2	
Telephone Number	
Post Code	
Signature	
Competent Person Scheme/Registration Number (if applicable)	
Date of Test	

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