Mechanical ventilation with heat recovery

Chapter 8.3

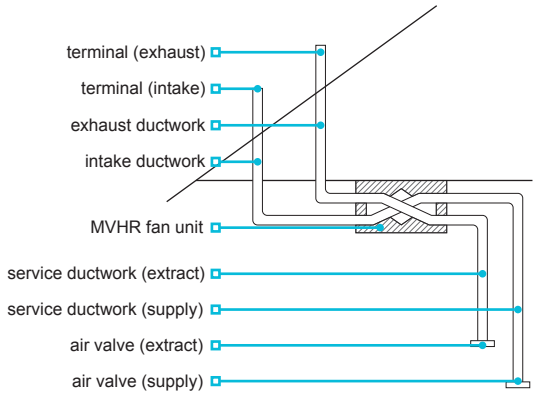
This chapter provides guidance on mechanical ventilation with heat recovery (MVHR) systems acceptable to NHBC.

NHBC

Raising Standards. Protecting Homeowners

Definitions for this chapter

Air valve (extract and supply)	Wall or ceiling mounted fittings used to balance the flow rate of air between rooms; may be referred to as grilles.
Exhaust ductwork	Carries air from the fan unit and exhausts it to the external atmosphere.
Intake ductwork	Carries air from the external atmosphere to the MVHR fan unit.
MVHR fan unit	Unit that contains the fan(s), heat exchanger and filter(s).
Service ductwork extract and supply	Carries air between the air valves and the MVHR fan unit.
Terminal fittings	Located on the outside of the building to finish the intake and exhaust ductwork.



8.3.1 Compliance

Also see: Chapter 2.1, Approved Document F, Domestic Ventilation Compliance Guide, Section 3 of the Technical Handbooks, Domestic Ventilation Guide in Scotland and Technical Booklets in Northern Ireland

MVHR design, materials and sitework shall comply with the Technical Requirements, and be installed by competent operatives.

MVHR systems that comply with the guidance in this chapter and are in accordance with the relevant British Standards and building regulations will generally be acceptable.

MVHR systems should be installed by operatives:

- competent and familiar with the system being installed, and
- trained in accordance with the BPEC installer scheme, or other suitable scheme acceptable to NHBC.

8.3.2 Provision of information

Designs and specifications shall be produced in a clearly understandable format, include all relevant information and be distributed to the appropriate personnel.

Designs and specifications should be issued to site supervisors, relevant specialist subcontractors and suppliers, and include the following information:

- Location of all ductwork runs, the fan unit and controls.
- Type, size and position of ducts and terminals.
- Direction of fall for 'horizontal' ductwork.
- Type and spacing of clips and fixings.
- Type and location of ancillary components, including those used for fire safety and acoustic purposes.
- Designed airflow-balancing figures for the system.

8.3.3 Building integration

Also see: Chapter 7.1 and 7.2

MVHR systems shall ensure compatibility with other building elements and not adversely affect the performance of the building. Issues to be taken into account include:

a) weathertightness
b) fixing of fan units
c) firestopping.

Weathertightness

Proprietary roof terminals should be used to ensure the weathertightness of the roof covering.

Fixing of fan units

MVHR fan units should only be fixed to parts of the building capable of taking the load. Where MVHR fan units are supported by framed structures, additional components such as noggings may be required to provide a secure fixing point.

Fan units should be located, orientated and fixed in accordance with the design, using the clips, brackets and fixings recommended by the manufacturer.

Firestopping

The MVHR system should not adversely affect the fire performance of the building. Issues to be taken into account include:

- ensuring that the fire requirements of the building are in accordance with relevant building regulations
- suitable detailing of components passing through other elements of the building
- location and type of firestops to be used
- integrity of protected stairs and halls
- integrity of walls and floors.

Proprietary fire components should be suitably tested, and specified to take account of the test conditions.

Relevant standards include:

BS 476	'Fire tests on building materials and structures.'
BS EN 1365-2	'Fire resistance tests for loadbearing elements. Floors and roofs.'
BS EN 1366-3	'Fire resistance tests for service installations. Penetration seals.'

8.3.4 Noise

MVHR systems shall be designed to minimise disturbance caused by noise.

MVHR fan units should be sized to run at their optimum speed and to provide suitable performance whilst taking the resulting noise and vibration into account. Specifying MVHR fan units that can provide the required airflow rates when running at less than full speed can reduce unnecessary noise.

Ductwork should be sized to allow air to pass freely without causing excessive noise disturbance. To reduce noise transfer along ductwork, a short length of flexible duct can be installed adjacent to air valves and fan units. Other issues to be taken into account include:

- noise between habitable rooms
- external noise
- location of the MVHR fan unit
- the type of mountings used to secure the MVHR fan unit.

8.3.5 Design considerations

Also see: Chapter 9.1

MVHR systems shall ensure compatibility and satisfactory performance. Issues to be taken into account include:

a) performance
b) systemised approach
c) type and position of air valves and terminals
d) control of condensation
e) protection from cold.

Performance

The MVHR system should be designed to provide satisfactory performance and be installed according to the design and manufacturer's recommendations. Variations from the design should maintain the satisfactory performance of the system and be approved by the designer.

Issues that should be taken into account include:

- ventilation rates as set out in appropriate building regulations and standards
- fan capacity, accounting for airflow resistance of the system
- ensuring the even distribution of airflow, taking into account airflow resistance, including from bends and fittings.

Airflow resistance should be calculated using figures for air valves and terminals determined in accordance with BS EN 13141-2 and data supplied by the duct manufacturer. Ductwork should be as direct as possible to reduce the number of bends.

Allowance should be made for air transfer within the home. Where gaps between the underside of internal doors and the floor finish are used for air transfer, the guidance in Chapter 9.1 'A consistent approach to finishes' should be considered.

Systemised approach

The MVHR system should be designed as a complete package, taking into account the performance of all components and materials, to ensure compatibility and the performance requirements of the system.

Particular consideration should be given where components from different manufacturers are specified on the same system.

Type and position of air valves and terminals

Air valves should be selected according to location and function, ensuring appropriate specification for:

- wall or ceiling location
- supply or extract function
- the velocity of the system.

To create cross-ventilation within a room and to ensure satisfactory operation, air valves on low velocity systems should be:

- positioned on the opposite side of the room from internal door openings
- a minimum of 200mm from walls, where located on a ceiling
- a maximum of 400mm from the ceiling, where located on a wall
- a minimum of 600mm (on plan) from hobs in kitchens
- positioned to account for the likely location of tall furniture and to avoid draughts over beds and seating areas
- lockable, where adjustable.

To prevent cross-contamination, intake terminals should generally be separated from exhaust terminals and other potential sources of pollution by a minimum of 1m measured on plan. Increased separation distances may be required between the intake and any:

- soil and vent pipe terminal
- boiler flue outlet
- biomass or solid fuel chimney terminal.

Terminals should prevent the entry of birds and animals.

Control of condensation

Ductwork should be insulated to prevent condensation formation where:

- it passes through spaces outside the insulated parts of the home, such as a roof void
- carrying cold air through spaces that are within the insulated parts of the home.

This can be achieved by using suitable pre-insulated ductwork, or a proprietary insulation system with a thermal resistance equivalent to a minimum of 25mm of insulating material, with a thermal conductivity of 0.04W/Mk.

Ductwork insulation, including that used for proprietary duct insulation systems and pre-insulated ducts should be:

- inert, durable and suitable for use with the ductwork system
- continuous and vapour resistant
- not adversely affected by moisture vapour
- installed in a neat and workmanlike manner to ensure that there are no gaps
- installed in accordance with the manufacturer's recommendations.

Where a vapour control layer is incorporated, the joints should be sealed using appropriate tapes or sealants as recommended by the manufacturer.

Table 1: Ductwork insulation

Type of duct	Ductwork continuously insulated	
	Ductwork located inside the insulated part of the home	Ductwork located outside the insulated part of the home
Intake	Yes	Yes
Exhaust	Yes	Yes
Service (supply and extract)	No	Yes(1)

Notes

1 Additional insulation should be provided to protect the system from the cold.

Any condensate that forms within the fan unit or ductwork should be able to drain to a suitable outfall. Fan units should be located to enable connection of the condensate drain to the soil and waste system via a dry trap.

Protection from cold

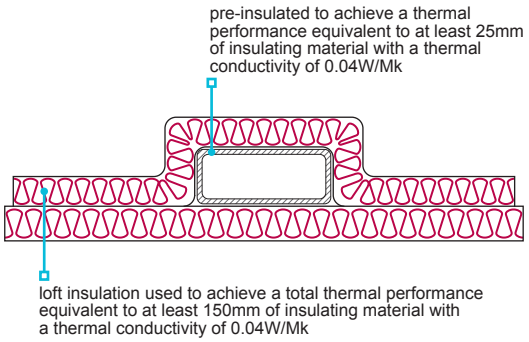
MVHR systems should be protected from the effects of cold. Issues to be taken into account include:

- performance in relation to indoor air quality
- the manufacturer's recommendations where any parts are located outside the insulated part of the home
- insulation of ductwork and other system components.

To prevent damage to the components and ensure satisfactory operation, MVHR systems should be fitted with automatic frost protection.

Horizontal sections of service ductwork, outside the insulated parts of the home, should be insulated to achieve a thermal resistance equivalent to at least 150mm of insulating material with a thermal conductivity of 0.04W/Mk. This may be achieved by installing the ductwork between the layers of horizontal insulation.

Condensate drains located outside the insulated part of the home should be insulated to prevent freezing.



8.3.6 Access and operation

MVHR systems shall be designed and installed to ensure that the fan unit and associated controls are easily accessible.

Table 2: Guidance for the suitable functioning of, and access to, the MVHR system

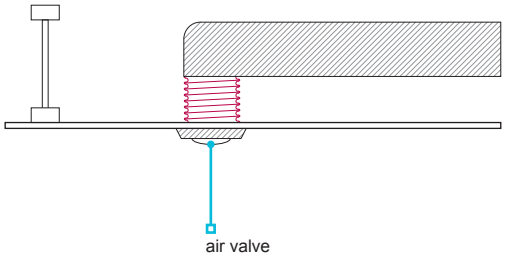
	Fan unit located inside the insulated part of the home	Fan unit located outside the insulated part of the home
Access	Access should not be obstructed and panels should be located and sized to enable routine servicing to be carried out.	A safe means of access, including a suitable walkway and a working platform 1m² immediately adjacent to the MVHR fan unit, should be provided. The walkway and platform should be designed to ensure the continuity of any insulation, and the supporting structure should be designed to take account of the additional load.
Control and functionality	Where a 'boost' function is provided, it should switch off automatically and be located in, or adjacent to, the room it serves. Where a 'summer bypass' function is provided, it should operate automatically and divert the airflow around the heat exchanger. The MVHR system should be capable of being isolated by a switched fused spur.	
Indication and controls	MVHR systems should include visual indicators showing maintenance and servicing requirements, and mode of operation. These should be visible from within the insulated envelope, not obscured from view, and be simple to use.	
Cleaning	To maintain operating performance, extract service ductwork and air valves should either be fitted with filters, or ductwork should be accessible for cleaning.	

8.3.7 Ductwork

Ductwork design and the materials used should be suitable for the intended purpose and not adversely affect the performance of the building.

Ductwork should:

- provide satisfactory performance for the life of the system
- be routed as directly as practicable
- be of a rigid or semi-rigid material suitable for use in MVHR systems
- be fixed in accordance with the manufacturer's recommendations.



Bends, connections and junctions should be formed using proprietary components that are part of the ductwork system.

Flexible ducting should:

- only be located adjacent to fan units or air valves
- not be more than 300mm in length
- not be used to form bends.

Where ductwork routes require alterations to structural elements, these should be in accordance with the manufacturer's recommendations or in accordance with Technical Requirement R5.

8.3.8 Fixing and jointing of ductwork

MVHR ductwork and insulation shall be installed to a satisfactory standard. Issues to be taken into account include:

a) fixing

b) jointing.

Ductwork should be securely installed in a neat and workmanlike manner.

Fixing

Parallel ductwork runs should be positioned to maintain a reasonably even gap.

To prevent condensate collecting, horizontal ductwork should be to a suitable outfall in accordance with the design, and installed to a true line to avoid localised dips.

Where ductwork passes through an external wall, it should be positioned to slope slightly downwards to prevent water entering the building.

Ductwork should be securely held in position by evenly spaced clips no more than 750mm apart, or in accordance with the ductwork manufacturer's recommendations.

Ductwork should not be in direct contact with other surfaces, such as plasterboard ceilings, that may transfer noise to the home.

Jointing

The method and materials used for jointing ductwork should be specified by the duct manufacturer, and be:

- durable and airtight
- securely fixed
- sealed with purpose-designed connections in accordance with the manufacturer's recommendations.

Where tapes and sealants are used, they should be suitable for the intended purpose and be recommended by the ductwork manufacturer. Issues to be taken into account in relation to the durability of the jointing method include:

- thermal movement
- moisture
- temperature
- compatibility with the duct material.

Tape should be installed in a neat and workmanlike manner, and surfaces should be dry and free from grease and dust before applying. Excess sealant should not extrude to the inside of the duct.

8.3.9 Commissioning and balancing

MVHR design, materials and sitework shall be tested and commissioned in accordance with the commissioning schedule.

Upon completion of the installation MVHR systems should be protected from dust during the construction of the home. Where possible the system should be switched off and dust covers applied to air valves.

Prior to completion of the home, the system:

- including ductwork and filters, should be checked to ensure it is clear from dirt and dust that may have accumulated during construction
- should be commissioned to confirm performance
- should be adjusted by using the air valves and controls to achieve the correct balancing and airflow rates
- should have air valves locked in position after correct commissioning and balancing.

Where the system cannot be balanced using the air valves and system controls, the complete system should be checked to ensure that it complies with the design.

Any changes from the design should be referred back to the designer. Adjusting the fan speed above the designed output may result in noise disturbance, and should be avoided.

A copy of the commissioning certificate should be made available to NHBC upon request.

8.3.10 Handover requirements

MVHR systems shall be provided with clear and detailed information and instructions that are handed over to the end user.

The pack of information should be in a format intended for a non-technical user and include:

- the commissioning certificate
- user instructions for the system and its controls
- user-friendly description and explanation of the system, including the location of components
- details of routine maintenance, e.g. changing/cleaning the filters
- method of cleaning the ductwork, where required
- guidance for the use of summer bypass and boost settings, where installed
- contact details of the manufacturer and installer
- details of the installed system, including part numbers for consumables
- details of any maintenance and servicing agreements.