



# TECHNICAL MANUAL

VERSION 10

# 16.

# Ventilation

## Contents

### Functional Requirements

- 16.1 System 1 - Background Ventilators and Intermittent Extract Fans
- 16.2 System 2 - Passive Stack Ventilation
- 16.3 System 3 - Continuous Mechanical Extract (MEV)
- 16.4 System 4 - Continuous Mechanical Extract with Heat Recovery

## ADDITIONAL FUNCTIONAL REQUIREMENTS

---

### **Workmanship**

A commissioning certificate is required for any work completed by an approved installer.

### **Materials**

No additional requirements.

### **Design**

1. Ventilation services - shall be designed, constructed and installed so that they:
  - a. Conform to Building Regulations;
  - b. Do not adversely affect the structural stability of the building;
  - c. Are constructed using non-hazardous materials;
  - d. Are durable and robust;
  - e. Are safe and convenient in use.

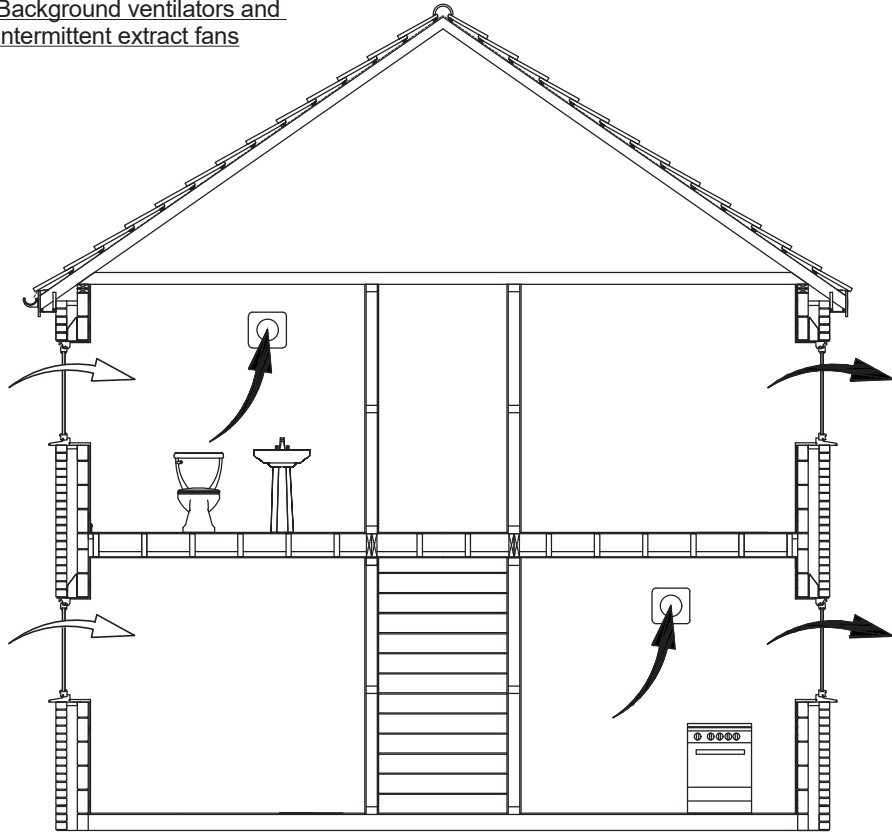
# **16.**

## **Ventilation**

### **16.1**

#### **System 1 - Background Ventilators and Intermittent Extract Fans**

**Background ventilators and intermittent extract fans**



**Intermittent extract fans and background ventilation**

A System 1 is suitable for use in houses and many flats or apartments with multiple external elevations. In some circumstances, it can be difficult to comply with System 1, especially in dwellings with a single external elevation.

The System comprises of background ventilators, usually trickle ventilators fitted to windows, and extract fans fitted in moisture producing areas or "wet rooms" such as kitchens and bathrooms.

The background ventilators provide the whole building ventilation and also supply air to the intermittently operated extract fans which provide the extract ventilation removing odours and excessive humidity.

**Extractor fans**

Where ductwork from extractor fans goes through unheated spaces such as roof voids, action should be taken to minimise the chance of condensation forming in the ducting and any consequential damage caused to finishes and the fan unit.

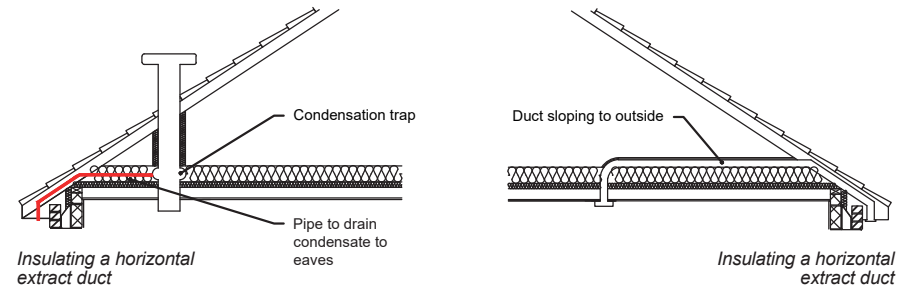
- Ensure ducting discharges to the outside air.
- Provide insulation to the outside of the ductwork, and lay to a fall away from the fan.

The system should provide extraction rates in accordance with Building Regulation requirements Approved Document F. All habitable and service rooms within dwellings should have some form of ventilation as a requirement. It may be permanent background ventilation, mechanical ventilation or an opening window.

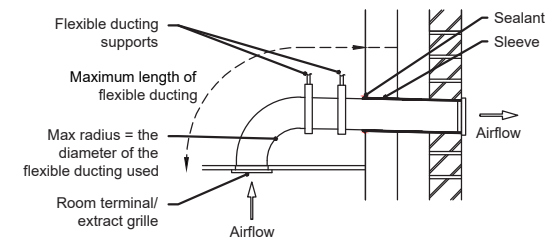
**Mechanical extract ventilation rates**

Room	Intermittent extract	Continuous extract
Kitchen	30 l/s adjacent to hob 60l/s elsewhere	13 l/s
Utility (access via dwelling)	30 l/s	8 l/s
Bath/shower room	15 l/s	8 l/s
Sanitary accommodation	6 l/s	6 l/s

**Extract ducts**

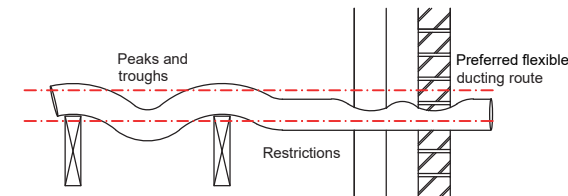


**Correct duct installation**



Adequate support is required for extract ducts, and they also need to have sealed joints where required. Insulation needs to be provided where ducts pass through unheated spaces, such as roof voids, to the outside air, or a condensation drain should be provided in accordance with the design.

**Incorrect duct installation**



Where ducts penetrate external walls these should be adequately protected against adverse weather and moisture ingress.

### Background ventilation

Background ventilation should be provided in accordance with the relevant regional Building Regulations. Where background ventilators (trickle vents) are installed in windows and doors, they must be correctly specified for the location and should be installed so as not cause potential damage to render finishes or restrict the ability to open the window/door.

### Purge ventilation

Purge ventilation should be provided in accordance with the relevant regional Building Regulations. Purge ventilation provision is required in each habitable room and should be capable of extracting a minimum of four air changes per hour (ach) per room directly to outside. Normally, openable windows or doors can provide this function, otherwise mechanical extract should be provided.

### Installation of building services

All items should be installed to ensure satisfactory operation.

Items to be taken into account include:

- Locations and fittings of pipes and cable service entries through the substructure.
- Services must be sleeved or ducted through structural elements (and not solidly embedded) to prevent damage. Fire stopping may also be required. Services should not be located in the cavity of an external wall, except for electricity meter tails.
- Only to be buried in screeds where permitted by relevant Codes of Practice.
- Should not adversely effect the fire or sound performance of an compartment wall or floor.

### Jointing of pipes and fittings

Proprietary joints should be made strictly in accordance with the manufacturer's instructions.

Suitable clips or brackets are to be used to secure. Fixings should be installed adequately, and spaced to stop sagging but not restrict thermal movement. Where needed, pipes should have adequate falls.

Sufficient room should be allowed for thermal expansion and contraction to avoid damage and noise from pipe movement.

### Notches and drillings

Floor joists should not be excessively notched or drilled. Further information can be found in the Upper Floors guidance.

### Concealed services

If the services are hidden in walls or floors, they need to be positioned so that any significant cracking of the surface cannot occur.

### Services in timber frame

In addition to general provisions for the installation of services, the following are of particular note for timber frame construction external walls:

- The routing and termination of services should not affect the fire resistance of the structure.
- Electrical services are to be rated for their location with consideration for insulation.
- Service penetrations through the VCL should be tight fitting to reduce air leakage and the passage of moisture vapour.
- Avoid running electrical services in the external wall cavity, except for meter tails.
- Services should be protected with metal plates if they pass within 25mm from face of stud.
- Adequate allowance for differential movement to occur without causing damage should be provided for rigid services rising vertically through a building.
- Services that pass through the external wall cavity and provide an opening (such as flues/vents) should be enclosed with a cavity barrier and protected with a cavity tray.

Further information can be found in both the 'Upper Floors', 'Internal Walls', and 'Electrical Services' guidance.

### Chasing of masonry cavity walls

If chases in walls are necessary, their depth should not exceed:

- One-sixth the thickness of the single leaf for horizontal chases.
- One-third the thickness for vertical chases.

Hollow blocks should not be chased unless specifically permitted by the manufacturer.

Further information can be found in the 'Internal Walls' guidance.

### Fire stopping

Fire stopping is required around services that penetrate fire-resisting floors, walls or partitions. If proprietary systems are used, they should be installed using the manufacturer's recommendations.

Issues that should be taken into account include:

- Suitable design detailing of components passing through elements of the building.
- The location and type of dampers and firestops to be used.
- The integrity of protected stairs and halls.
- The integrity of walls and floors.
- Additional requirements for flats and apartments with a floor above 4.5m.

Further information can be found in the 'Upper Floors' and 'Internal Walls' guidance.

# **16.**

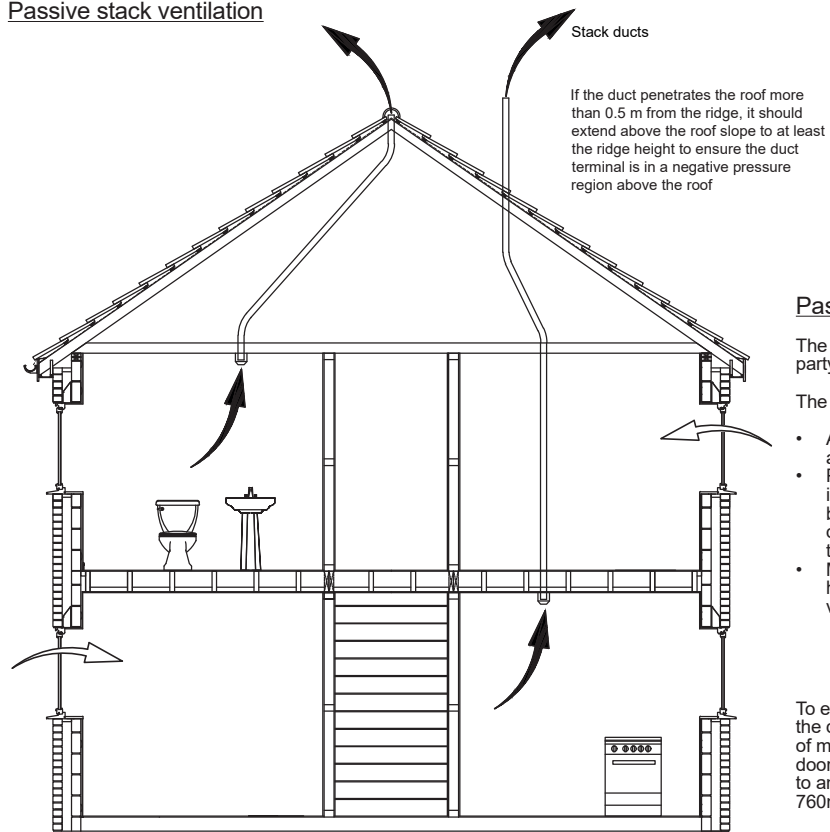
## **Ventilation**

### **16.2**

#### **System 2 - Passive Stack Ventilation**

## 16.2.1 SYSTEM 2 - PASSIVE STACK VENTILATION: General requirements

### Passive stack ventilation



### Passive stack ventilation (PSV)

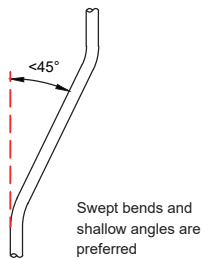
The system is to meet the relevant third-party accreditation.

The PSV layout should be designed to:

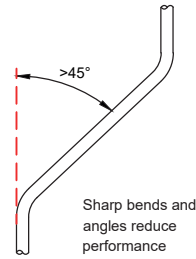
- Avoid cross flow between the kitchen and bathroom/WCs.
- Prevent, as far as possible, air flow in the ducts being adversely affected by the prevailing wind speed and direction, or by sudden changes in these.
- Minimise resistance to air flow by having ducts that are as near to vertical as possible.

To ensure good transfer of air throughout the dwelling, there should be an undercut of minimum area 7600mm<sup>2</sup> in all internal doors above the floor finish (equivalent to an undercut of 10mm for a standard 760mm wide door).

### Suitable bends for passive stack ducts



### 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. Offset at an angle should be no more than 45° to the vertical.

### Extract ducts

Where ductwork from extractor fans goes through unheated spaces such as roof voids, action should be taken to minimise the chance of condensation forming in the ducting and any consequential damage caused to finishes.

The system should provide extraction rates in accordance with regional Building Regulation requirements Approved Document F.

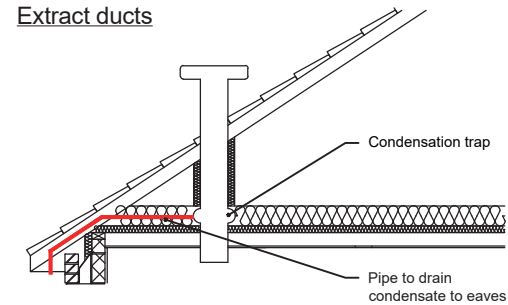
All habitable and service rooms within dwellings should have some form of ventilation as a requirement. It may be permanent background ventilation, mechanical ventilation or an opening window.

- Ducting should be insulated where it passes through unheated areas and voids (e.g. loft spaces) with the equivalent of at least 25mm of a material having a thermal conductivity of  $\leq 0.04W(m.K)$  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.

Adequate support is required for extract ducts, and they also need to have sealed joints where required. Insulation needs to be provided where ducts pass through unheated spaces, such as roof voids, to the outside air, or a condensate trap should be provided in accordance with the design.

The ducting should be installed in accordance with the manufacturer's instructions.

### Extract ducts



Insulating a vertical extract duct

### Whole-building ventilation

The whole-building ventilation rate for the supply of air to the habitable rooms in a dwelling should be no less than the rates stated in the table below.

### Whole-building

Ventilation	Number of bedrooms in dwelling				
	1	2	3	4	5
Whole building ventilation rate <sup>a, b</sup> (l/s)	13	17	21	25	29

#### Notes:

a. In addition, the minimum ventilation rate should be not less than 0.3 l/s per m<sup>2</sup> of internal floor area (this includes all floors, e.g. for a two-storey building add the ground and first floor areas).

b. This is based on two occupants in the main bedroom and a single occupant in all other bedrooms. This should be used as the default value. If a greater level of occupancy is expected add 4 l/s per occupant.

### Ductwork installation

- 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.
- Ducting should be properly supported along its length to ensure the duct can run straight without distortion or sagging and that there are no kinks at any bends or the connection to outlet terminals.
- In the roof space the duct should be secured to a wooden strut that is securely fixed at both ends
- A ridged duct should be used for system stability for the part of a PSV system which is outside, above the roof slope. It should protect down into the roof space far enough to allow firm support.

### Background ventilation

Background ventilation should be provided in all rooms except the rooms where PSV is located in accordance with the relevant regional Building Regulations. Where back ground ventilators (trickle vents) are installed in windows and doors, they must be correctly specified for the location and should be installed so as not cause potential damage to render finishes or restrict the ability to open the window/door.

Please note: open flued combustion appliances will still require an air supply in accordance with Approved Document J.

### Purge ventilation

Purge ventilation should be provided in accordance with the relevant regional Building Regulations. Normally, openable windows or doors can provide this function, otherwise mechanical extract should be provided.

### Installation of building services

All items should be installed to ensure satisfactory operation.

Items to be taken into account include:

- Locations and fittings of pipes and cable service entries through the substructure.
- Services must be sleeved or ducted through structural elements (and not solidly embedded) to prevent damage. Fire stopping may also be required. Services should not be located in the cavity of an external wall, except for electricity meter tails.
- Only to be buried in screeds where permitted by relevant Codes of Practice.
- Should not adversely effect the fire or sound performance of an compartment wall or floor.

### Jointing of pipes and fittings

Proprietary joints should be made strictly in accordance with the manufacturer's instructions.

Suitable clips or brackets are to be used to secure. Fixings should be installed adequately, and spaced to stop sagging but not restrict thermal movement. Where needed, pipes should have adequate falls.

Sufficient room should be allowed for thermal expansion and contraction to avoid damage and noise from pipe movement.

### Notches and drillings

Floor joists should not be excessively notched or drilled. Further information can be found in the Upper Floors guidance.

### Services in framed structures

In addition to general provisions for the installation of services, the following are of particular note for timber frame construction external walls:

- The routing and termination of services should not affect the fire resistance of the structure.
- Service penetrations through the VCL should be tight fitting to reduce air leakage and the passage of moisture vapour.
- Adequate allowance for differential movement to occur without causing damage should be provided for rigid services rising vertically through a building.
- Services that pass through the external wall cavity and provide an opening (such as flues/vents) should be enclosed with a cavity barrier and protected with a cavity tray.

Further information can be found in both the 'Upper Floors', 'Internal Walls', and 'Electrical Services' guidance.

### Fire stopping

Fire stopping is required around services that penetrate fire-resisting floors, walls or partitions. If proprietary systems are used, they should be installed using the manufacturer's recommendations.

Issues that should be taken into account include:

- Suitable design detailing of components passing through elements of the building.
- The location and type of dampers and firestops to be used.
- The integrity of protected stairs and halls.
- The integrity of walls and floors.
- Additional requirements for flats and apartments with a floor above 4.5m.

Further information can be found in the 'Upper Floors' and 'Internal Walls' guidance.

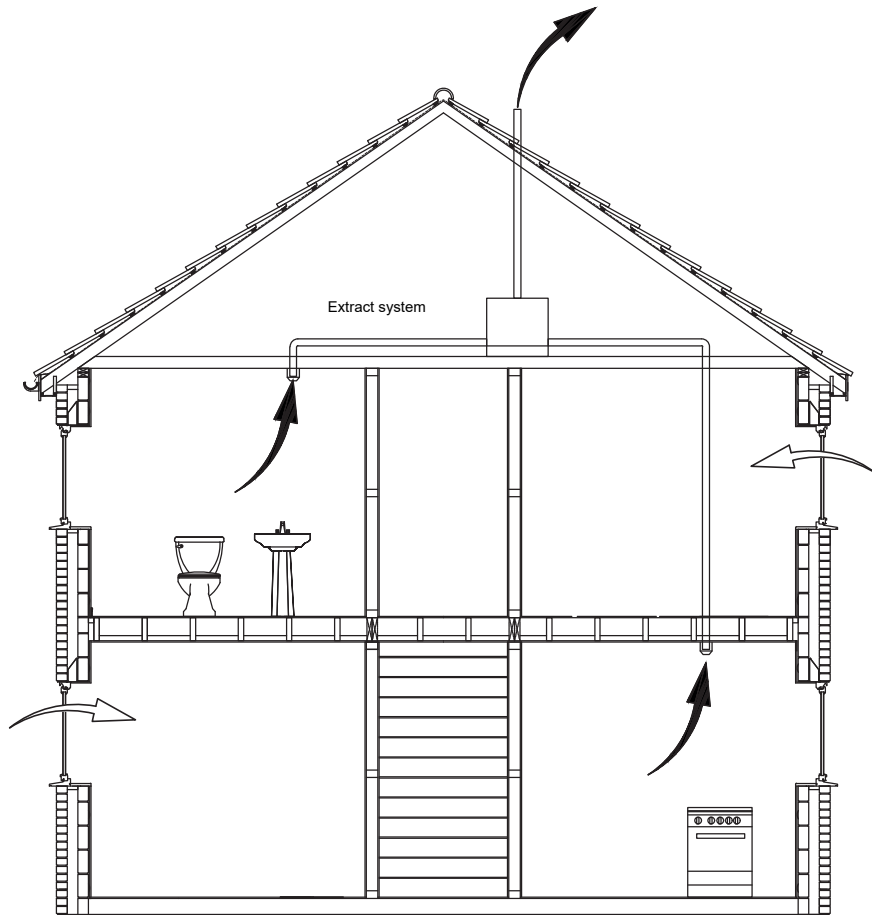
# **16.**

## **Ventilation**

### **16.3**

#### **System 3 - Continuous Mechanical Extract (MEV)**

## Continuous mechanical extract



## Design

The MEV system should be designed as a complete package, the performance of all materials and components should be considered to ensure compatibility and performance of the system.

The MEV system should:

- Be designed to ensure that a satisfactory level of performance is achieved in accordance with the domestic ventilation compliance guides supporting the relevant regional Building Regulations.
- The design should ensure even distribution of airflow taking account airflow resistance, including the bends and fittings.
- Have adequate fan capacity accounting for airflow resistance of the system.
- The ductwork should be as direct as possible.
- Installed in accordance with the design and manufacturers recommendations.
- Airflow resistance should be calculated in accordance with BS EN 13141-2 and manufacturers data.

## The design should outline

- The location of all ductwork runs, the position of the fan units and controls.
- The size, type and position of ductwork and terminals.
- Direction of falls for all horizontally laid ductwork.
- Type of fixings and specified fixing centres.
- The location and type of ancillary components e.g. those used for fire safety.
- Demonstrate the airflow-balancing figures for the proposed system.

## MEV fan unit

The MEV fan unit should be adequately fixed to a part of the building that can support the load and fixed in accordance with the design and manufacturers recommendations.

## Ductwork

The ductwork should provide suitable performance for the life of the system and should be ridged/semi ridged of a material that is suitable for use in MEV systems and installed in accordance with the manufacturers recommendations.

It is important to ensure that all ductwork is:

- Suitably supported in accordance with the ductwork manufacturers recommendations, this is generally secured with evenly spaced clips at no more than 750mm centres.
- Horizontal ductwork should be laid to a fall in accordance with the design to prevent condensate collecting and should be installed to a true line to prevent localised dips.
- Laid to a slight outfall when passing through an external wall to reduce the risk of water ingress.
- Suitably jointed using purpose design products that are durable, securely fixed and air tight in accordance with the manufacturers recommendations.
- Suitably insulated where it passes through uninsulated parts of the property or carrying cold air through insulated parts of the dwelling e.g. the roof space using pre insulated ductwork or propriety insulation system.
- Flexible ducting should be limited to use adjacent to fan units or air valves and should not be used to form bends.
- Ductwork should not be in direct contact with other surfaces e.g. ceilings.

## Access and operation

MEV systems must be installed so that:

- The fan units and controls are easily accessible.
- Identify maintenance and servicing requirements.
- Ducts and air valves should have either fitted filters or be accessible for cleaning.

## Commissioning

The MEV system should be commissioned to confirm performance to ensure compliance with the design. A copy of the commission certificate should be made available upon request.

### Background ventilation

Background ventilation should be provided in accordance with Approved Document F.

To ensure good transfer of air throughout the dwelling, there should be an undercut of minimum area 7600mm<sup>2</sup> in all internal doors above the floor finish. This is equivalent to an undercut of 10mm for a standard 760mm width door.

Ensure that the air transfer provision is unrestricted after floor finishes have been laid (e.g. carpets should not encroach).

### Purge ventilation

Purge ventilation should be provided in accordance with the relevant regional Building Regulations.

### Installation of building services

All items should be installed to ensure satisfactory operation.

Items to be taken into account include:

- Locations and fittings of pipes and cable service entries through the substructure.
- Services must be sleeved or ducted through structural elements (and not solidly embedded) to prevent damage. Fire stopping may also be required. Services should not be located in the cavity of an external wall, except for electricity meter tails.
- Only to be buried in screeds where permitted by relevant Codes of Practice.
- Should not adversely effect the fire or sound performance of a compartment wall or floor.

### Notches and drillings

Floor joists should not be excessively notched or drilled. Further guidance can be found in the 'Upper Floors' section.

### Noise

All continuous running fans should be quiet as to not discourage their use by occupants.

### Controls

- Any manual boost controls should be provided locally to the areas being served.
- In kitchens, any automatic controls must provide sufficient flow during cooking with fossil fuels (e.g. gas) to avoid build up of combustion products.
- Ensure the system always provides the minimum whole dwelling ventilation rate.

### Services in framed structures

In addition to general provisions for the installation of services, the following are of particular note for timber frame construction external walls:

- The routing and termination of services should not affect the fire resistance of the structure.
- Service penetrations through the VCL should be tight fitting to reduce air leakage and the passage of moisture vapour.
- Adequate allowance for differential movement to occur without causing damage should be provided for rigid services rising vertically through a building.
- Services that pass through the external wall cavity and provide an opening (such as flues/vents) should be enclosed with a cavity barrier and protected with a cavity tray.
- Avoid running electrical services in the external wall cavity, except for meter tails.
- Services should be protected with metal plates if they pass within 25mm from face of stud.

Further information can be found in the 'Upper Floor', 'Internal Walls' and 'Electrical Services' sections.

### Fire stopping

Fire stopping is required around services that penetrate fire-resisting floors, walls or partitions. If proprietary systems are used, they should be installed using the manufacturer's recommendations.

Issues that should be taken into account include:

- Suitable design detailing of components passing through elements of the building.
- The location and type of dampers and firestops to be used.
- The integrity of protected stairs and halls.
- The integrity of walls and floors.
- Additional requirements for flats and apartments with a floor above 4.5m.

Further information can be found in the 'Upper Floor' and 'Internal Walls' sections.

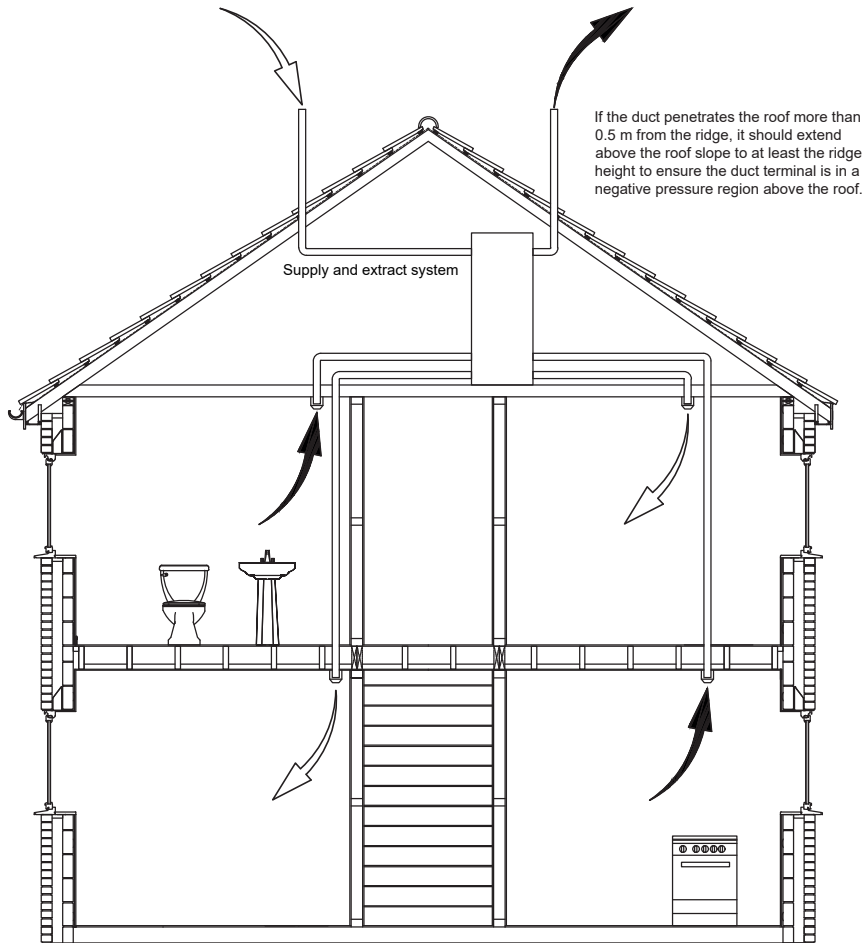
# **16.**

## **Ventilation**

### **16.4**

#### **System 4 - Continuous Mechanical Extract with Heat Recovery**

Continuous mechanical supply and extract with heat recovery (MVHR)



Design

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

The MVHR system should:

- Be designed to ensure that a satisfactory level of performance is achieved in accordance with the Domestic ventilation compliance guides supporting the relevant regional Building Regulations.
- The design should ensure even distribution of airflow taking account airflow resistance, including the bends and fittings.
- Have adequate fan capacity accounting for airflow resistance of the system.
- The ductwork should be as direct as possible.
- Installed in accordance with the design and manufacturers recommendations.
- Airflow resistance should be calculated in accordance with BS EN 13141-2 and manufacturers data.

The design should outline:

- The location of all ductwork runs, the position of the fan units and controls.
- The size, type and position of ductwork and terminals.
- Direction of falls for all horizontally laid ductwork.
- Type of fixings and specified fixing centres.
- The location and type of ancillary components e.g. those used for fire safety.
- Demonstrate the airflow-balancing figures for the proposed system.

MVHR fan unit

The MVHR fan unit should be adequately fixed to a part of the building that can support the load and fixed in accordance with the design and manufacturers recommendations.

Ductwork

The ductwork should provide suitable performance for the life of the system and should be ridged/ semi ridged of a material that is suitable for use in MVHR systems and installed in accordance with the manufacturers recommendations.

It is important to ensure that all ductwork is:

- Suitably supported in accordance with the ductwork manufacturers recommendations, this is generally secured with evenly spaced clips at no more than 750mm centres.
- Horizontal ductwork should be laid to a fall in accordance with the design to prevent condensate collecting and should be installed to a true line to prevent localised dips.
- Laid to a slight outfall when passing through an external wall to reduce the risk of water ingress.
- Suitably jointed using purpose design products that are durable, securely fixed and air tight in accordance with the manufacturers recommendations.
- Suitably insulated where it passes through uninsulated parts of the property or carrying cold air through insulated parts of the dwelling e.g. the roof space using pre insulated ductwork or propriety insulation system.
- Flexible ducting should be limited to use adjacent to fan units or air valves and should not be used to form bends.
- Ductwork should not be in direct contact with other surfaces e.g. ceilings.

Access and operation

MVHR systems must be installed so that:

- The fan units and controls are easily accessible.
- Suitable access for any maintenance and service requirements is provided.
- Ducts and air valves should have either fitted filters or be accessible for cleaning.

Commissioning

The MVHR system should be commissioned to confirm performance to ensure compliance with the design. A copy of the commission certificate should be made available upon request.

### Purge ventilation

Purge ventilation should be provided in accordance with the relevant regional Building Regulations.

### Installation of building services

All items should be installed to ensure satisfactory operation.

Items to be taken into account include:

- Locations and fittings of pipes and cable service entries through the substructure.
- Services must be sleeved or ducted through structural elements (and not solidly embedded) to prevent damage. Fire stopping may also be required. Services should not be located in the cavity of an external wall, except for electricity meter tails.
- Only to be buried in screeds where permitted by relevant Codes of Practice.
- Should not adversely effect the fire or sound performance of a compartment wall or floor.

### Notches and drillings

Floor joists should not be excessively notched or drilled. Further guidance can be found in the 'Upper Floors' section.

### Noise

All continuous running fans should be quiet as to not discourage their use by occupants.

### Controls

- Any manual boost controls should be provided locally to the areas being served.
- In kitchens, any automatic controls must provide sufficient flow during cooking with fossil fuels e.g. gas, to avoid build up of combustion products.
- Ensure the system always provides the minimum whole dwelling ventilation rate.

### Services in framed structures

In addition to general provisions for the installation of services, the following are of particular note for timber frame construction external walls:

- The routing and termination of services should not affect the fire resistance of the structure.
- Service penetrations through the VCL should be tight fitting to reduce air leakage and the passage of moisture vapour.
- Adequate allowance for differential movement to occur without causing damage should be provided for rigid services rising vertically through a building.
- Services that pass through the external wall cavity and provide an opening (such as flues/vents) should be enclosed with a cavity barrier and protected with a cavity tray.
- Avoid running electrical services in the external wall cavity, except for meter tails.
- Services should be protected with metal plates if they pass within 25mm from face of stud.

Further information can be found in the 'Upper Floor', 'Internal Walls' and 'Electrical Services' sections.

### Fire stopping

Fire stopping is required around services that penetrate fire-resisting floors, walls or partitions. If proprietary systems are used, they should be installed using the manufacturer's recommendations.

Issues that should be taken into account include:

- Suitable design detailing of components passing through elements of the building.
- The location and type of dampers and firestops to be used.
- The integrity of protected stairs and halls.
- The integrity of walls and floors.
- Additional requirements for flats and apartments with a floor over 4.5m.

Further information can be found in the 'Upper Floors' and 'Internal Walls' sections.

T 0800 183 1755 E [enquiries@labcwarranty.co.uk](mailto:enquiries@labcwarranty.co.uk)

[www.labcwarranty.co.uk](http://www.labcwarranty.co.uk)

MD Insurance Services Ltd. is the scheme administrator for LABC Warranty and is authorised and regulated by the Financial Conduct Authority. Registered in England No: 3642459. **TS-011A-10.00-110621**

