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VENTILATION**

100% there for  
Electrical Wholesalers

# **Domestic Ventilation Installation Guide**

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**Issue 1 - August 2024**



# Why choose National Ventilation

National Ventilation is one of the leading manufacturers and suppliers of ventilation solutions. We have one of the biggest and most diverse range of ventilation products in the UK specialising in innovative, energy-saving ventilation products that can accommodate domestic, commercial and industrial applications.

With over 30 years of industry experience, we have a deep understanding of the ventilation market. We continue to focus on developing high quality, industry leading products which are quick and easy to install to the highest standards. As part of our service commitment, we offer you our full support when you need to specify ventilation systems.

We offer a FREE ventilation design service through our dedicated design team that can provide full ventilation designs and site visits. We are also able to offer ventilation training on fans and systems.

We not only supply ventilation products, but we also have the knowledge to support electrical wholesalers in completing their projects on time and on budget.



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The purpose of this guide is to provide the installer with current guidance and information regarding the proper installation of various ventilation systems and their configurations. This guide should be used in conjunction with the latest Building Regulations for Ventilation (Approved Document F1).

According to Approved Document F Volume 1 (ADF1), 2021 edition and in Scotland The Building Standards Division, Domestic Technical Handbook June 2023, it is mandatory to measure and report the installed performance of ventilation systems to Building Control. This requirement applies to Intermittent Extract (formally known as System 1), Continuously Running extract - MEV (formally known as System 3) and Mechanical Ventilation with Heat Recovery - MVHR (formally known as System 4).

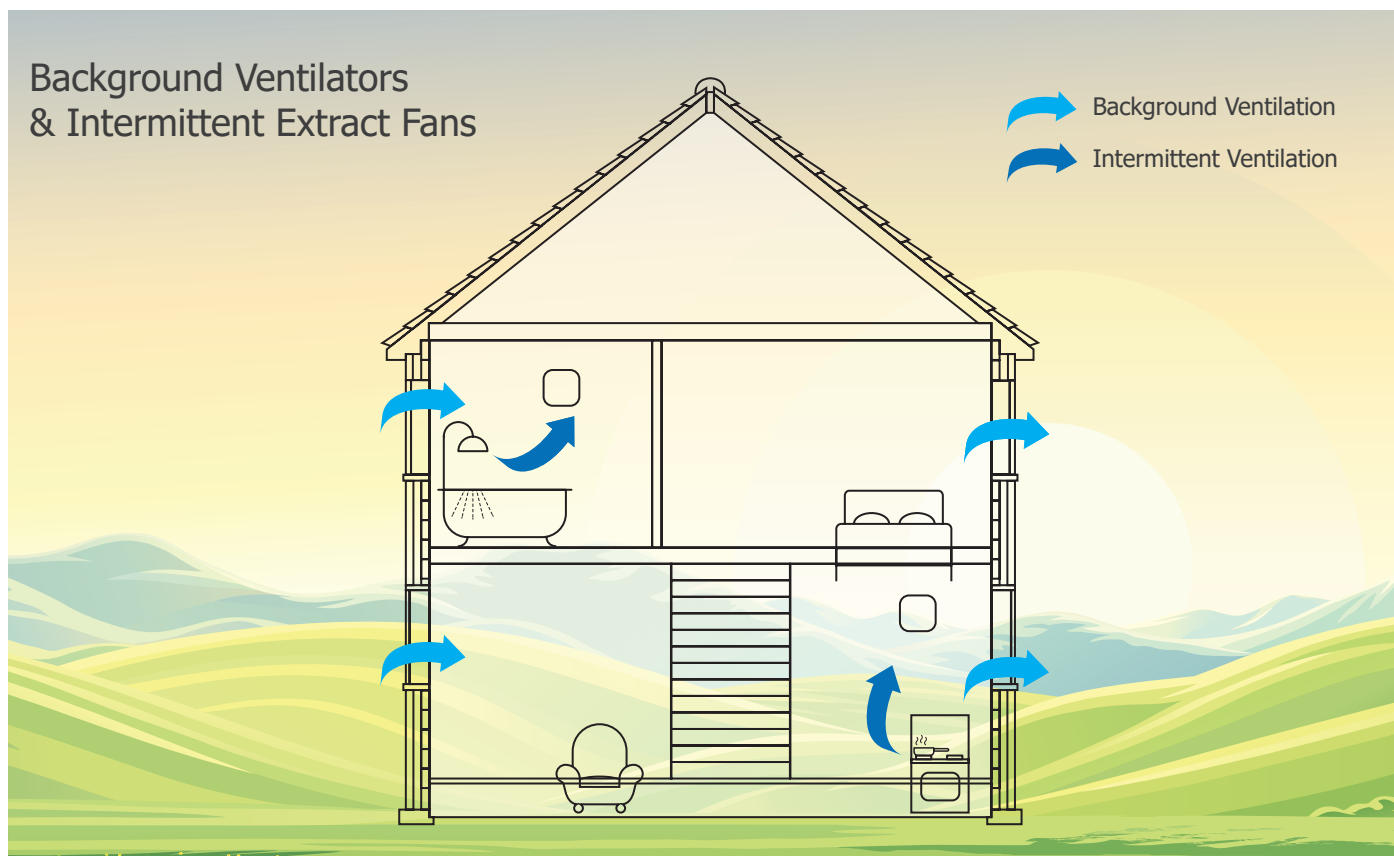
The performance of National Ventilation fans and ventilation units has been assessed, and they will comply with regulatory requirements when the system is installed correctly. The most common reasons for failing to meet minimum ventilation requirements are installation issues, such as blocked or constricted ducts, excessive use of bends and the selection of an inappropriate exhaust terminal. It is essential to minimize the use of flexible ducting and follow the system design drawings.

Any ducting connected to the fan will introduce resistance to the system. When ducts are partially obstructed, misaligned with the terminal or fan spigot or squashed, the system's resistance level will significantly increase. All systems will malfunction if the system's resistance surpasses the acceptable limit specified by the manufacturer.

It should be understood that the installation and design requirements given in this document are based on the latest Building Regulations ADF 1 and ADL 1 and National Ventilation's product installation guidance. There may be instances where other guidance documents such as NHBC guides have more stringent requirements and these may need to be followed to achieve compliance with the specific site requirements.



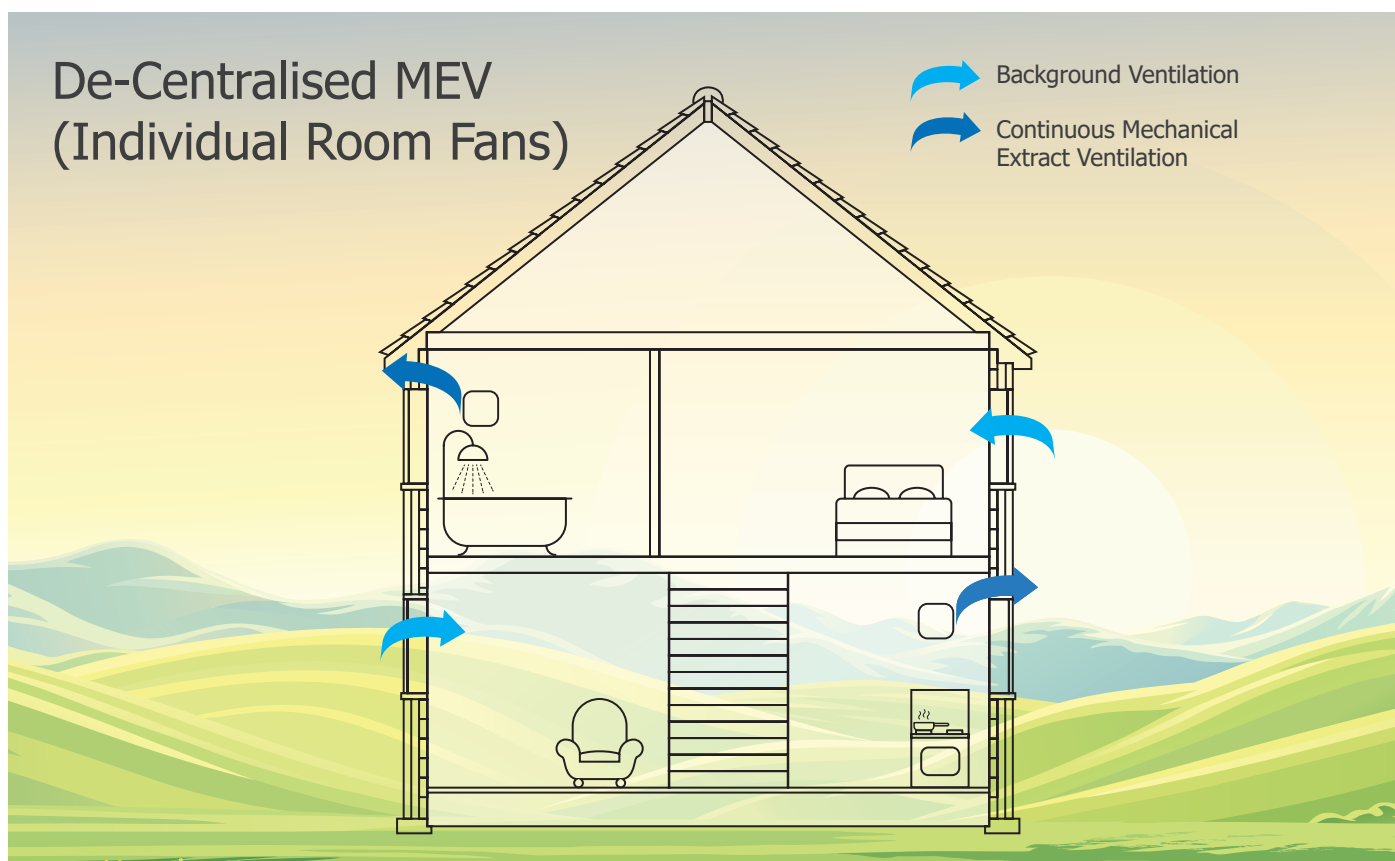
## Installation Guidance



- Background Ventilators and Intermittent extract fans are only suitable for "Less airtight dwellings" - see Paragraph 1.45 and table 1.6 of ADF 1.
- Fans should be mounted as high as practical and no more than 400mm below the ceiling.
- Ensure correctly sized background ventilators are fitted in all appropriate rooms in accordance with Table 1.7 of ADF1.
- Vertical ducting requires a condensate trap.
- Connections of rigid ducts should be sealed with a suitable non hardening sealant and mechanically fixed (eg self tapping screws). Duct tape only is not an acceptable method of fixing.
- Rigid ducting should be supported every 1 metre or either side of a joint.
- Horizontal ducting should slope downwards away from the fan.
- Where used flexible ducting should be pulled taught (90% of its maximum length).
- Flexible ducting should be kept to a minimum, no more than 1.5m in length and ideally used just for final connections.
- Bends in flexible duct should be sweeping with a radius of at least the duct diameter
- Flexible ducting should be mechanically connected with a worm drive clip and duct tape. The use of cable ties is not an acceptable mechanical fix.
- Ensure flexible ducting is not distorted or squashed.
- Flexible ducting needs to be supported a minimum of every 600mm.
- Ensure all doors have a suitable undercut, 10mm from finished floor level or 20mm from unfinished floor level.



## Continuous Mechanical Extract Fans (dMEV)



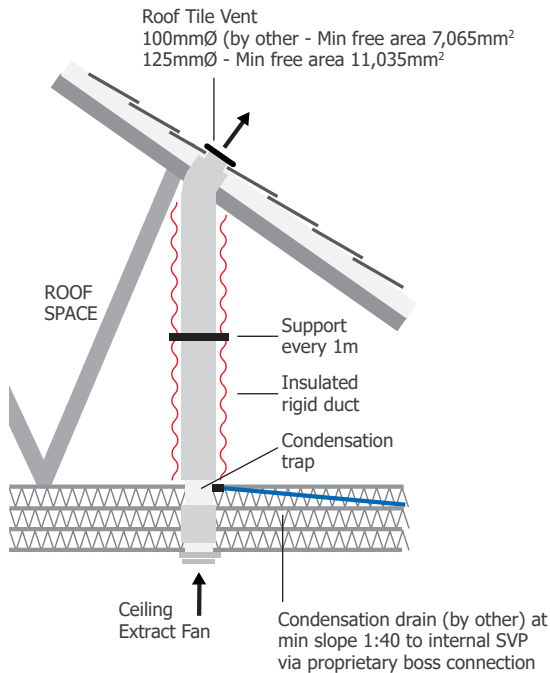
- dMEV systems are suitable for "All dwellings"- see Paragraph 1.45 and table 1.6 of ADF 1.
- Whilst ADF 1 allows for flexible ducting up to 1.5m for SAP compliance dMEV fans should be installed with rigid ducting only.
- Fans should be mounted as high as practical and no more than 400mm below the ceiling.
- Ensure correctly sized background ventilators are fitted in all appropriate rooms in accordance with paragraph 1.64 of ADF1.
- Ducting should be insulated where it passes through unheated area and voids (e.g. loft spaces) with the equivalent of at least 25mm of a material having a thermal conductivity of  $<0.04 \text{ W/(m.K)}$  to reduce the possibility of condensation forming.
- Vertical ducting requires a condensate trap.
- Connections of rigid ducts should be sealed with a suitable non hardening sealant and mechanically fixed (eg self tapping screws). Duct tape only is not an acceptable method of fixing.
- Rigid ducting should be supported every metre or either side of a joint.
- Horizontal ducting should slope downwards away from the fan.
- Flexible ducting should be kept to a minimum, no more than 1.5m in length and ideally used just for final connections.
- Where used flexible ducting should be pulled taught (90% of its maximum length).
- Bends in flexible duct should be sweeping with a radius of at least the duct diameter.
- Flexible ducting should be mechanically connected with a worm drive clip and duct tape. The use of cable ties is not an acceptable mechanical fix.
- Ensure flexible ducting is not distorted or squashed.
- Flexible ducting needs to be supported a minimum of every 600mm.
- Ensure all doors have a suitable undercut, 10mm from finished floor level or 20mm from unfinished floor level.



## Ceiling Mounted Extract Fans - Install Guidance

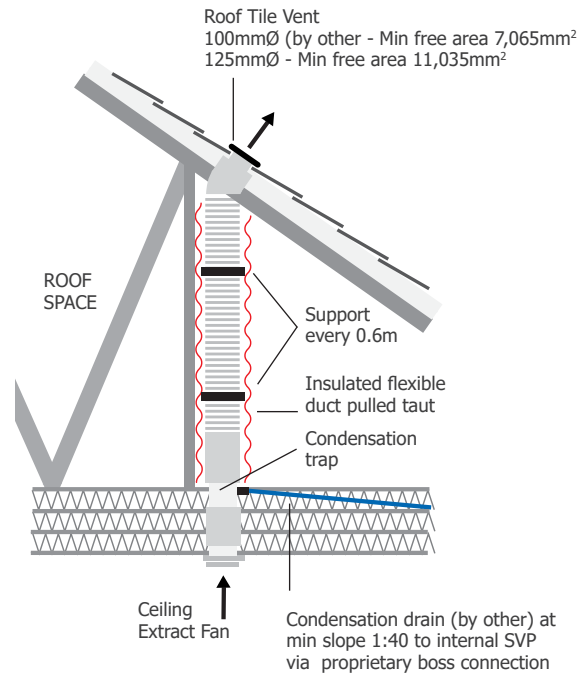
### Ceiling mounted roof vent (rigid)

All ducting in unheated areas needs to be insulated.



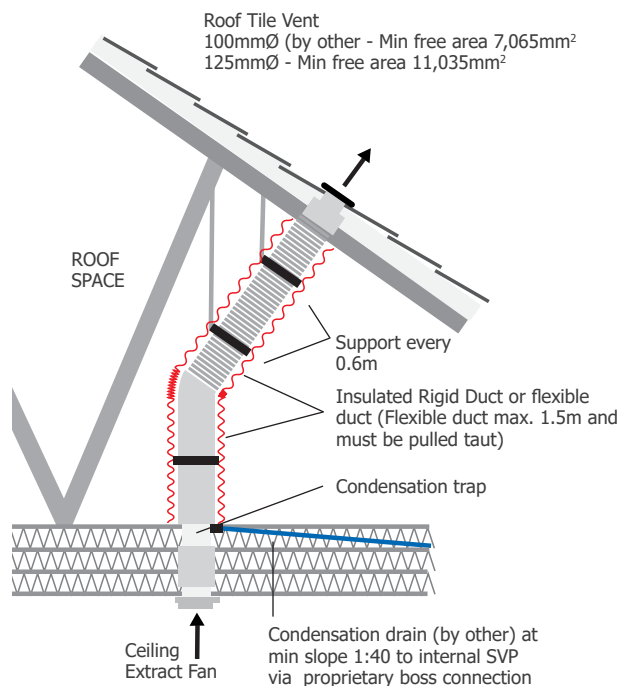
### Ceiling mounted roof vent (flex)

All ducting in unheated areas needs to be insulated.



### Ceiling mounted roof vent (flex)

All ducting in unheated areas needs to be insulated.



\*For further details please consult the current local building regulations

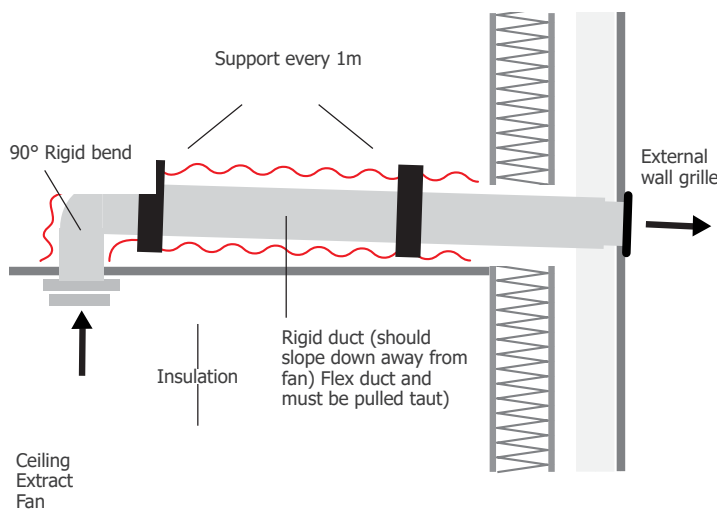


# Ceiling and Wall Mounted Fan Installation

## Gable End Walls - Install Guidance

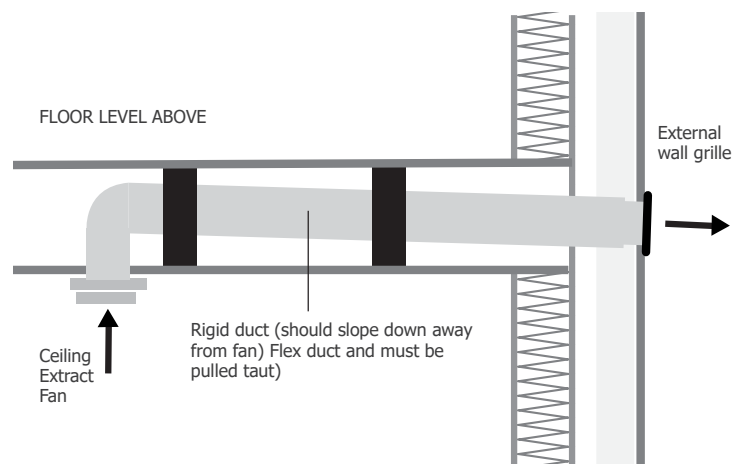
### Ceiling mounted Gable end wall (rigid, parallel with joists)

All ducting in unheated areas needs to be insulated. Ducting should always be rigid. Flexible ducting should be supported every 600mm. Horizontal ducting should slope downwards away from the fan.



### Ceiling mounted Gable end wall (rigid, through joists)

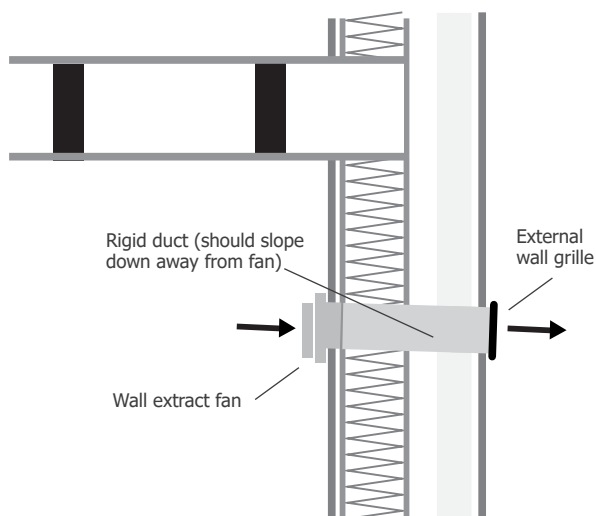
All ducting in unheated areas needs to be insulated. Ducting should always be rigid. Flexible ducting should be supported every 600mm. Horizontal ducting should slope downwards away from the fan.



## Through Wall - Install Guidance

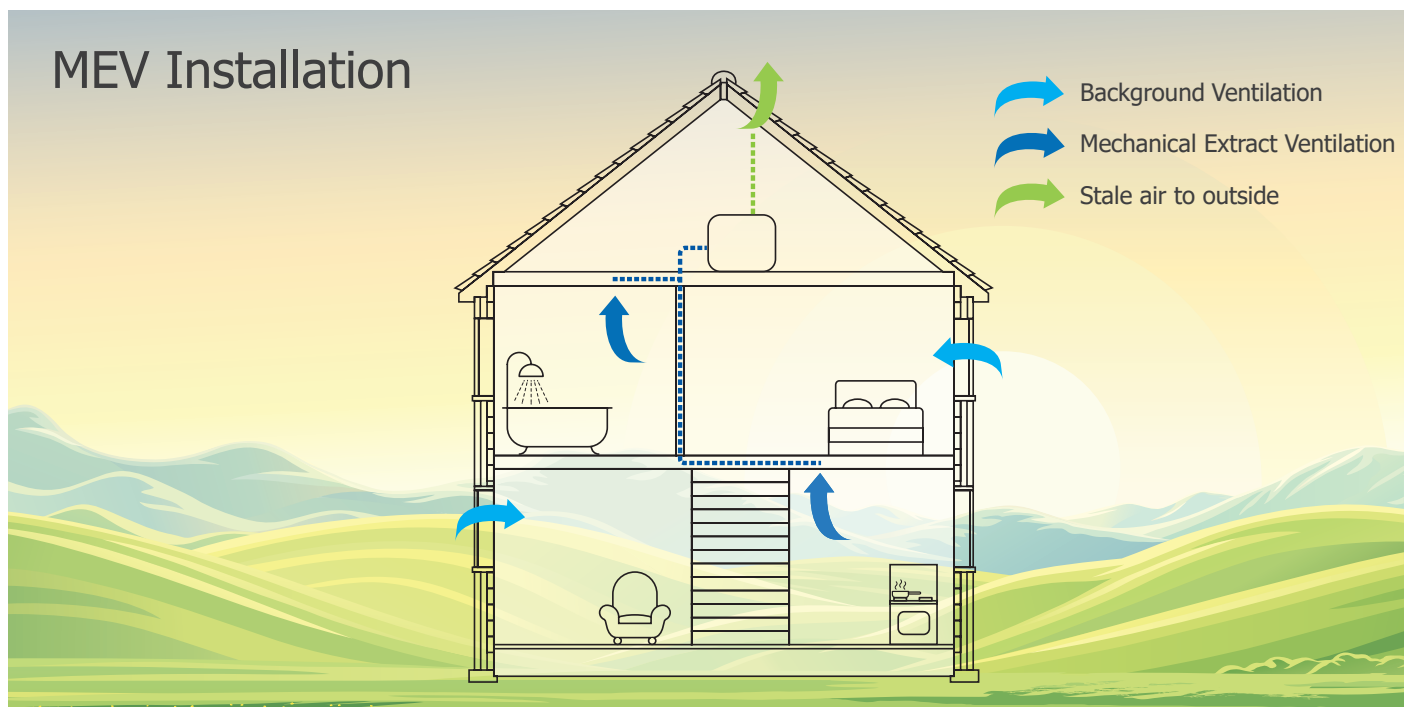
### Through wall (rigid duct)

All ducting in unheated areas needs to be insulated. Ducting should always be rigid. Horizontal ducting should slope downwards away from the fan.



\*For further details please consult the current local building regulations

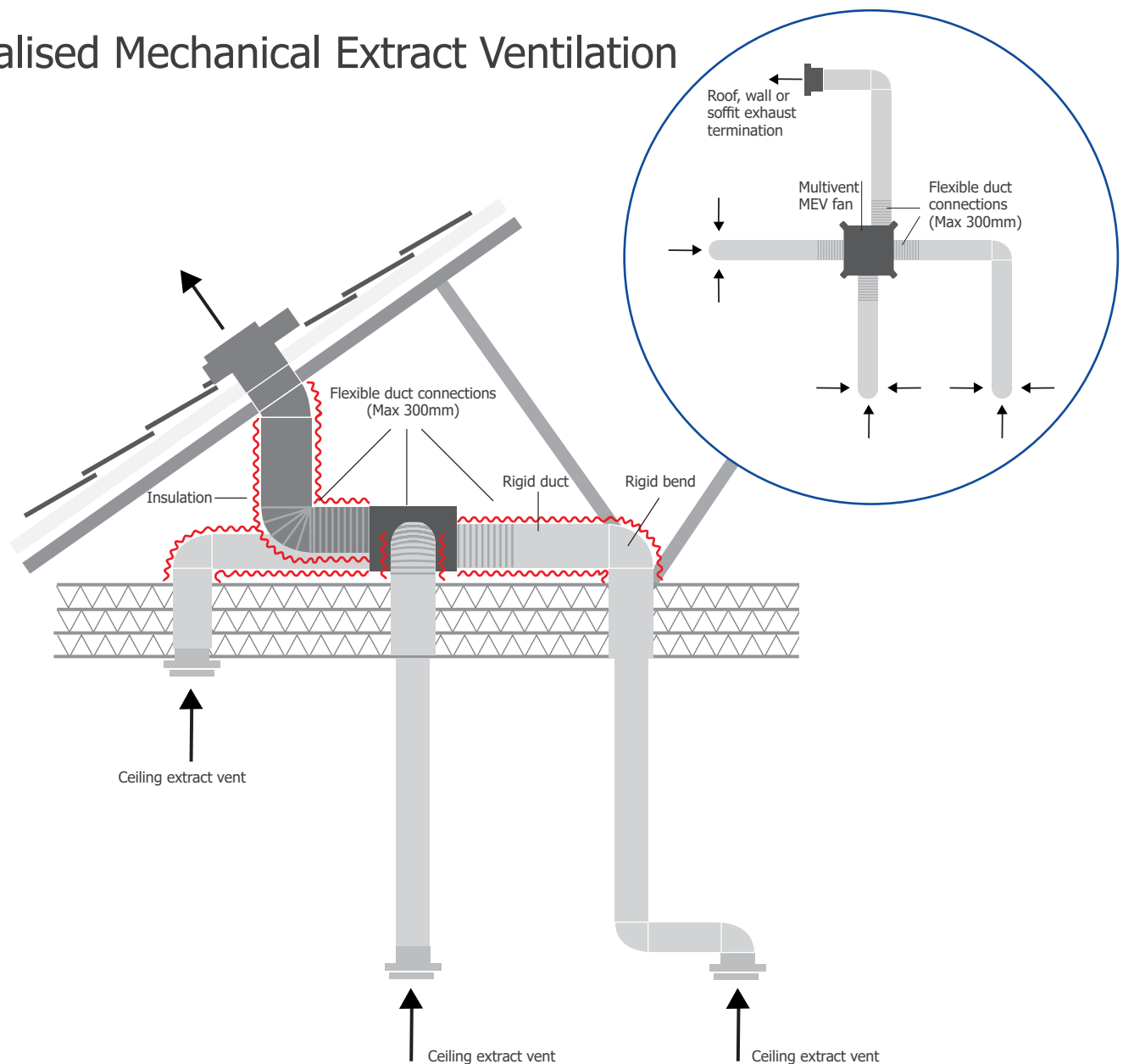
# Mechanical Extract Ventilation (MEV)



- MEV systems are suitable for "All dwellings"- see Paragraph 1.45 and table 1.6 of ADF 1.
- Room terminations should be mounted as high as practical and no more than 400mm below the ceiling.
- Ensure correctly sized background ventilators are fitted in all appropriate rooms in accordance with paragraph 1.64 of ADF1.
- Ducting should be insulated where it passes through unheated area and voids (e.g. loft spaces) with the equivalent of at least 25mm of a material having a thermal conductivity of  $<0.04 \text{ W/(m.K)}$  to reduce the possibility of condensation forming.
- Horizontal ducting should slope downwards away from the MEV unit.
- Connections of rigid ducts should be sealed with a suitable non hardening sealant and mechanically fixed (eg self tapping screws). Duct tape only is not an acceptable method of fixing.
- Rigid ducting should be supported every metre or either side of a joint.
- Flexible ducting should be kept to a minimum, no more than 1.5m in length and ideally used just for final connections.
- Where used flexible ducting should be pulled taught (90% of its maximum length).
- Bends in flexible duct should be sweeping with a radius of at least the duct diameter
- Flexible ducting should be mechanically connected with a worm drive clip and duct tape. The use of cable ties is not an acceptable mechanical fix.
- Ensure flexible ducting is not distorted or squashed.
- Flexible ducting needs to be supported a minimum of every 600mm.
- In vertical ducting a condensate trap should be considered
- Ensure all doors have a suitable undercut, 10mm from finished floor level or 20mm from unfinished floor level.

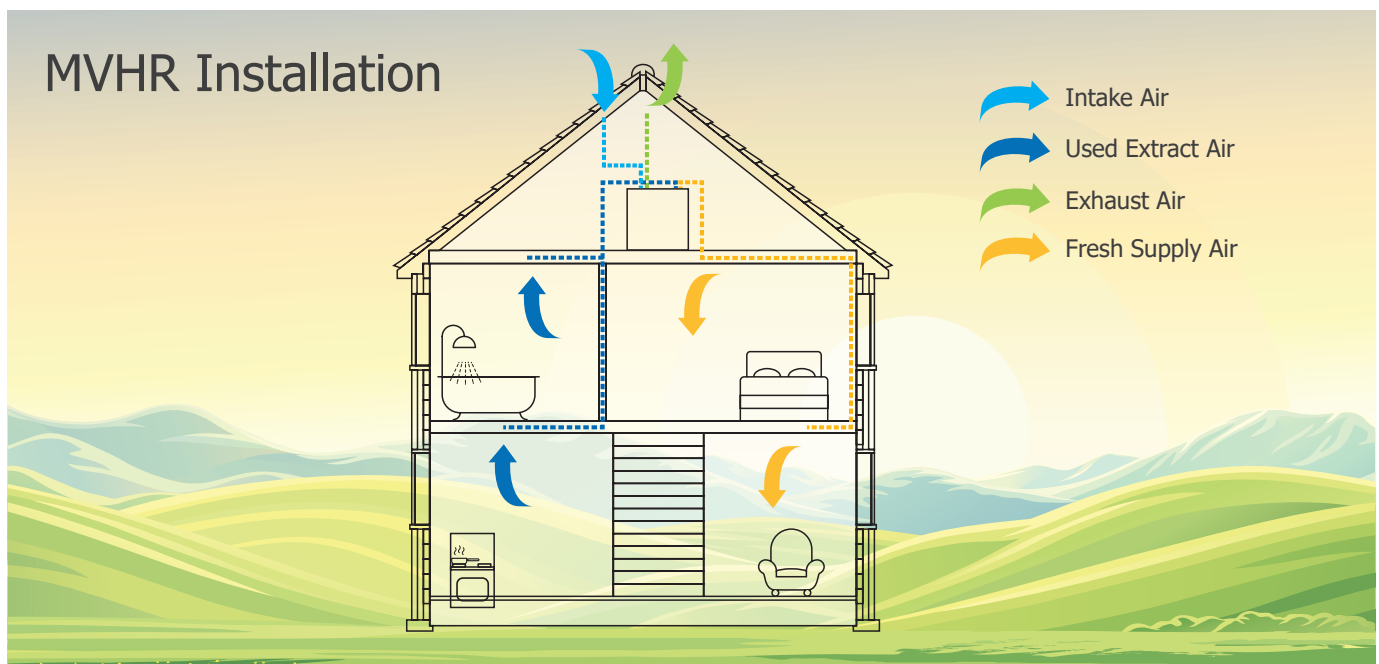


### Centralised Mechanical Extract Ventilation



- Ducting should be insulated where it passes through unheated area and voids (e.g. loft spaces) with the equivalent of at least 25mm of a material having a thermal conductivity of  $<0.04 \text{ W/(m.K)}$  to reduce the possibility of condensation forming.
- Flexible ducting needs to be pulled taught and lengths kept to a minimum, maximum length of 1.5 metres as per building regulations.
- Flexible duct should only be used to connect ceiling valves and the MEV unit to rigid duct.
- Connections of flexible duct need a mechanical fix (tie wrap or clamp) and tape.
- Ensure flexible ducting is not distorted or squashed.
- Rigid ducting should be supported every metre or either side of a joint.
- Horizontal ducting should slope downwards away from the fan.

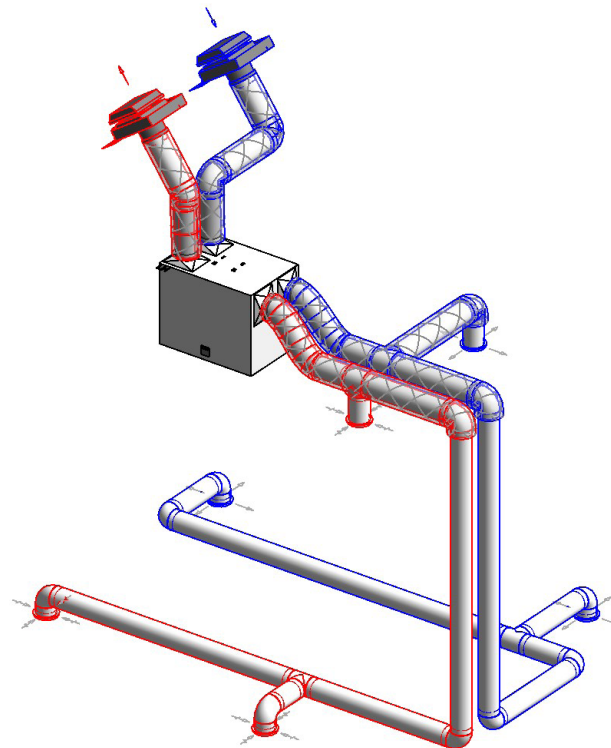
# Mechanical Ventilation with Heat Recovery (MVHR)



- MVHR systems are suitable for "All dwellings" - see Paragraph 1.45 and table 1.6 of ADF 1.
  - MVHR units require a condensate drain. A non-return valve needs to be fitted. The condensate must have a 5° fall and be terminated to an internal waste.
  - MVHR systems do not require background ventilators fitted in any rooms, in accordance with paragraph 1.72 of ADF1. Should any be fitted these must be closed to prevent unintended airpaths.
  - Ducting should be insulated where it passes through unheated area and voids (e.g. loft spaces) with the equivalent of at least 25mm of a material having a thermal conductivity of  $<0.04 \text{ W/(m.K)}$  to reduce the possibility of condensation forming.
  - Ducting carrying air between the unit and atmosphere should always be insulated, with the equivalent of at least 25mm of a material having a thermal conductivity of  $<0.04 \text{ W/(m.K)}$  to reduce the possibility of condensation forming. Acoustic flexible duct should not be used for this.
  - Connections of rigid ducts should be sealed with a suitable non hardening sealant and mechanically fixed (eg self tapping screws). Duct tape only is not an acceptable method of fixing.
  - Rigid ducting should be supported every metre or either side of a joint.
  - Horizontal ducting should slope downwards away from the MVHR unit.
  - Flexible ducting should be kept to a minimum, no more than 1.5m in length, ideally 300mm used just for final connections to the unit and terminals.
  - Where used flexible ducting should be pulled taught (90% of its maximum length).
  - Bends in flexible duct should be sweeping with a radius of at least the duct diameter.
  - Flexible ducting should be mechanically connected with a worm drive clip and duct tape. The use of cable ties is not an acceptable mechanical fix.
  - Ensure flexible ducting is not distorted or squashed and is supported at least every 600mm.
  - In vertical ducting a condensate trap should be considered
  - Ensure the correct valves are used for the room type.
  - National Ventilation recommends a separation of 2m for external terminations, the minimum building regulations separation is 300mm.
  - Ensure all doors have a suitable undercut, 10mm from finished floor level or 20mm from unfinished floor level.
  - Any deviation from designs need to be reported and checked by the system designer before installation.
  - For installation of flat channel or circular ducting, please refer to drawings for individual house types.
- Additional points for Radial Duct Systems;**
- Distribution boxes within an unheated area will need to be wrapped in 25mm insulation.
  - Where self-seal connections are employed these should be securely connected.



## Typical MVHR Duct System

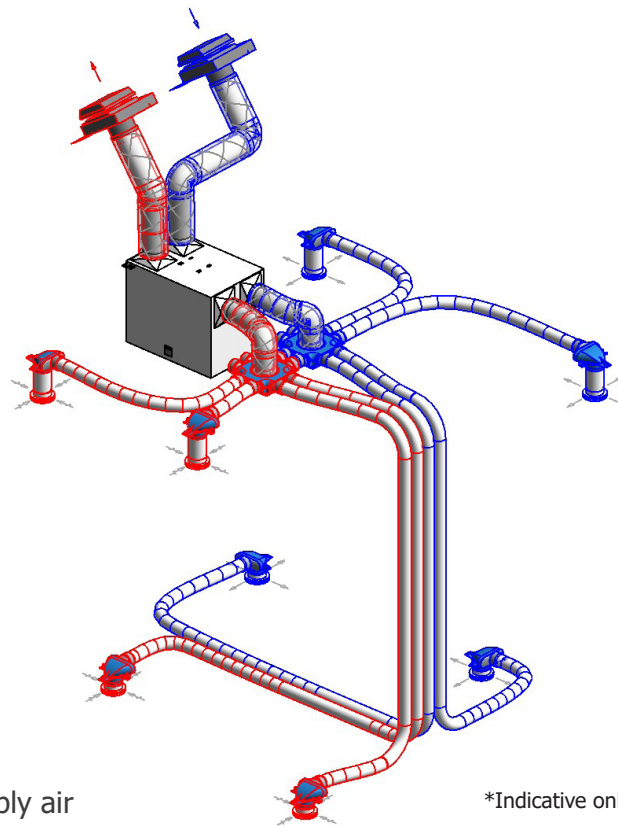


● Extract air ● Supply air

\*Indicative only, please refer to the specific MVHR's F&W

- National Ventilation recommends a separation of 2m for external terminations, the minimum building regulations separation is 300mm.
- Ducting should be insulated where it passes through unheated area and voids (e.g. loft spaces) with the equivalent of at least 25mm of a material having a thermal conductivity of  $<0.04 \text{ W/(m.K)}$  to reduce the possibility of condensation forming.
- Ducting carrying air between the unit and atmosphere always need to be insulated, with the equivalent of at least 25mm of a material having a thermal conductivity of  $<0.04 \text{ W/(m.K)}$  to reduce the possibility of condensation forming. Acoustic flexible duct should not be used for this.
- Flexible ducting needs to be pulled taught and lengths kept to a minimum, maximum length of 1.5 metres as per building regulations.
- Flexible duct should only be used to connect ceiling valves and the MVHR unit to rigid duct.
- Connections of flexible duct need a mechanical fix (tie wrap or clamp) and tape.
- Ensure flexible ducting is not distorted or squashed.
- Rigid ducting should be supported every metre or either side of a joint.
- Horizontal ducting should slope downwards away from the fan.
- Ensure the correct valves are used for the room type
- Any deviation from designs need to be reported and checked by the system designer before installation.
- MVHR units require a condensate drain. A non-return valve needs to be fitted. The condensate must have a  $5^\circ$  fall and be terminated to an internal waste.

## Radial System



- National Ventilation recommends a separation of 2m for external terminations, the minimum building regulations separation is 300mm.
- Ducting should be insulated where it passes through unheated area and voids (e.g. loft spaces) with the equivalent of at least 25mm of a material having a thermal conductivity of  $<0.04 \text{ W/(m.K)}$  to reduce the possibility of condensation forming.
- Distribution boxes within an unheated area will need to be wrapped in 25mm insulation.
- Ducting carrying air between the unit and atmosphere always need to be insulated, with the equivalent of at least 25mm of a material having a thermal conductivity of  $<0.04 \text{ W/(m.K)}$  to reduce the possibility of condensation forming. Acoustic flexible duct should not be used for this.
- Ensure self-seal connections are made using seal ring and clip.
- Flexible ducting needs to be pulled taught and lengths kept to a minimum, maximum length of 1.5 metres as per building regulations.
- Flexible duct should only be used to connect the MVHR unit to rigid duct or the distribution box. Connections of flexible duct need a mechanical fix (tie wrap or clamp) and tape.
- Ensure flexible ducting is not distorted or squashed.
- Rigid ducting should be supported every metre or either side of a joint.
- Horizontal ducting should slope downwards away from the fan.
- Use extract valves for extract rooms only.
- Use supply valves for supply rooms only.
- Any deviation from designs need to be reported and checked by the manufacturer before installation.
- MVHR units require a condensate drain. A non-return valve needs to be fitted. The condensate must have a  $5^\circ$  fall and be terminated to an internal waste.



## Duct Installation - Round rigid and flexible ducting

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### Installation Guidance - Connecting Solid PVC Duct



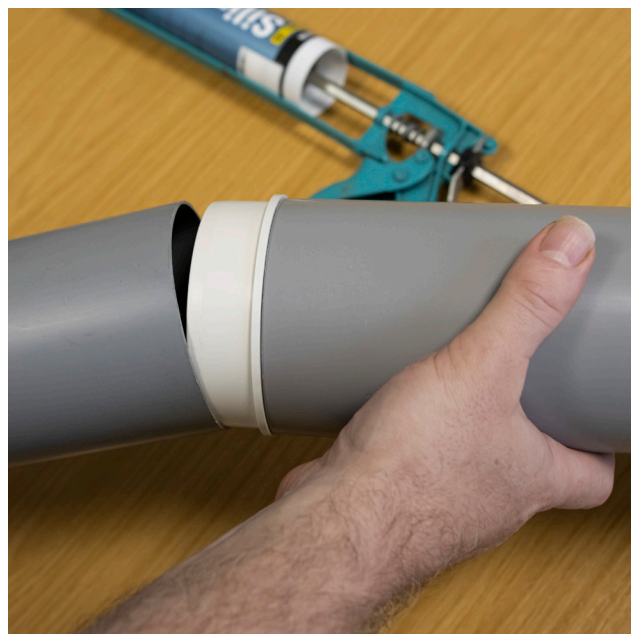
Apply a smooth layer of non hardening sealant/ acrylic around the inside edge.



Carefully push fitting into duct.



Apply a smooth layer of non hardening sealant/ acrylic around the inside edge of the second piece of ducting.



Carefully push the ducting onto the fitting.

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## Installation Guidance - Connecting Solid PVC Duct



Ensure ducting is fully pushed onto fitting.



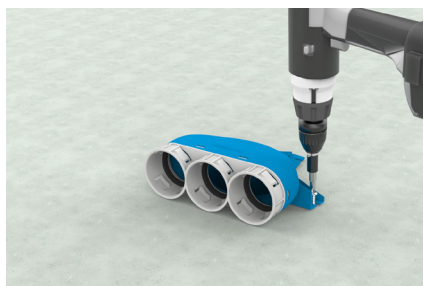
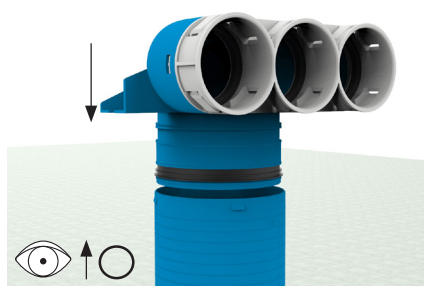
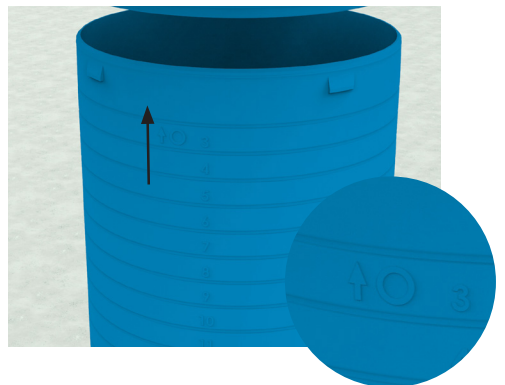
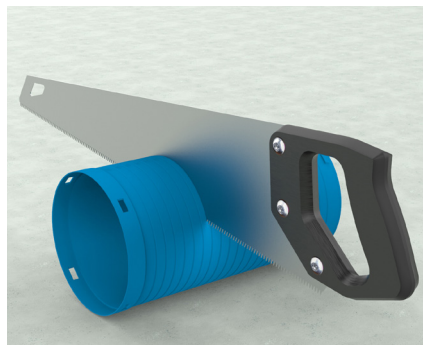
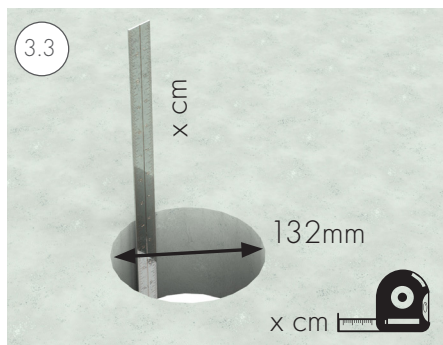
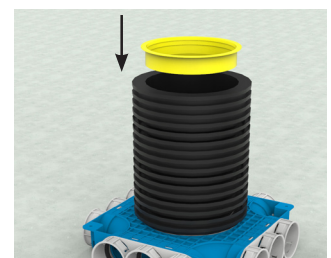
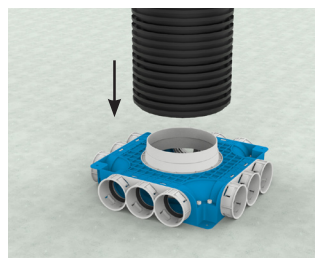
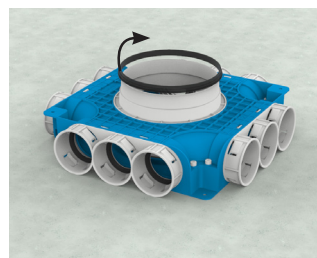
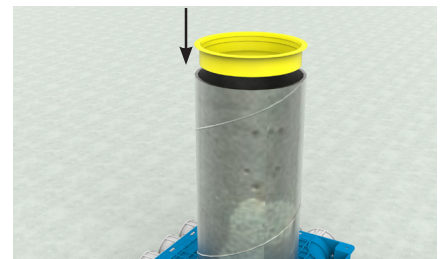
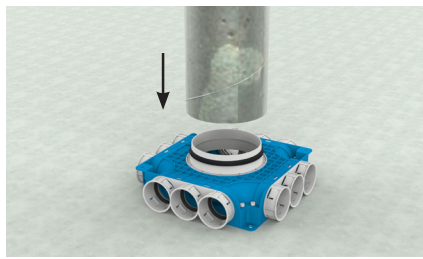
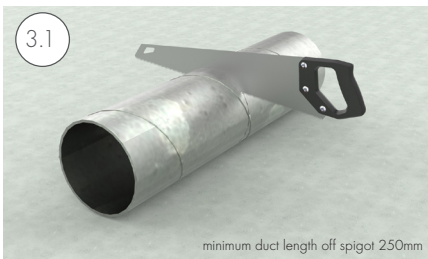
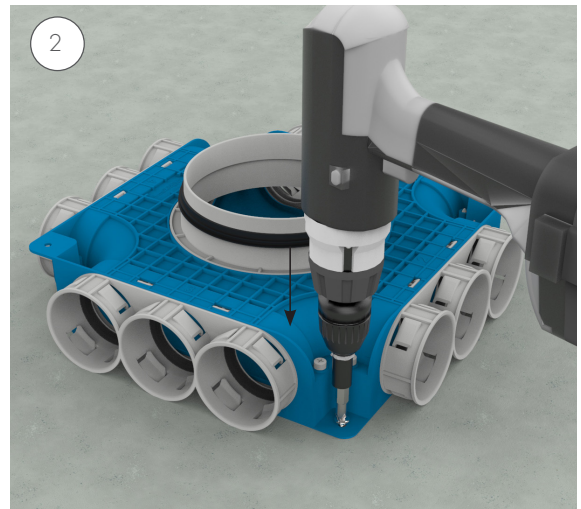
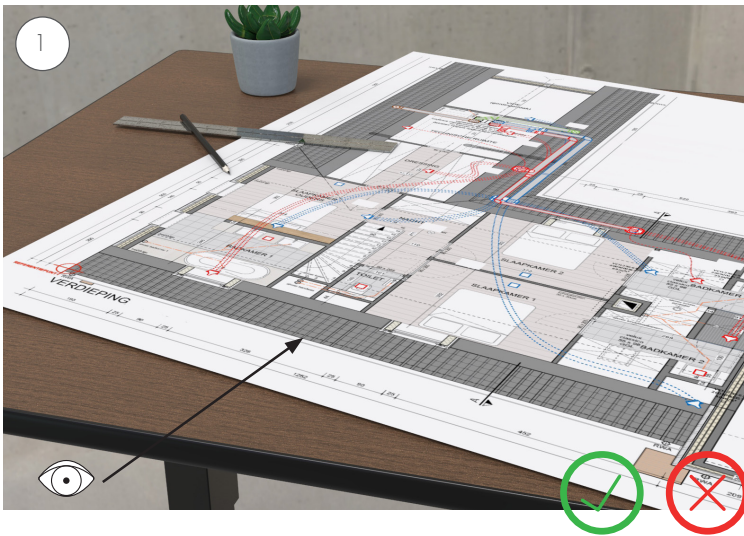
Apply a mechanical fix (i.e. 3-4 self tapping screws), ensure the ducting is not distorted.

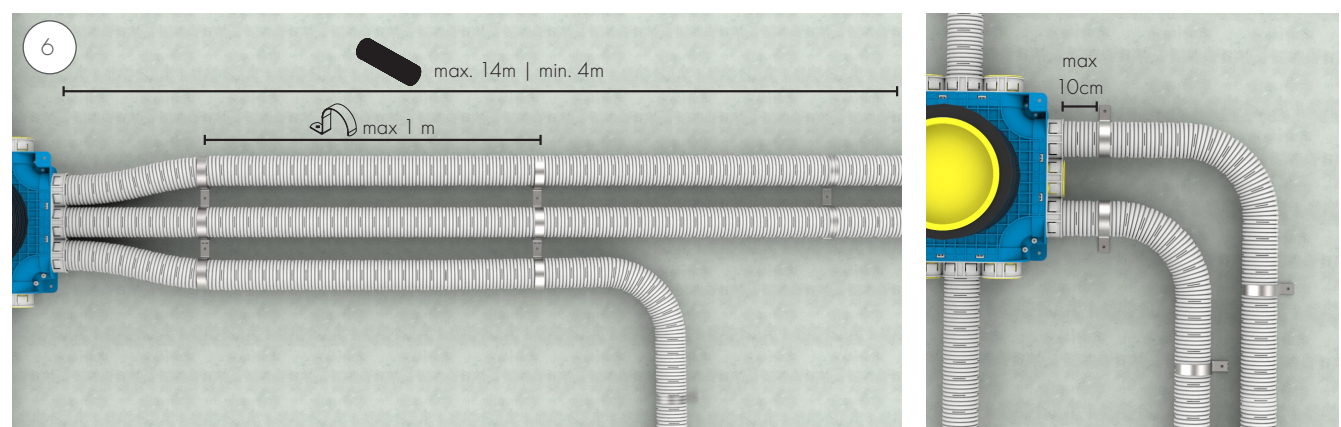
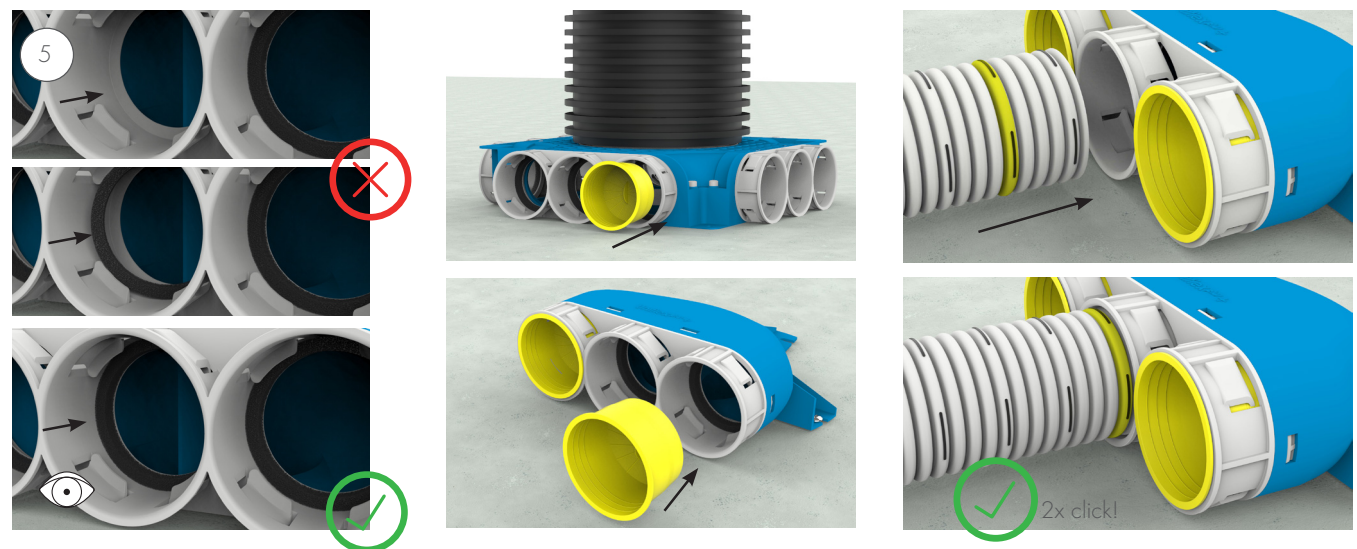
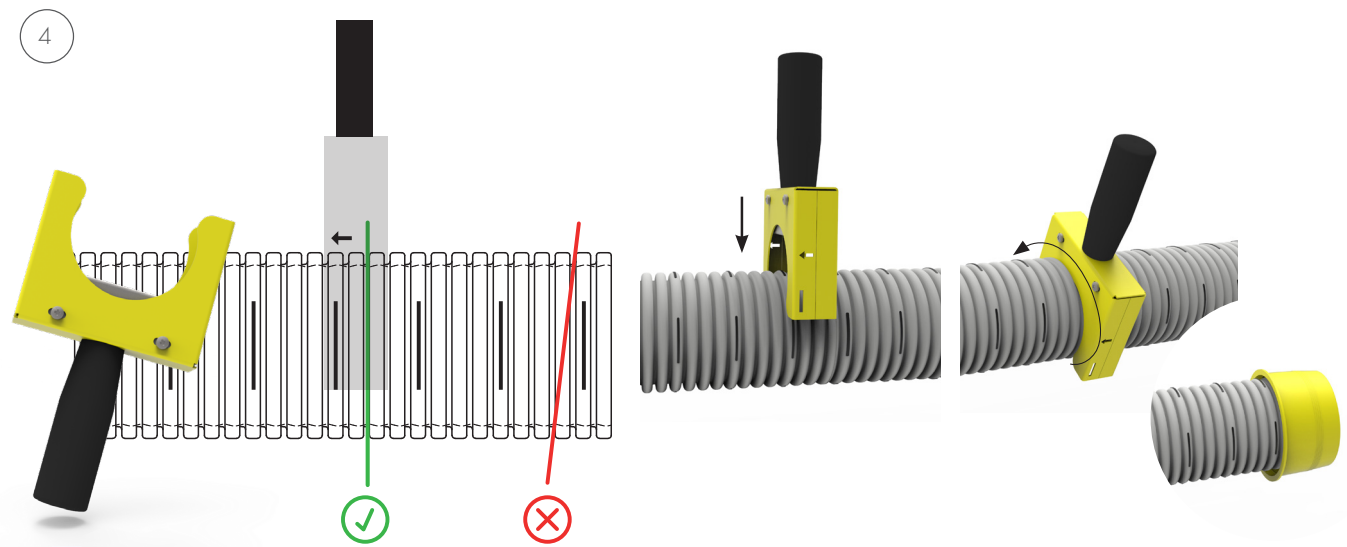


Apply silver aluminium tape to ensure the seal is maintained to help the connection while sealant sets.

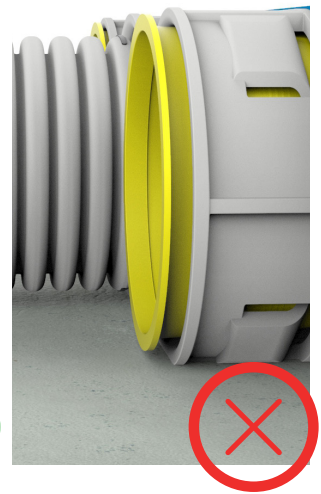
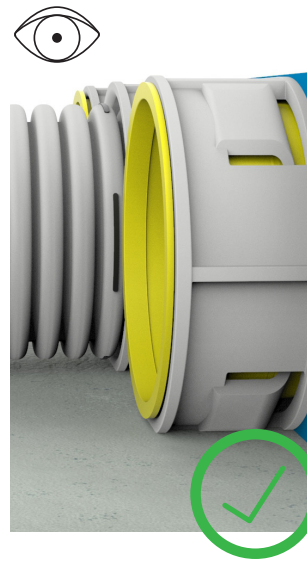
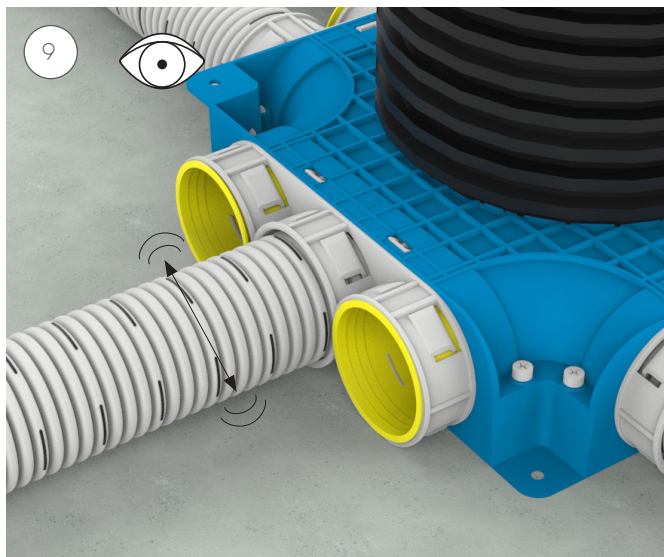
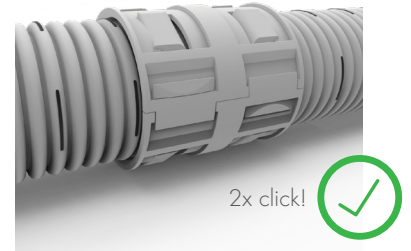
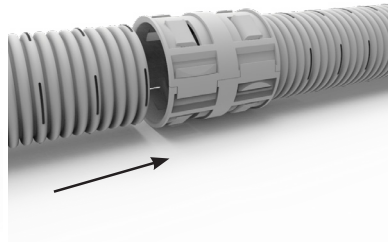
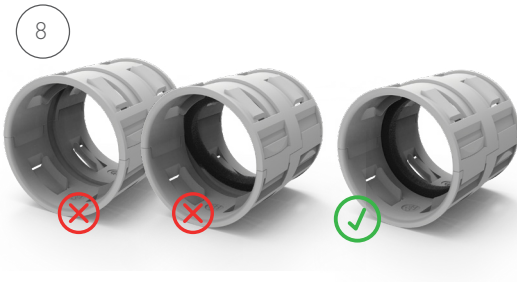
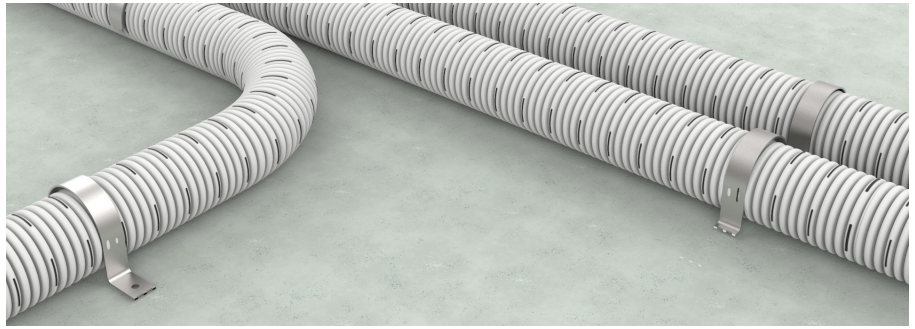
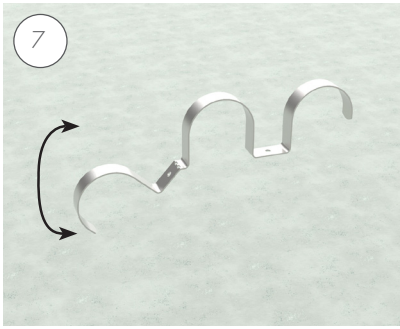


## Ducting Installation - Radial Ducting















## Duct Installation - Round rigid and flexible ducting

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### Installation Guidance - Connecting Flexible/Standard/Acoustic



Carefully slide the flexible duct or inner sleeve over the connector.



Apply a mechanical fixing (worm drive clip or strong tie wrap).



If fixing insulated or acoustic duct, pull the insulation fully over the connection.



Pull the outer sleeve fully over the insulation and inner sleeve. Connect using a mechanical fixing and then tape (Do not use tape only).

## Duct Installation - Rectangular rigid ducting

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### Uninsulated in warm area



Use the specified size and type of duct as indicated on the drawings and seal all joints with a flexible, non-hardening sealant and tech screws.



When crossing ducts & dropping under steels keep the drop downs to a minimum, so as not to impact on the designed air flow.

### First Fix - Ducting Joints



The integrity of the ductwork depends on the successful application of the correct jointing method:

- Rectangular rigid ducting joints should be sealed with non-hardening flexible sealant and secured with a minimum of 1 tech screw on each end & 2 on each long side.



## Duct Installation - Rectangular rigid ducting

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### Unheated spaces



- Ensure duct runs connect to external sleeve & are insulated right up to the internal wall.
- Pull back the insulation in order to undertake the correct joint method as for rigid ducting above.
- Tape must then be used to seal the insulation joint ensuring there are no gaps.
- Ensure insulation is sealed around fire collars

### Ducting support



Strap banding to be used to support ducting at a maximum distance apart of 1.5m, with additional banding near elbows and where applicable to ensure stability.

- Ensure brackets are secured to the slab with suitable fixings to ensure ducting remains tightly in position.
- Do not over tight strap banding in order to maintain correct duct profile.

## Background Ventilators & Intermittent Fans

Commissioning should be completed for all systems and a commissioning certificate filled out for each individual property.

Commissioning should be done using 1 of the following methods:

- A: Use a vane anemometre with proprietary hood calibrated annually by a UKAS accredited calibration centre to a tolerance of  $\pm 5\%$ .
- B: Use a powered anemometre with proprietary hood calibrated annually by a UKAS accredited calibration centre to a tolerance of  $\pm 5\%$ . This method can be referred to as the preferred method.

- Ensure all intended background ventilators and other air transfer devices are open. These should be left open at all times.
- Ensure all internal doors and all windows are closed including the rooms where measurements are being carried out.
- Use an anemometre to measure the airflow of each individual fan, recording the measurements in l/s on the commissioning certificate. Use Approved document F Table 1.1 (see below) or the designs to ensure the required airflow measurements are met.



Vane Anemometre



Powered Anemometre

**1.1 - MINIMUM EXTRACT VENTILATION RATES FOR INTERMITTENT EXTRACT SYSTEMS**

Room	Minimum Intermittent Extract Rate
Kitchen (Cooker hood extracting to the outside)	30l/s
Kitchen (No cooker hood or cooker hood does not extract to the outside)	60l/s
Utility Room	30l/s
Bathroom	15l/s
Sanitary Accommodation	6l/s

Guidance from NHBC Building Regulations Guidance Note G272a 10/13 and BSRIA 'A Guide to Measuring air flow rates' document BG46/2022 can be used for intermittent axial fans for a minimum bench mark , please see below table

If the fan performance exceeds the minimum benchmark value indicated in Table 1.2 below, it would be reasonable for Building Control Bodies to assume that the fan is performing to the required level and accept the test results as showing compliance with Part F of the Building Regulations.

**1.2 - TABLE OF FAN RATING PERFORMANCE**

Fan Rating	Minimum Benchmark Performance
15l/s	12l/s
30l/s	24l/s
60l/s	35l/s

### Continuous Mechanical Extract Ventilation



- Ensure all intended background ventilators (if any) and other air transfer devices are open. These should be left open at all times.
- Ensure all internal doors and all windows are closed including the rooms where measurements are being carried out.

For individual room fans:

- Use an anemometre to firstly measure the airflow of each individual fan on the high speed (Boost), recording the measurements in l/s on the commissioning certificate. Then measure the airflow of each individual room fan on the low setting (Trickle). Check with airflow tables on the designs to ensure the required airflow measurements are met.
- Ensure all controls operate correctly.

For Centralised units:

The following guidance may be followed depending on the system fitted, also refer to manufacturers instructions.

Adjustable terminals with a fixed (stepped) speed fan.

- The fan speed should be set to achieve the desired boost flow rate first.
- Open all terminals. The index terminal (the one furthest away) should be set to fully open.
- All other terminals are adjusted to achieve the required flow rate.

- If the correct flow rates cannot be achieved at all terminals the fan speed should be increased.
- If all the terminals have been closed significantly then the fan speed should be reduced and the terminals rebalanced.
- Once the boost airflow rates have been achieved lock off the valves.
- For the trickle (Continuous low rate) measure the airflows and adjust the unit only to achieve the required flow rates. The valves should not be adjusted.

Adjustable terminals controllable speed fan.

- The fan speed should be set approximately to achieve the desired continuous flow rate. Open all the terminals ensuring the index terminal (the one furthest away) is set to fully open.
- All other terminals are adjusted to achieve the required flow rate on boost.
- If the index terminal has to be closed to achieve the correct flow rates then reduce the fan speed and rebalance the terminals.
- Once the boost airflow rates have been achieved lock off the valves.
- For the trickle (Continuous low rate) measure the airflows and adjust the unit only to achieve the required flow rates. The valves should not be adjusted.
- Measure the power consumption of the unit and record on the commissioning certificate.
- Ensure all controls operate correctly.



## Mechanical Ventilation With Heat Recovery

Ensure all internal doors and all windows are closed including the rooms where measurements are being carried out.

Note: Background ventilators (trickle vents) are not required for MVHR systems.

Follow the guidance for System 3 centralised units ensuring the below process for the order of commissioning is followed:

1. Extract Boost
2. Supply trickle
3. Supply Boost
4. Extract trickle



If the unit is a constant flow (constant volume) unit, follow the guidance below.

Adjustable terminals with a fixed volume flow fan.

- The fan speed should be set to achieve the desired high flow rate.
- Open all terminals ensuring the index terminal (the one furthest away) is set to fully open.
- All other terminals are adjusted to achieve the required flow rate.
- Adjustment of terminals achieves balancing only.
- The total flow rate is governed by the fan control setting.
- Care should be taken to ensure the terminals are not closed too much as this will only make the fan work harder as it maintains the constant volumetric flow rate.
- Set the airflow rate on the unit to the required low rate. The terminals shall not be adjusted.
- Record all airflows on the commissioning sheet.
- Once units are fully set up and commissioned ensure all controls operate correctly and record the power consumption.

### 1.3 - MINIMUM EXTRACT VENTILATION RATES FOR CONTINUOUS EXTRACT MEV & MVHR SYSTEMS

Room	Minimum High Rate	Continuous Rate
Kitchen	13l/s	The sum of all extract ventilation in the dwelling on its continuous rate should be at least the whole dwelling ventilation rate given in Table 1.4
Utility Room	8l/s	
Bathroom	8l/s	
Sanitary Accommodation	6l/s	

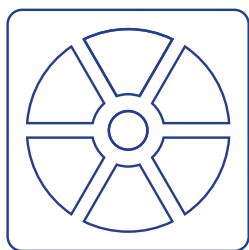
Note: If the continuous rate of ventilation provided in a room is equal to or higher than the minimum high rate specified in the table, no extra ventilation is needed.

For current 2023 Scottish Building Regulations please refer to the number of habitable rooms rather than bedrooms in the below table:

### 1.4 - MINIMUM WHOLE DWELLING VENTILATION RATES DETERMINED BY THE NUMBER OF BEDROOMS OR FLOOR AREA WHICHEVER GIVES THE GREATER RESULT

Number of bedrooms	Minimum ventilation rate by number of bedrooms	By Floor Area
1	19	0.3l/s per m <sup>2</sup> of floor area
2	25	
3	31	
4	37	
5	43	

Notes: 1. If the dwelling only has one habitable room, a minimum ventilation rate of 13l/s should be used.  
2. For each additional bedroom, add 6l/s to the values in Table 1.4.



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