

MVHR design

Craig Brooke





Independent Heat Recovery
Ventilation Specialists

A guide to incorporating a Mechanical Ventilation System with Heat Recovery into your project

Craig Brooke
Design Manager

Relax!

ADM have all your heat recovery
ventilation needs covered!

Design | Supply | Installation | Service | Spares

www.admsystems.co.uk



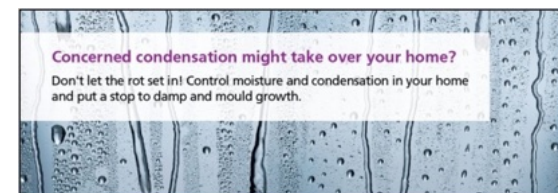
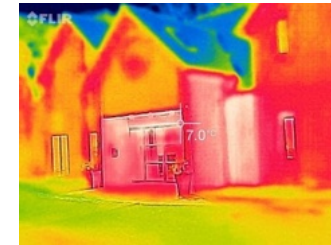
Who are ADM Systems?

- One of the pioneers in heat recovery ventilation - core competence since the early 1990s
- Completely independent not limited to any one manufacturers product range
- Select from a range of SAP Appendix Q products including *Passive House* approved
- Services include full CAD design, supply, installation, technical support commissioning and balancing and maintenance
- Network of UK based NIC/EIC accredited ventilation installers



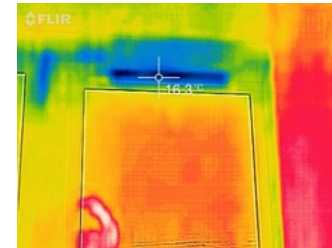
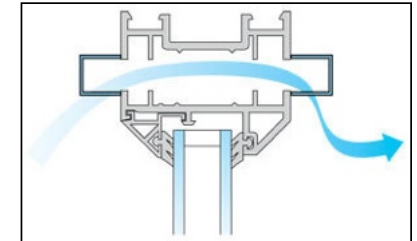
Why ventilate?

- Pre-Covid in an airtight house up to **30% to 40% of total heat loss** can be contributed by uncontrolled ventilation
- It's a requirement of Part F and Part L of the Building Regulations for England & Wales, or Scottish Domestic Technical Handbook Section 3.14
- Indoor air quality, condensation control (we spend around 90% of our time indoors)
- Normally required in a Passive House due to the level of airtightness being achieved



Why extract only is not the best approach in Low Energy Homes

- Extract fans and Central Extraction approaches all require **trickle vents in windows** X
- Cold draughts make us feel less comfortable (wind chill) X
- Tendency is to turn up heating to compensate X
- Uncontrolled ventilation = uncontrolled heat loss X
- Extract only will compromise the low energy home key components X
- Extract only homes proven to have poorer air quality X

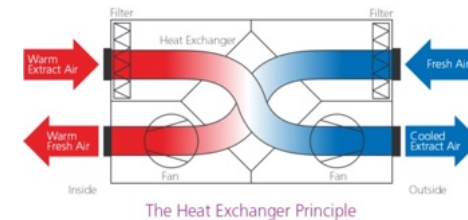
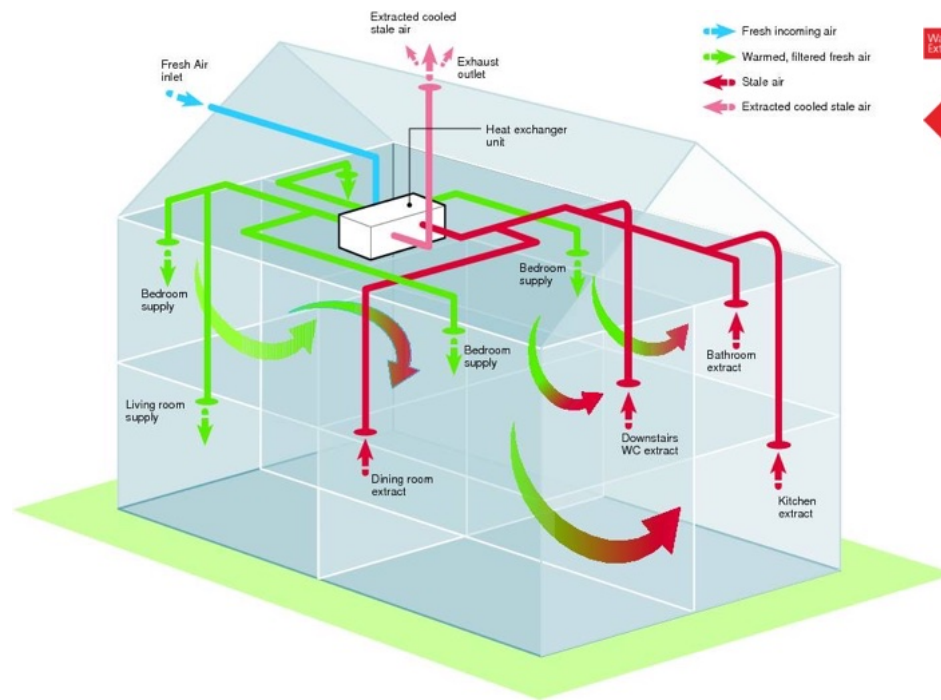


What is MVHR?

- NOT a heating system, but compliments heating system by considerably reducing heat losses. ✓
- NOT an air conditioning system! Has a bypass function to aid with potential overheating. Some products are available to offer tempering of air. ✓
- A balanced and controlled system providing background ventilation throughout the property ✓
- Supplies a constant supply of filtered fresh air and extracts the stale air within your property ✓
- Recovers most of the heat you generate within your home which lowers energy costs ✓
- **No Requirement for Trickle Ventilators or additional fans ✓**



How does MVHR work?



Uses heat from “warm areas” of the building, and transfers this to other areas. Warm areas can be “wet rooms”, but also South facing rooms, double height areas, wood burning stove

In the summer months a bypass system allows fresh, filtered air to be introduced without being heated by the heat exchanger.



Purge Ventilation



MVHR Provides background Ventilation

Purge Ventilation required in Building regulations in addition to background MVHR system not instead of

Purge rate of 4 air changes per hour primarily used to aid with overheating and is usually achieved with natural openings, doors/windows

Purge allowed and encouraged even in Passive House/Low Energy Homes



What happens in Summer - Overheating

Mitigate First

Energy efficient design

Orientation, Fenestration, Shading.

Insulation and Air Tightness

Natural Purge Ventilation



Applying Solutions to Mitigate Overheating in Homes
Whitepaper

zehnder
always the
best climate

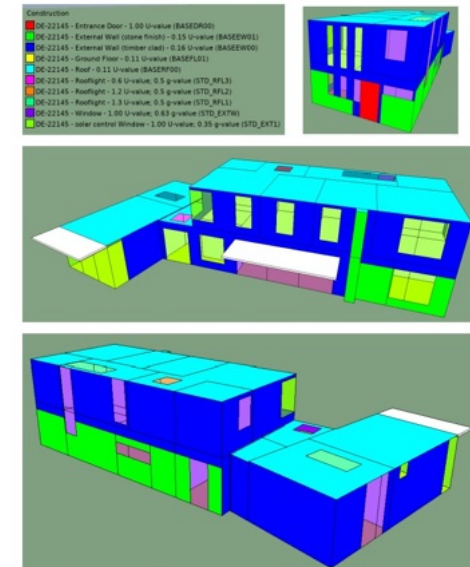
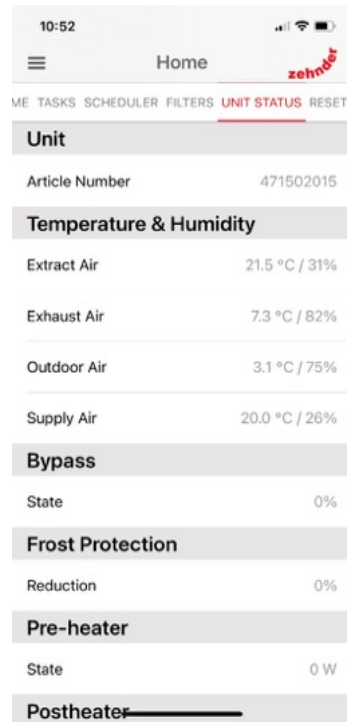


Figure 8: IES Model showing Fabric Specification



MVHR effect vs Extract only effect

MVHR House in Northumberland



10:52 Home zehnder

ME TASKS SCHEDULER FILTERS UNIT STATUS RESET

Unit	
Article Number	471502015
Temperature & Humidity	
Extract Air	21.5 °C / 31%
Exhaust Air	7.3 °C / 82%
Outdoor Air	3.1 °C / 75%
Supply Air	20.0 °C / 26%
Bypass	
State	0%
Frost Protection	
Reduction	0%
Pre-heater	
State	0 W
Postheater	

Non MVHR House Northumberland



10:51 Menu BBC WEATHER a moment ago Warnings issued

Newbiggin-by-the-Sea Today 07:55 16:46

11:00	12:00	13:00	14:00	15:00
3°	3°	3°	3°	3°
98%	96%	95%	95%	94%
22	20	19	18	17

Today Thu Fri Sa

4° 3°	6° 5°	6° 4°	
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MVHR: Design Considerations

- Summary of Design **INPUTS**

- Geographic location i.e. Building Regulations that are to apply
- Floor area and building volume
- Air permeability (air tightness of building – normally on SAP calculation)
- Construction type (traditional block/brick, SIPS, ICF, timber frame etc.)
- Building layout (vaulted areas, joist type, glazing/solar gain)
- Unit location (maintenance/access)
- Control strategy (integral humidity sensors, remote/wired manual controls)
- System integration (app control, Building Management Systems, wood burning stoves, cooker hood type, internal door undercut)
- External terminal considerations i.e. north-facing air intake, planning restrictions etc

- Summary of Design **OUTPUTS**

- Unit(s) specification
- Ducting routes and types including any sound attenuation requirements
- Building air changes per hour
- Individual room airflow rates highlighting air changes per hour
- Power consumption (dictates running costs)
- Filter replacement cost and future maintenance costs



MVHR: Selecting the unit(s)

Units – suitability, air flow performance, cost, thermal efficiency, power consumption, control options, user friendliness, durability, consumables



Location of MVHR units



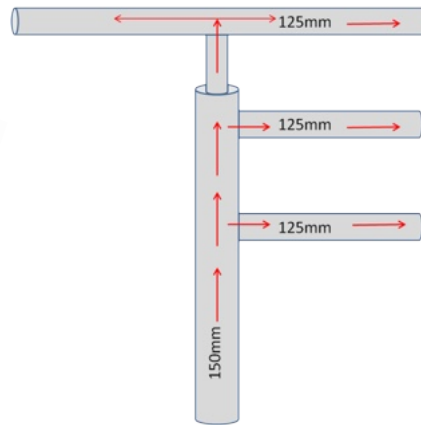
Location of MVHR units (continued)



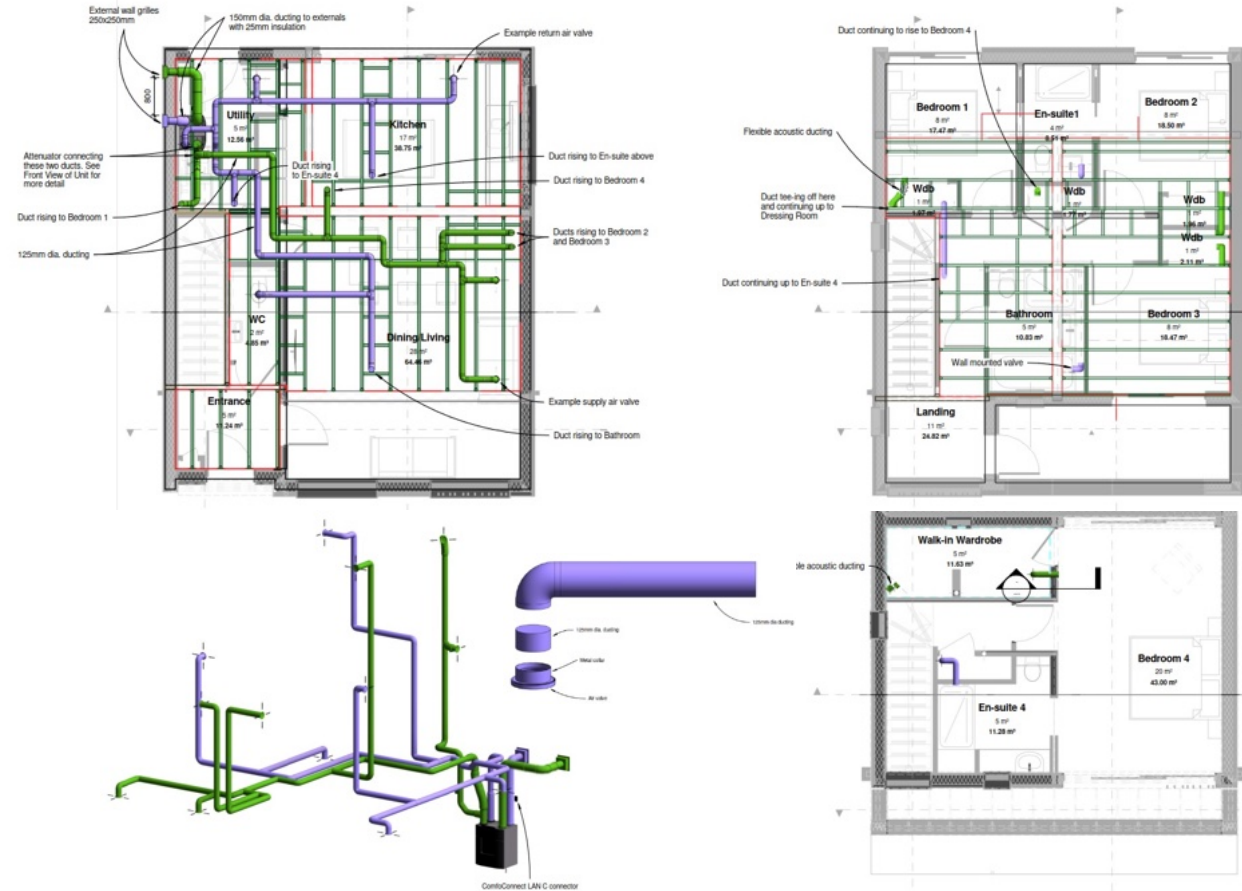
MVHR: Selecting the ducting

Branched system arrangement

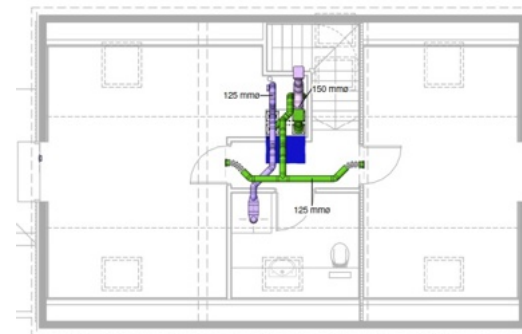
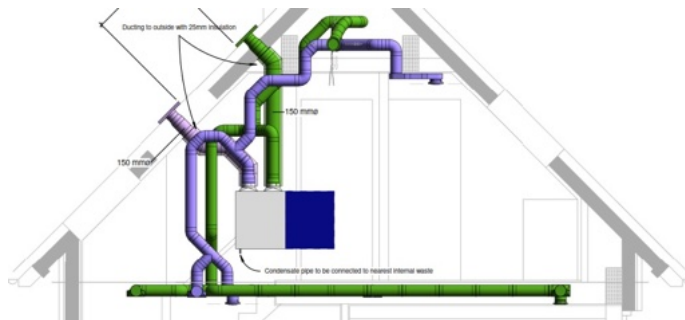
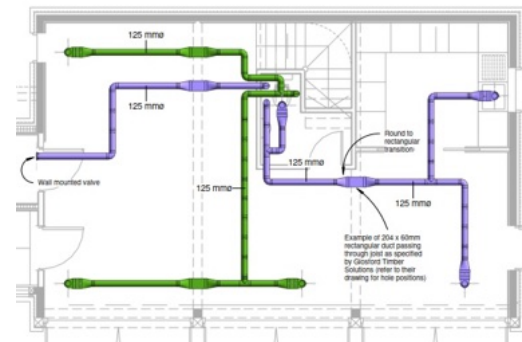
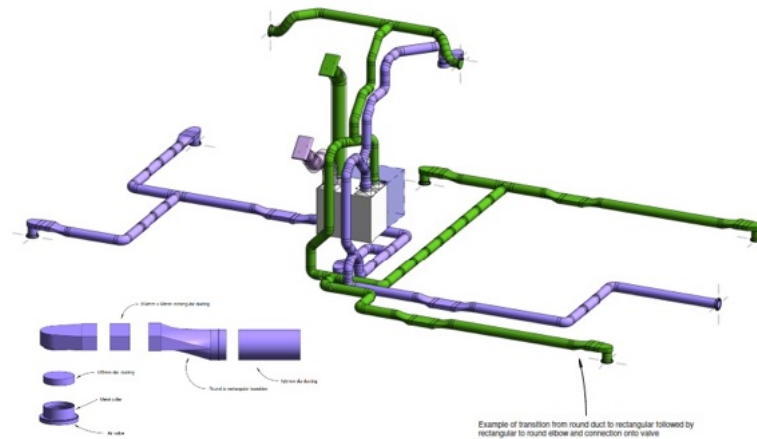
Smooth-bore improves air flows, most have push-fit connections, available in 200mm, 180mm, 150mm, and 125mm diameter, also in rectangular 220mm x 90mm or 204mm x 60mm (for limited void spaces).



MVHR: Design layout branch ducting



MVHR: Design layout branch ducting



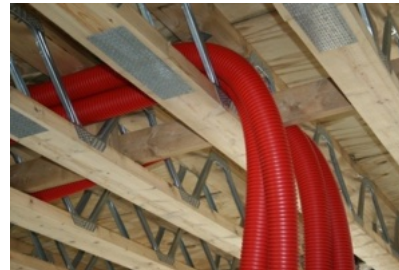
MVHR: Examples of ducting - uninsulated



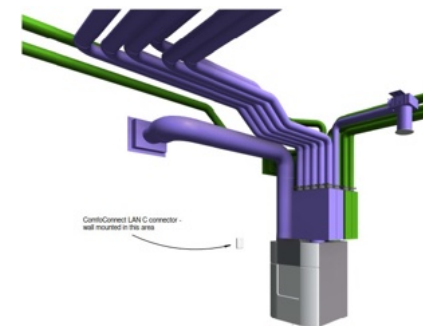
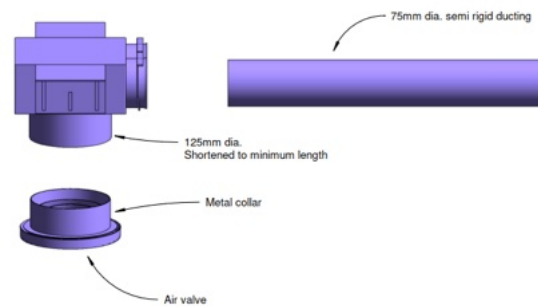
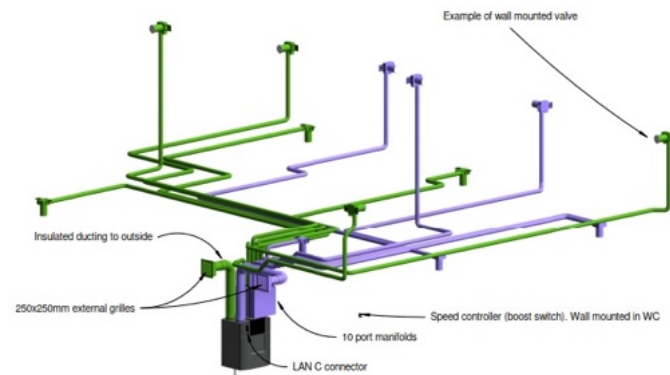
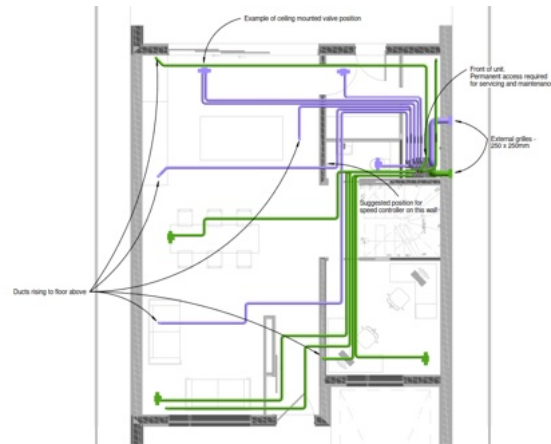
MVHR: Radial Semi-Rigid Ducting

(90mm diameter o/d)

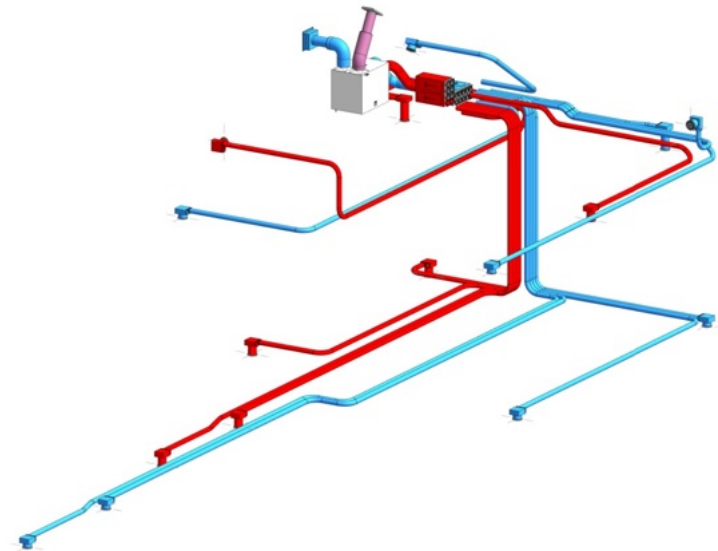
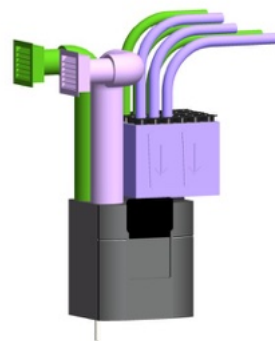
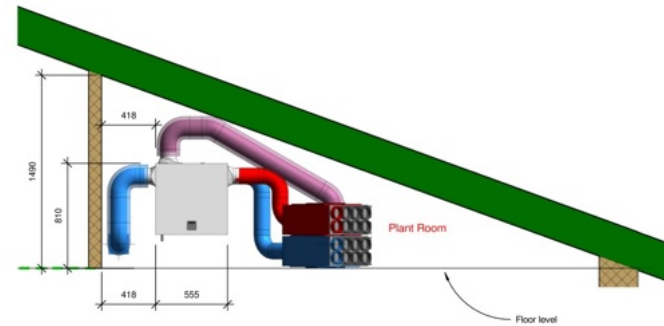
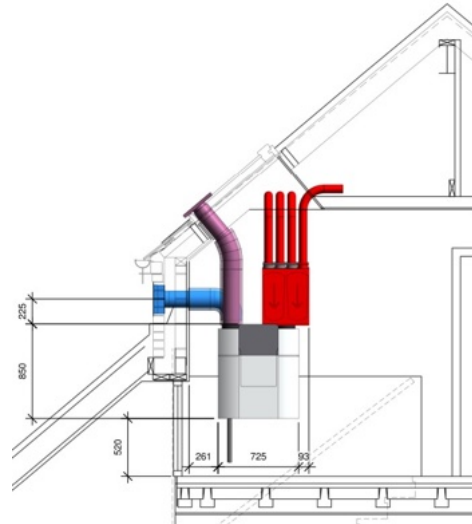
Smooth-bore improves air flow, anti-static lining, ideal for Pozi Joists, Eco-Joists and engineered timber, perfect for limited void spaces and renovation projects. Can be quicker to install than branched eliminates “cross-talk” between rooms, rubber seal on joints ensures airtightness. Use in conjunction with multiple port distribution manifolds for air distribution – can use two manifolds to increase number of ports. Anyone can install.



MVHR: Design layout radial ducting



MVHR: Design layout radial ducting

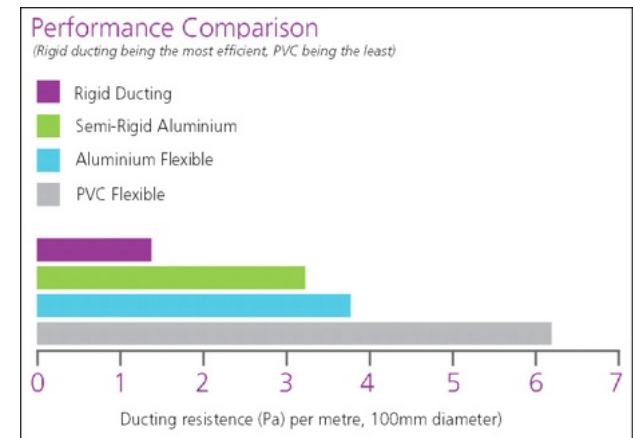


MVHR: Further examples of radial ducting installed



MVHR: Ducting to be avoided!

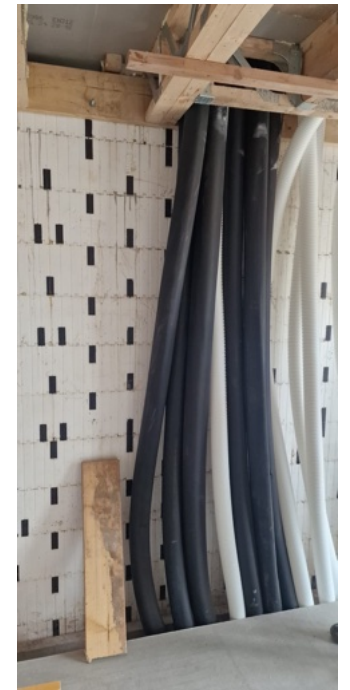
The ventilation industry strongly advises against the overuse of flexible ducting, this is mainly because of its high air resistance (especially when kinked or restricted). Not only is it easily punctured or crushed but it will also lower the efficiency of any heat recovery unit. Very short sections may be unavoidable, guidance offered in the Building Regulations must always be followed. Flexible acoustic attenuation may be utilised where appropriate.



MVHR: Selecting the correct components

Thermal ducting options

- Any ductwork running in 'cold unheated areas' must be insulated
- Supply air ducting should also be insulated to take maximum advantage of summer bypass mode or if any air tempering devices are used
- Applies to both branch and radial systems
- A Building Regulation requirement to external ducting runs



MVHR: Selecting the correct components

Thermal ducting options



Fully insulated radial duct system with manifolds remaining to be lagged so that all duct connections can be inspected to ensure all clips and seals fitted



MVHR: Selecting the correct components

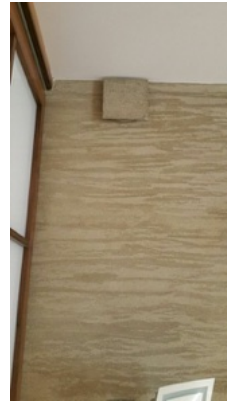
Sound attenuation – User comfort also avoid being a nuisance to your neighbours



MVHR: Ancillary Options

Internal diffusers

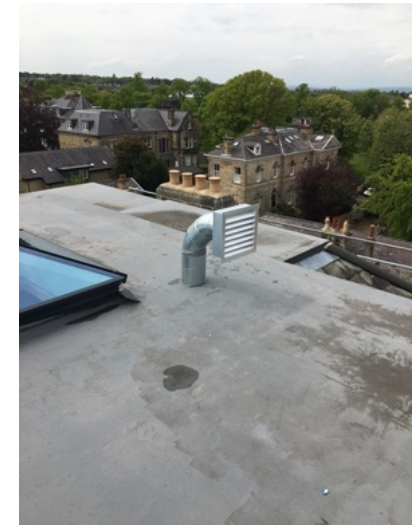
Suitability, aesthetics, system performance



MVHR: Ancillary Options

External terminals – roof (normally exhaust only)

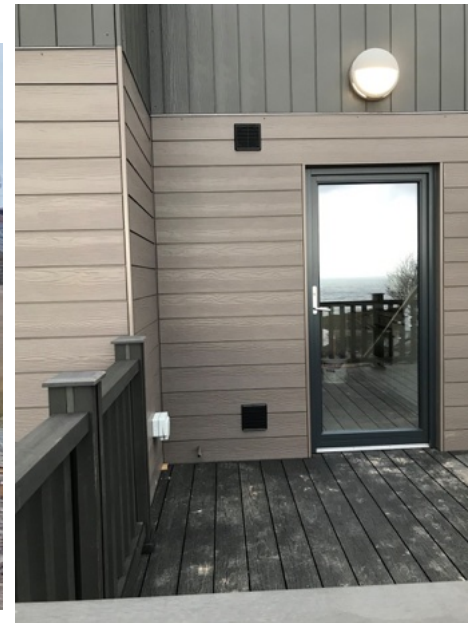
Suitability, aesthetics, system performance



MVHR: Ancillary Options

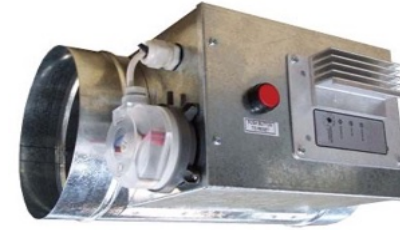
External terminals (Wall vents both intake and exhaust)

Suitability, aesthetics, system performance



MVHR: Pre/Post Heating

- Tempers the fresh air going into the MVHR machine in winter to prevent frost protection system shut down
- Also available as an integral preheater option
- Standard specification in Passive House projects
- Air entering MVHR system should not be below 0 °C to ensure condensate discharge and heat exchanger will not freeze up
- Minimum desirable domestic supply air temperature 16.5 °C



MVHR: Pre/Post Heating (in-duct) - examples

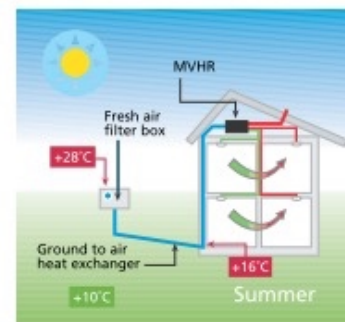
Electric



Water



MVHR: Cooling/air tempering (not air conditioning)



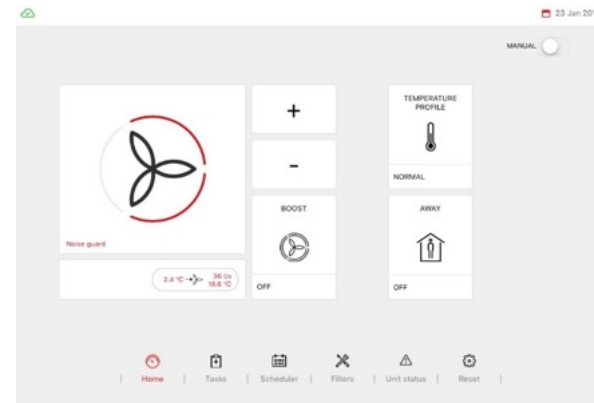
MVHR: Control Strategy

Integral humidistat, manual boost switching (auto revert to normal speed after set time), remote controller/programmer, PIR sensor, CO₂ sensor, app control, summer bypass settings, temperature profiles.



MVHR: System Integration

App control, Building Management Systems, cooker hood specification, wood burners, valve positions (for cleaning and avoiding smoke alarms etc), condensate requirements



MVHR: Fire stopping internal and external penetrations

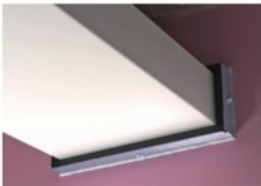


Fire collar fitted to wall



Fire collar fitted to ceiling/floor

Images courtesy of Qualifire



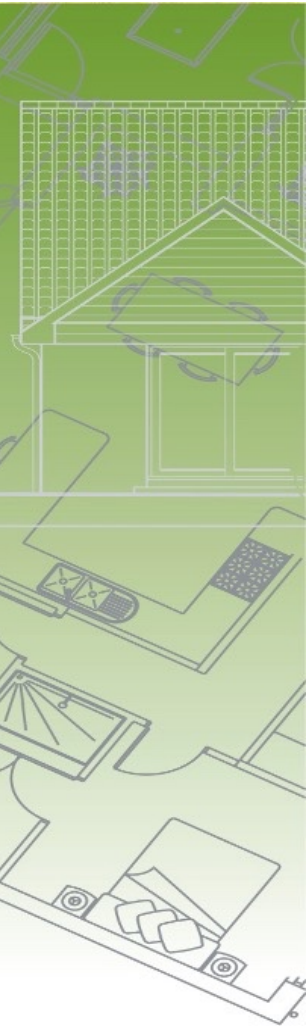
Images courtesy of Qualifire



Fire rated supply and return air valves



Fire rated return air valve with fusible link



SUMMARY: Key MVHR considerations prior to starting your project

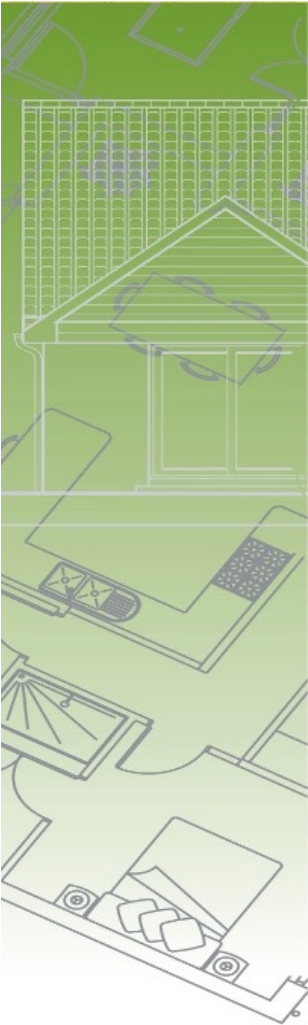
- Think about a system as early as possible
- Consider the unit location
- Know the rules and be compliant!
- Strive for airtightness and energy efficiency
- Choose your component and system supplier carefully by considering the following:
 - Are they experienced in MVHR?
 - Do they offer NICIEC/BPEC accredited installation?
 - Are they biased?
 - Can they offer you full support?
 - Do they work closely with your appointed consultants and trades?



MVHR: Servicing



New Build Project in Perthshire





Project in Perthshire

Construction Type was SIPS

Floor area 120m²

Achieved an airtightness of 0.7 m³/(h.m²)@50pa

All electric

Heat Pump

Solar Panels

Back up immersion heater for boosting of hot water

Wood Burner for supplementary heat when required

MVHR system installed

**Average monthly consumption 302kwh ca. £82 per month
based on average February 2024 electricity prices. Home
working so occupied permanently**

Battery to be installed which will reduce consumption





Thank you for listening

Craig Brooke

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