adm systems
Independent Heat Recovery
Ventilation Specialists

MVHR design

Brian Singleton

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ADM SYSTEMS

MVHR Expert

Brian is a senior engineer with ADM Systems who were pioneers in MVHR in the early 90s. He has been with the business almost from inception and is also a BPEC and NICEIC accredited engineer who regularly helps with the design specification and commissioning of installed systems. Materialising self-builders' dreams is what drives Brian.

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Building Airtight? Ventilate Right

The Importance of MVHR

Brian Singleton
ADM Systems

Relax!

ADM have all your heat recovery ventilation needs covered!

Design | Supply | Installation | Service | Spares

www.admsystems.co.uk

Introduction

- Who are ADM Systems
- Ventilation Options
- Mechanical Ventilation with Heat Recovery (MVHR / Heat Recovery Ventilation)
- Design Considerations
- Practical installation process

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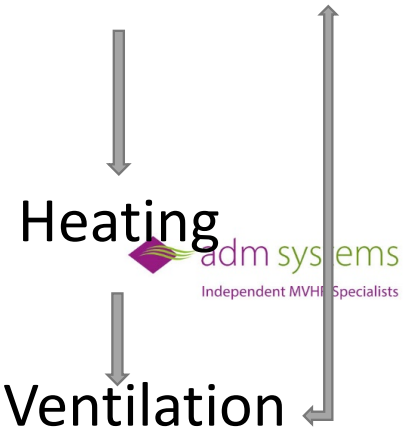
Who are ADM Systems?

- 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

Key components when considering the thermal strategy for your build

Fabric First, Insulation, Air Tightness 10 v 0.6



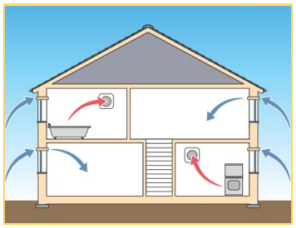
Why is ventilation a key consideration in the thermal strategy of a house?

- In an airtight house up to **35% of total heat loss** can be contributed by 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 and Condensation Control (we spend 90% of our time indoors)

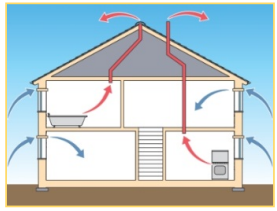
Your Non MVHR Ventilation Options

Extract Only Options 2022 Regulations

Opening windows
Does not satisfy Building Regulations (Summer Purge only)

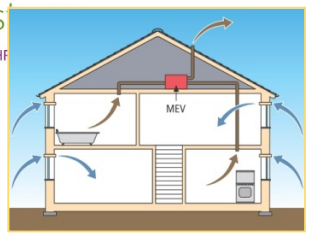


Intermittent Extract fans and trickle ventilators.
Only suitable for less airtight properties



Passive Stack (PSV)
Part F Building Regulations

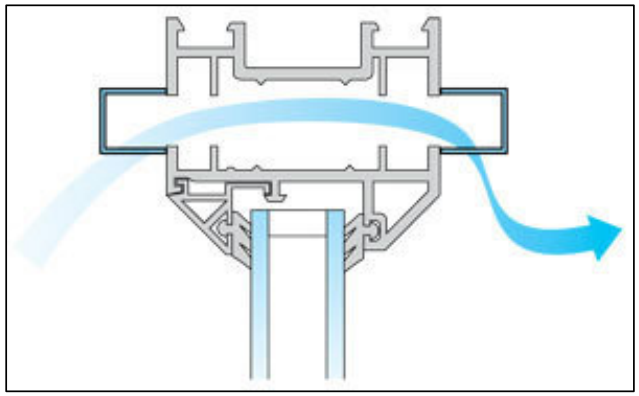
Removed from New Regs 6/22



Continuous Extract (MEV or dMEV) and trickle ventilators

Extract Only Options

- Extract fans Passive Stack and Central Extraction approaches all require **trickle vents in windows**
- Cold draughts make us feel less comfortable (wind chill)
- Tendency is to turn up heating to compensate



Trickle Ventilation Requirements for Ventilation Strategy using Extraction only

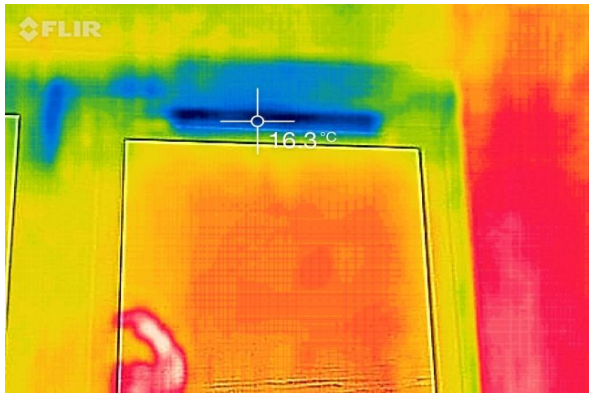
- Based on 200m² Property with 4 Beds Lounge Study and Dining,
- Section 3.14 Scottish Regulations 124,000 mm² overall
- Part F England and Wales 92,000mm² overall Intermittent Fans
- Part F England and Wales 32,000mm2 overall Continuous Fans

Letterbox 250mm x 40mm

In order for your property to comply, you would be required to include the equivalent openings in your structure:-

- Scottish regulations =**12 x Letterboxes**
- E & W Regulations = **8/9 Letterboxes Intermittent Fans, 3/4 Letterboxes Continuous fans**
- **Plus penetrations for all extract only fans (Thermal Bridging**)

Impact and Flaws of Trickle Vents

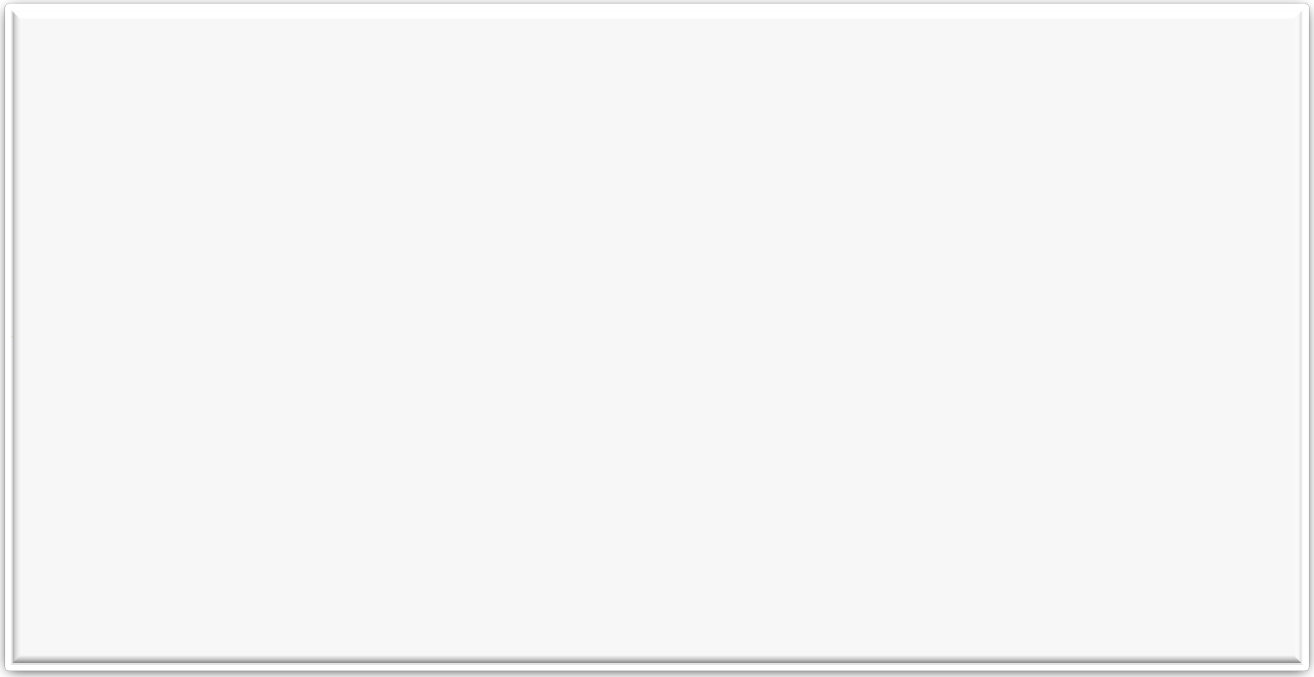



Ahhh! So THAT's where all our heat is disappearing to??!

Mechanical Ventilation with Heat Recovery (MVHR)

How does it work and what are the benefits?

What is MVHR and how does it work



MVHR the Benefits

What is MVHR?

- NOT a heating system, but compliments heating system by considerably reducing heat losses.
- NOT an air conditioning system! Some cooling products are available to offer tempering of air.
- It is a balanced and controlled whole house forced air ventilation system
- 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
- **No Requirement for Trickle Ventilators**

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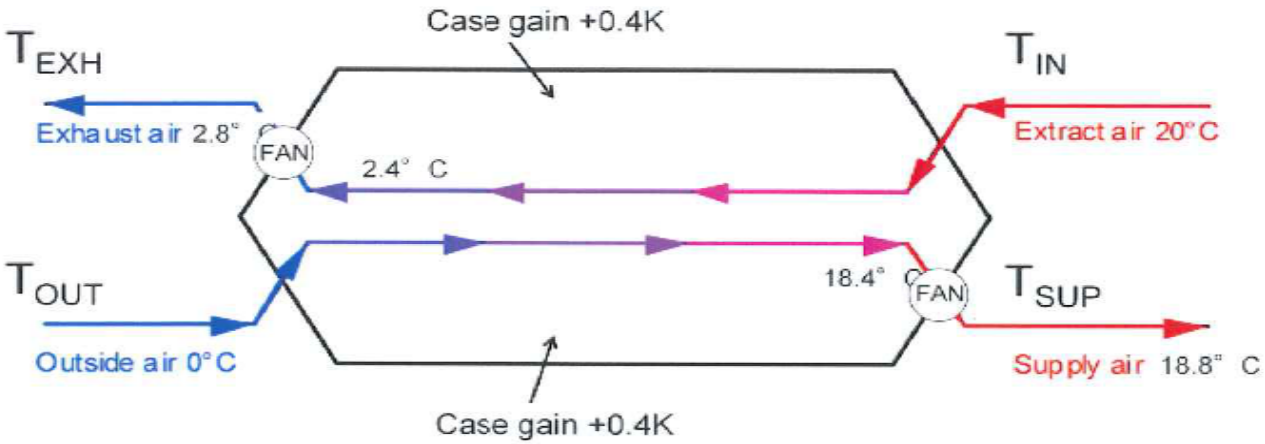
How does MVHR Work?

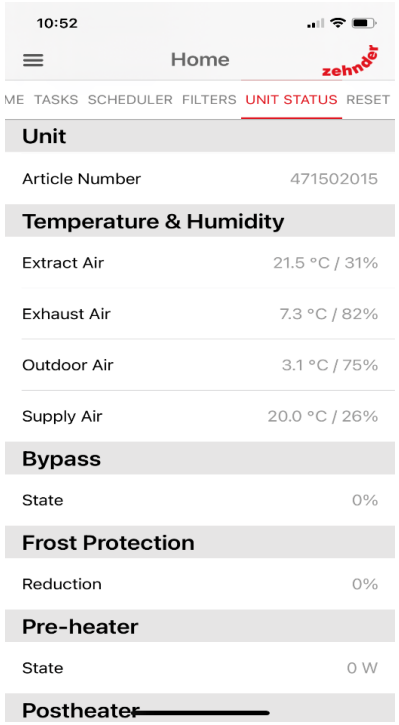


Total fan power 0.3 Wh/m³

$$\eta_{HR} = \frac{T_{IN} - T_{EXH} + P_{el} / (\dot{V} \cdot c)}{T_{IN} - T_{OUT}}$$

MVHR effect v Extract Only effect

MVHR House in Northumberland



Non MVHR House Northumberland

Mechanical Ventilation with Heat Recovery (MVHR)

The Ventilation Design Process
(What's involved)

Airflow Requirements l/s or m^3h

England & Wales Part F System 4

Sum of wet rooms or Floor Area x 0.30 whichever is greater (normally floor area in most self builds)
For air permeability <5m3(h:m2) @50 pa Normally 0.44 -0.45 ach
For air permeability >5m3 (h:m2) a 50 pa Normally 0.30 ach (rate now rarely used other than for renovation projects)

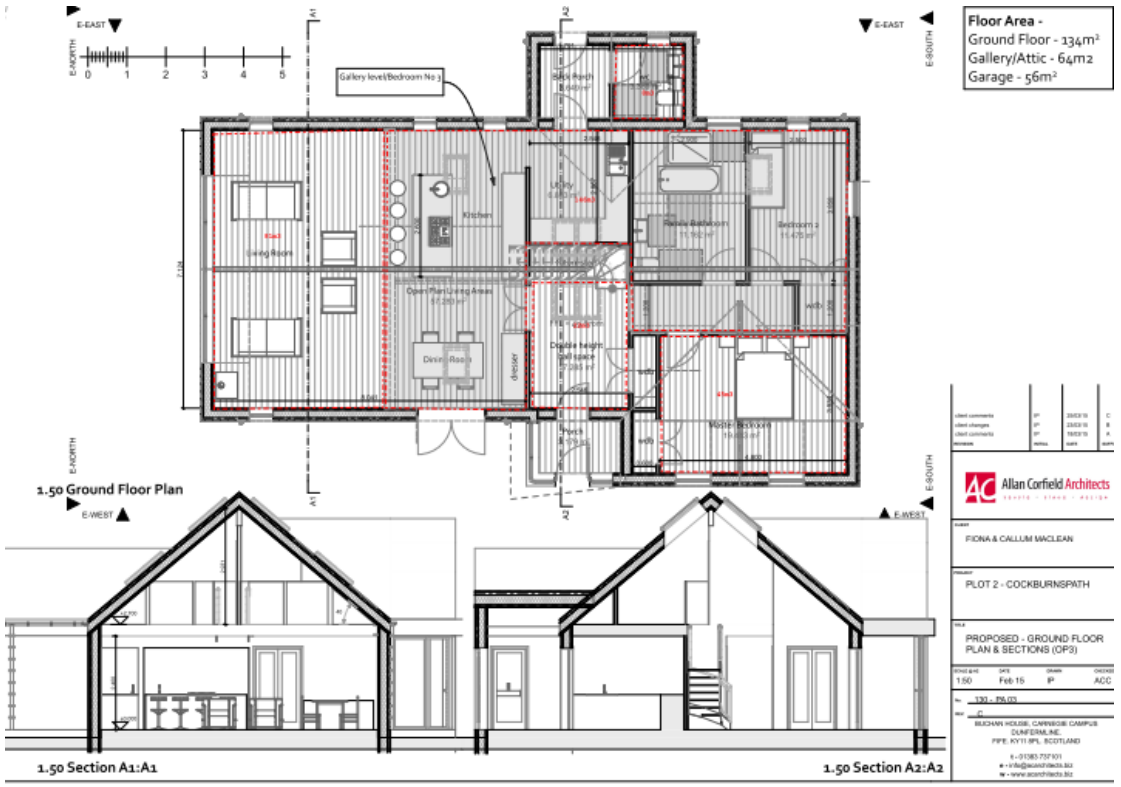
Scotland Technical Handbook 3.14 and BRE Digest 398

Flexibility on ach, 0.35-0.40 usually applied

Passive House

PHPP Occupancy based or 0.30 ach

Review plans and determine required air flows



Selecting the Components

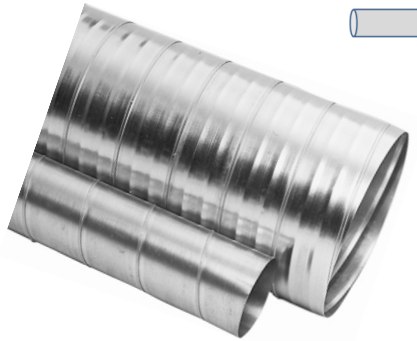
Plant unit –Suitability, Airflow performance, cost, thermal efficiency, power consumption, control options, user friendly, durability, consumables

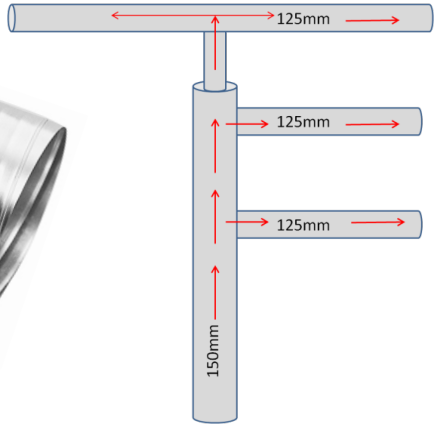
Ducting Options - Semi-Rigid Radial

Smooth-bore improves air flows; anti-static lining; SAP Appendix Q compliant; ideal for Pozi Joists; Eco-Joists and engineered timber; perfect for limited void spaces and renovation projects; quicker to install than branch; reduces "*cross-talk*" between rooms; rubber seal on joints ensure 100% tightness; use in conjunction with a multiple port distribution manifold for central air distribution.

Ducting Option – Rigid Ducting

Smooth-bore improves air flows; push-fit connections; SAP Apendix Q compliant; available on 180mm, 150mm, 125mm and 100mm diameter, also in 204cm x 60mm x 90mm for limited void spaces).

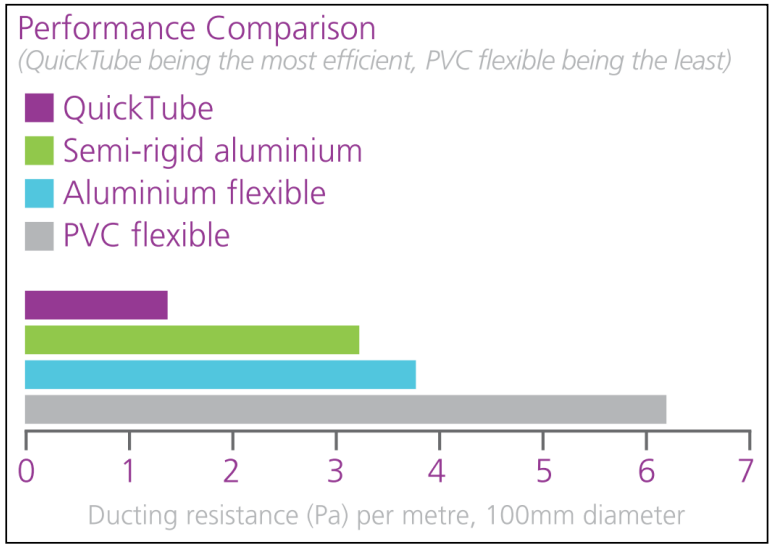




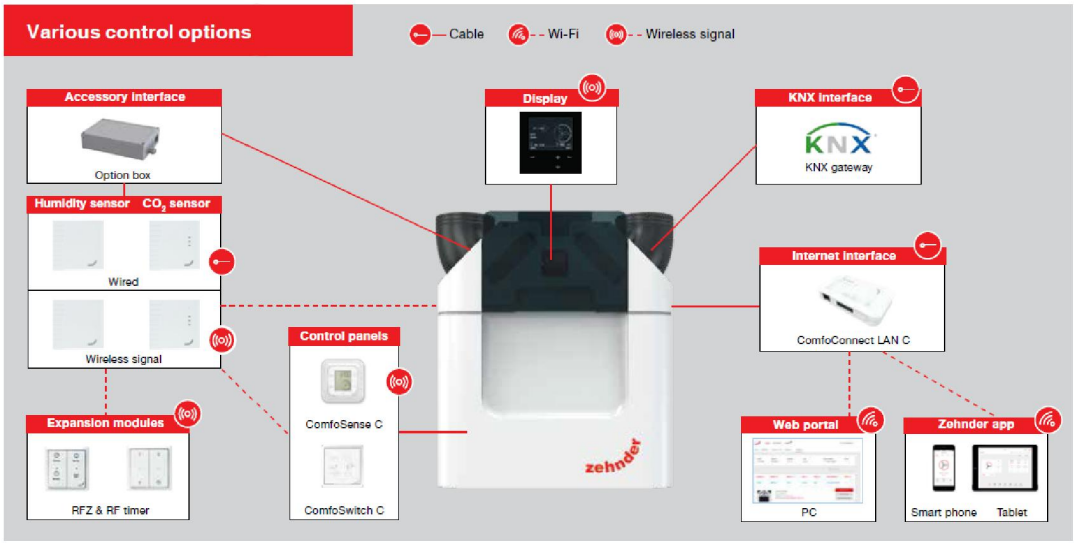
APPROVED FOR adm systems SAP APPENDIX Q

Ducting – NOT recommended!

We **strongly advise against** flexible (spiral) ducting of ALL types because of its high air resistance (especially when kicked or restricted). Not only is it easily punctured or crushed but it will also lower the efficiency of any heat recovery unit.

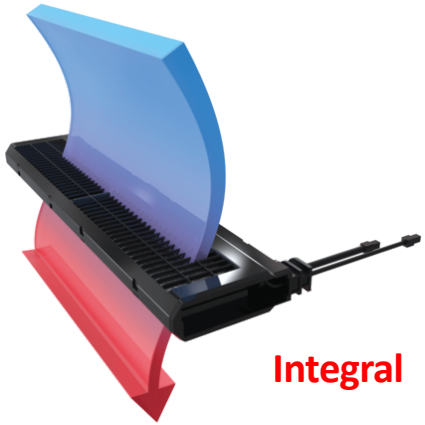


MVHR Controls



Pre & Post Heat Options

- Pre heat the air into the MVHR machine in winter to prevent frost protection system shut down
- Pre-Heater Essential in Northern UK Locations and/or if building is to be part heated
- Standard specification in Passive House projects
- Minimum desirable supply air temperature 16.5 degrees
- Air entering MVHR system should not be below 0 degrees

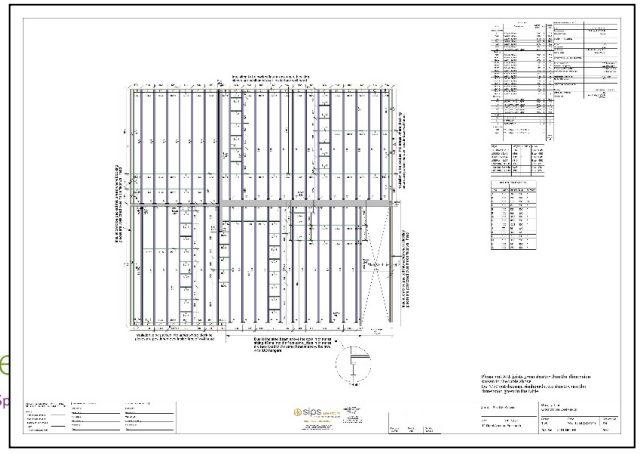


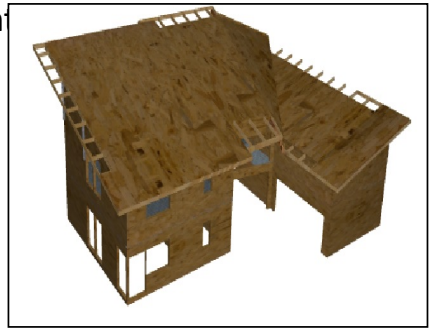
Integral

Remote

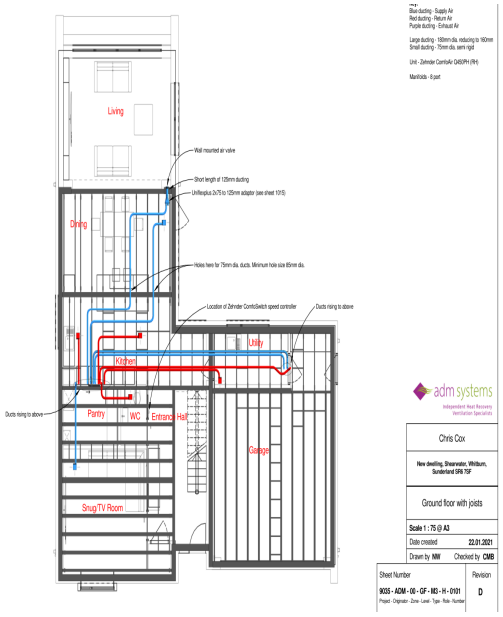
Information required to produce the design layout, preferable before construction

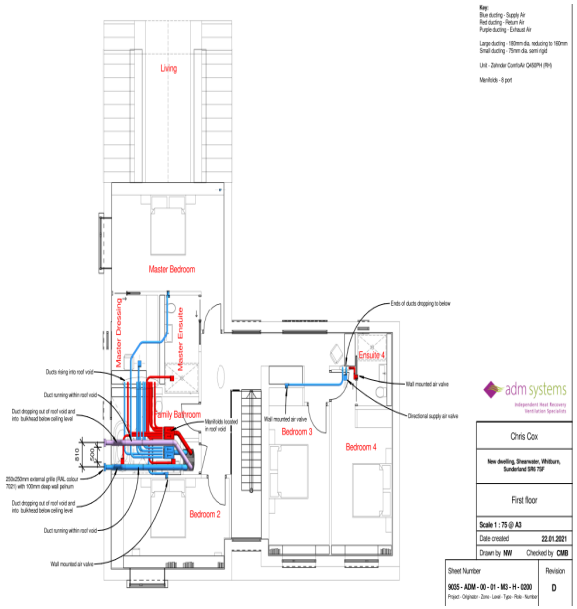
- Construction fabric
- Sections and elevations
- Joist type
- Floor joist direction and centres
- Desired location of unit
- Location of external terminals
- Warm roof of cold roof construction
- Fire stopping requirement
- Building Code Level
- Air infiltration level
- 3D Modelling



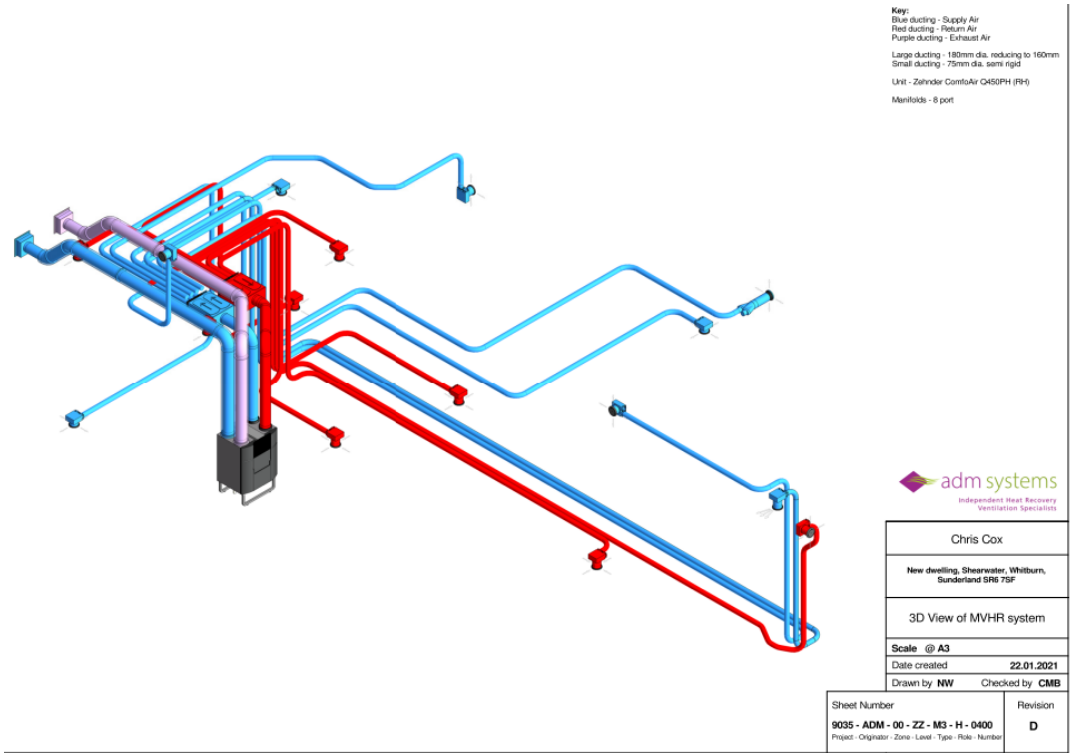


Project Specific System Design





Isometric 3D Design View



Project Specific Air Change Schedule

EXTRACT	Volume	A.C.R.	Volumetric Normal Flow Rate (l/s)				Pipes	Valves	Normal Rate		Boost Rate		
Room Name	m³	No./h	Unit 1	n/a	n/a	n/a			m³/h	m³/s	m³/h	l/s	m³/s
Ensuite 4	13.5m³	2.0	7.5				(1)	(1)	26.9	0.0075	33.6m³	9.3	0.0093
Family Bathroom	27.2m³	1.9	14.4				(2)	2	51.8	0.0144	64.7m³	18.0	0.0180
Kitchen	44.6m³	1.3	16.1				(2)	2	58.0	0.0161	72.4m³	20.1	0.0201
Master Ensuite	16.1m³	2.7	12.0				(1)	(1)	43.1	0.0120	53.9m³	15.0	0.0150
Utility	16.5m³	1.6	7.3				(1)	(1)	26.3	0.0073	32.9m³	9.1	0.0091
WC	6.4m³	3.8	6.7				(1)	(1)	24.1	0.0067	30.2m³	8.4	0.0084
			63.9					##					
			Total volumetric flow rate (extract) l/s:						230.1	0.0639	287.7	79.9	0.0799
									230.1	Target rates		79.9	

SUPPLY	Volume	A.C.R.	Volumetric Normal Flow Rate (l/s)				Pipes	Valves	Normal Rate		Boost Rate		
Room Name	m³	No./h	Unit 1	n/a	n/a	n/a			m³/h	m³/s	m³/h	l/s	m³/s
Bedroom 2	64.5m³	0.5	8.1				(1)	(1)	29.0	0.0081	36.3m³	10.1	0.0101
Bedroom 3	60.4m³	0.5	7.6				(1)	(1)	27.2	0.0076	34.0m³	9.4	0.0094
Bedroom 4	62.5m³	0.5	7.8				(1)	(1)	28.1	0.0078	35.2m³	9.8	0.0098
Dining	43.1m³	0.6	6.9				(1)	(1)	25.0	0.0069	31.2m³	8.7	0.0087
Living	89.3m³	0.6	14.4				(1)	(1)	52.0	0.0144	65.0m³	18.0	0.0180
Master Bedroom	72.2m³	0.5	9.0				(1)	(1)	32.5	0.0090	40.6m³	11.3	0.0113
Master Dressing	17.3m³	0.6	2.9				(1)	(1)	10.4	0.0029	13.0m³	3.6	0.0036
Snug/TV Room	43.3m³	0.6	7.2				(1)	(1)	26.0	0.0072	32.5m³	9.0	0.0090
			63.9										
			Total volumetric flow rate (supply) l/s:						230.1	0.0639	287.7	79.9	0.0799
			Ratio (Supply/Extract)	100%					230.1	Target rates		79.9	

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Air change schedule	
Project number	9035
Date	22.01.2021
DWG No	1000

ited, Suite 3, Unit A, Briar Rhydding House, Baildon, Shipley, West Yorkshire. BD17 7JW
Telephone: 01756 701051 email: design@admsystems.co.uk

Mechanical Ventilation with Heat Recovery (MVHR)

The Installation Process

MVHR Installation Process
Timescales

- First Fix : wind and watertight
- First Fix Preferable before other services
- Second fix : walls floors boarded and/or plastered
- Commissioning and Balancing : As close as possible to client move in
- Client to be available at Commissioning and Balancing for system instruction/handover

Consider potential conflicts

Air valve positions First and Second Fix Assembley

Consider the location of units

Passive House
project unit
in store room

Consider location of units

Consider location of unit

Plant Room/Utility

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Consider location of unit

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Tight Space?

Branch ducting in eaves/comb void

MVHR Unit Location : allow access for maintenance

Air Valves & Locations


Extract


Supply

External Wall Grilles.

External Roof Vents

Thank you for listening

Brian Singleton

Question Time