

Welcome to
Whitecode Consulting

Mechanical Fit Out and
Testing of Dwellings CPD



WHITECODE
CONSULTING

Heating

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- ▶ Heating distribution into dwellings should be separated from the primary network by a twin plate Hydraulic Interface Unit (HIU)
 - Twin plate refers to having a heating plate exchanger and separate HWS heat exchanger for producing HWS instantaneously
- ▶ Pipework should be soldered copper throughout
- ▶ Insulation should be 20mm Kingspan Kooltherm (or equivalent) phenolic foam throughout
- ▶ Vertical pipework drops should be insulated using 13mm Armaflex (or equivalent)

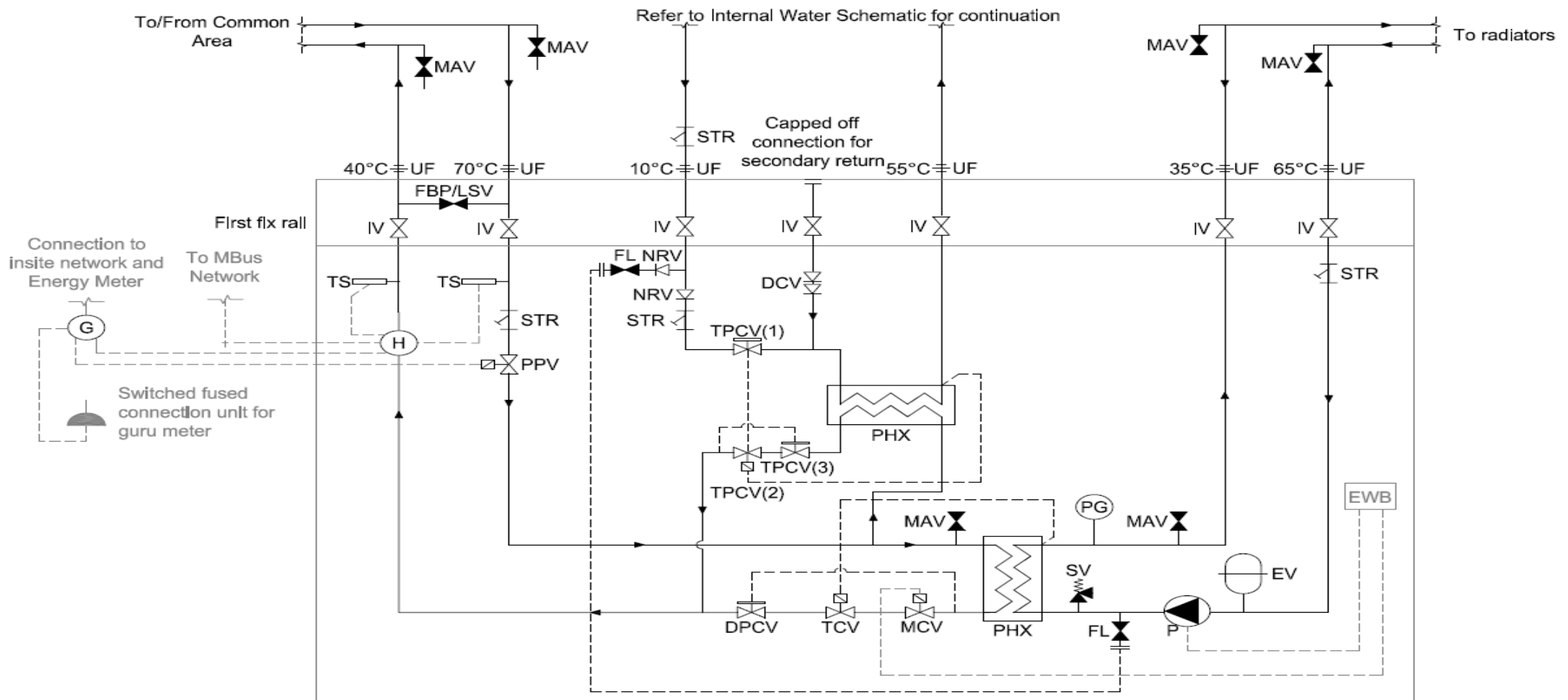
Twin Plate HIU



Phenolic Foam

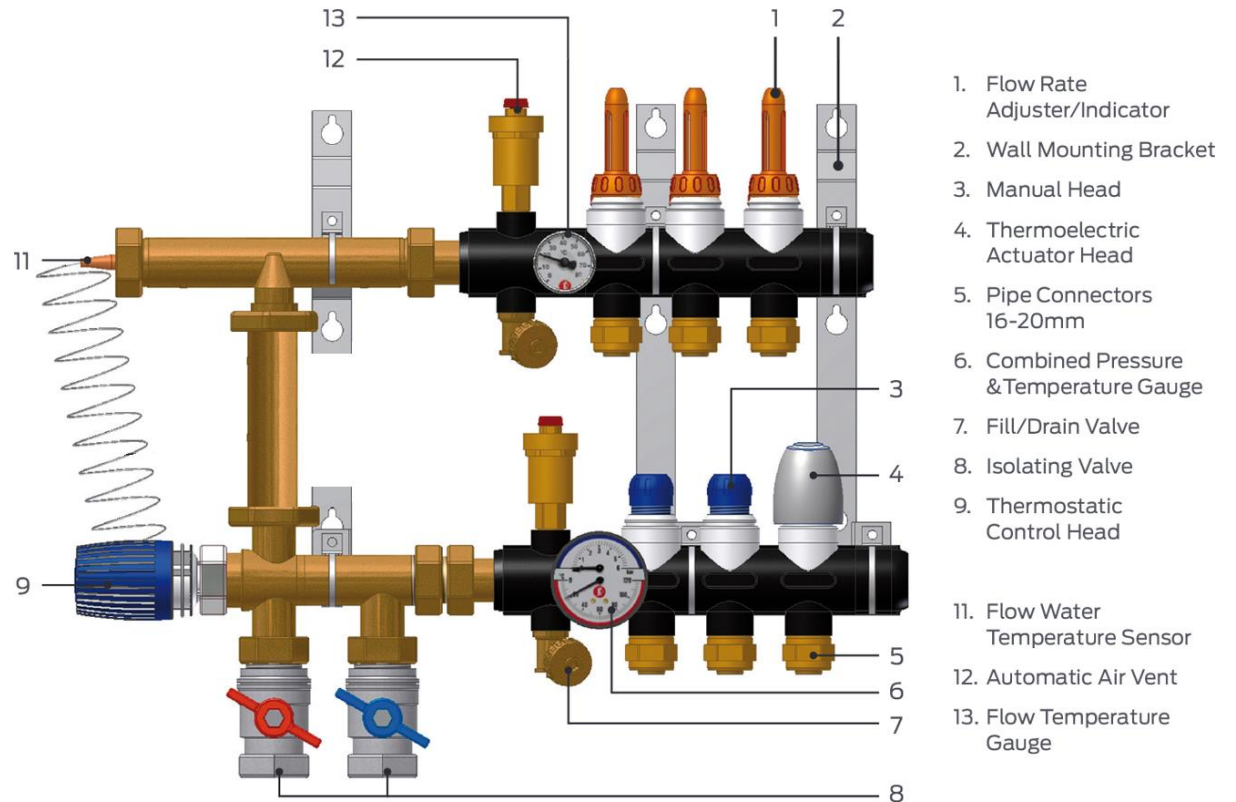
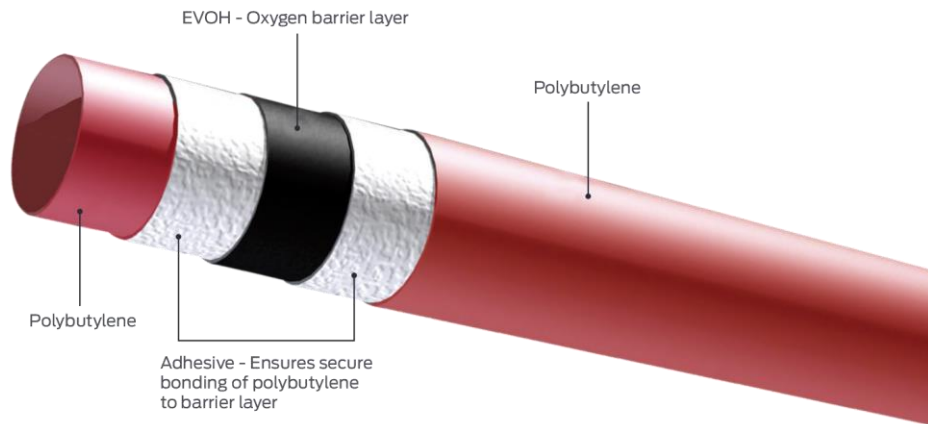


HIU Schematic



Emitters – Underfloor Heating

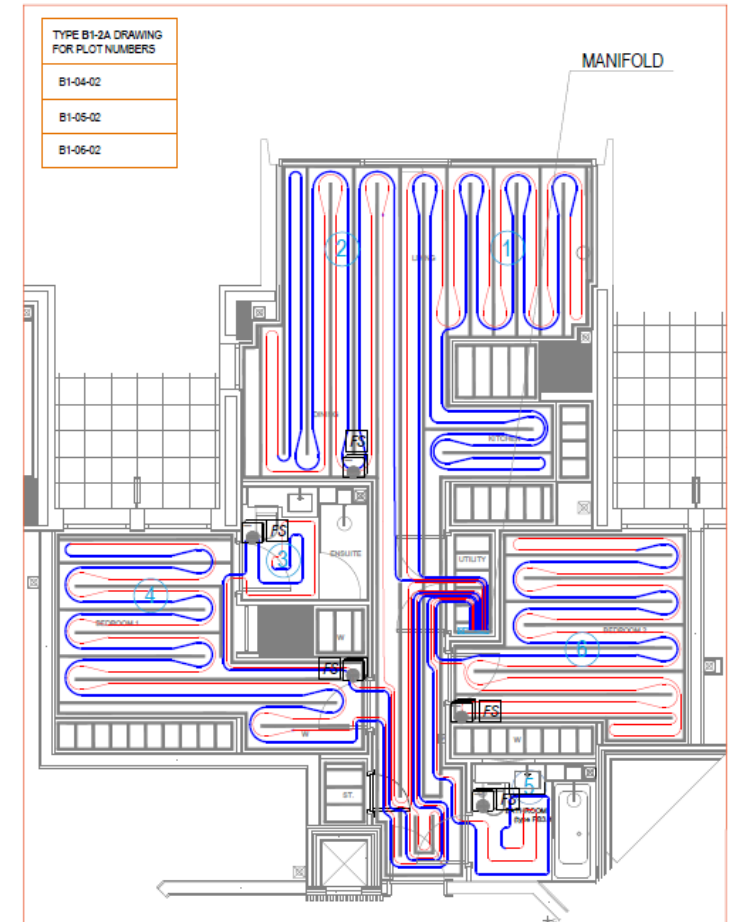
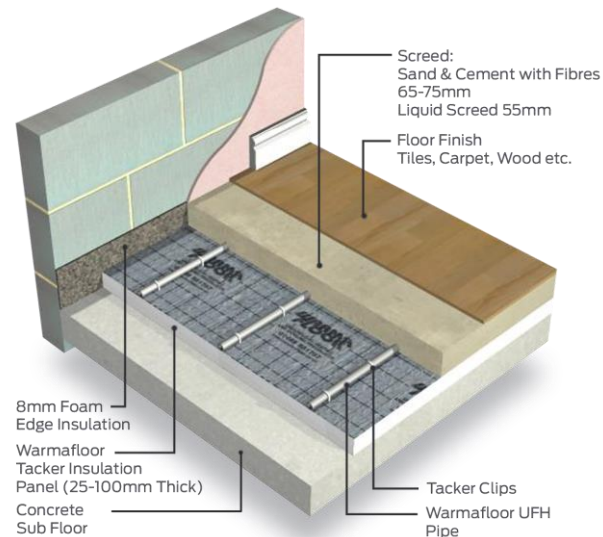
- ▶ Within private units an underfloor heating manifold is generally utilised
- ▶ Pipework from the manifold should distribute within the floor in polybutylene pipework



1. Flow Rate Adjuster/Indicator
2. Wall Mounting Bracket
3. Manual Head
4. Thermoelectric Actuator Head
5. Pipe Connectors 16-20mm
6. Combined Pressure & Temperature Gauge
7. Fill/Drain Valve
8. Isolating Valve
9. Thermostatic Control Head
11. Flow Water Temperature Sensor
12. Automatic Air Vent
13. Flow Temperature Gauge

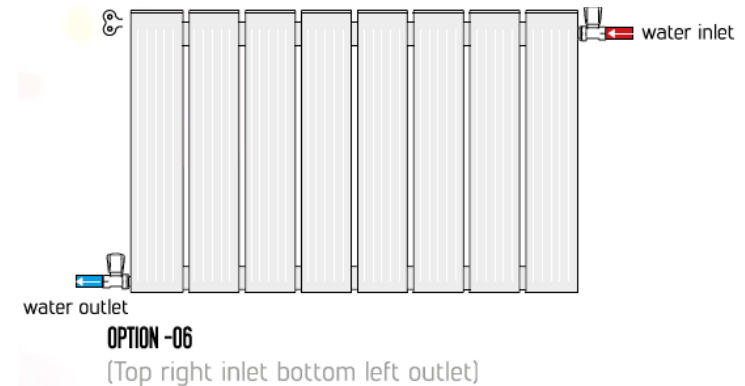
Emitters – Underfloor Heating

- ▶ Pipework should be fixed to a tacker insulation panel with locating tacker clips for the pipework
- ▶ It is essential to minimise floor coverings, as wooden flooring, carpet, rugs, etc., all insulate the floor and prevent heat from escaping; special consideration is required in high end units



Emitters - Radiators

- ▶ Typically provided within HA units to meet HA specification
- ▶ Radiator valves should be positioned top bottom opposite end, to enable the Thermostatic Radiator Valve (TRV) to be positioned at the high point to comply with lifetime homes
- ▶ It is necessary for the TRV to be commissionable to ensure low return temperatures are achieved, such as the Danfoss PT40
- ▶ Low return temperatures are necessary to comply with CISBE Code of Practice for heat networks, which states a maximum return of 40°C is required
- ▶ The room with the thermostat is not required to be provided with a TRV



Thermostatic Radiator Valve

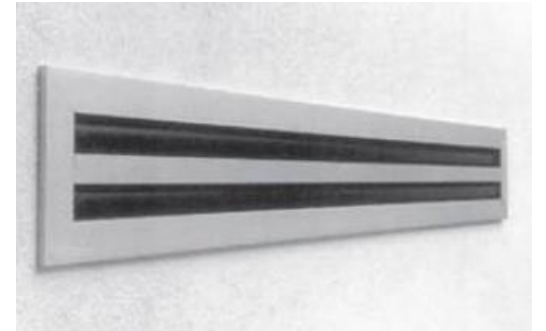


Cooling

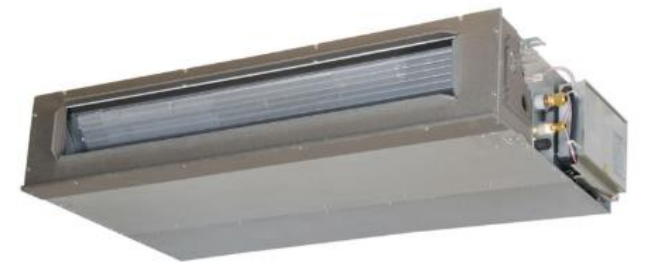
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- ▶ The heat transfer medium, water or refrigerant, depends on the scale of the scheme; however similar principles apply to both systems
- ▶ Fan Coil Units (FCU's) should be located in each room requiring cooling
- ▶ The size and number of units depends on the load to the system
- ▶ Attenuation is required to be selected to each FCU, dependent on the duty of operation and the project specific requirements
- ▶ Powder-coated grilles will be provided to each room for supply and return air; these should be located horizontally on walls

Linear Grille



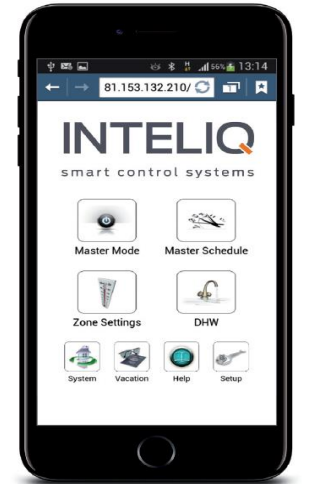
Mitsubishi FCU



Heating & Cooling Controls

- ▶ Heating and cooling can be controlled via a single course system such as Intelli Q, which is provided by someone such as Warmafloor
- ▶ The system should enable programmable zones within each space, utilising a digital room thermostat
- ▶ The main controller should be located within the cupboard with a wiring centre connecting each of the separate zones
- ▶ App control should also be available

Digital Room
Thermostat



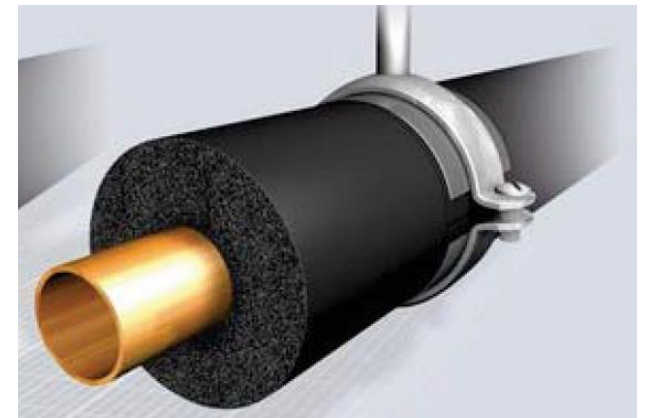
Hot and Cold Water Services

- ▶ Boosted cold water should serve the property with a minimum pressure of 3bar; this ensures all high flow and pressure taps operate correctly; apartments never need a water feed bigger than 22mm.
- ▶ Cold water should enter the property and distribute to the secondary HWS plate for production of hot water
- ▶ Whitecode recommend all pipework should be installed in braised copper (*see opposite*)
- ▶ Hot and cold water should be insulated throughout using 15mm Kingspan Kooltherm (*or equivalent*) phenolic foam insulation with passivated barrier to prevent pitting
- ▶ Vertical pipework drops should be insulated using 13mm Armaflex (*or equivalent*)
- ▶ CWS pipework must not come into physical contact with any heating or HWS pipework, in order to prevent heat transfer

Braising Copper Pipework

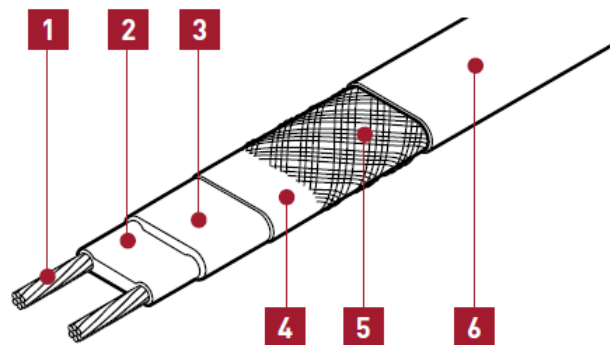


Armaflex Insulation



Heat Maintenance Tape

- ▶ Heat maintenance tape should be provided to ensure compliance with L8, BS 8558 and WRAS
- ▶ Heat maintenance tape is recommended to ensure 50°C water is achieved within 30 seconds
- ▶ Hot water within 30 seconds is also required to comply with many clients requirements and aspirations



- 1 Copper conductor (1.2 mm²)
- 2 Self-regulating heating element
- 3 Modified polyolefin insulation
- 4 Aluminium foil wrap
- 5 Protective tinned copper braid
- 6 Modified polyolefin protective outer jacket.

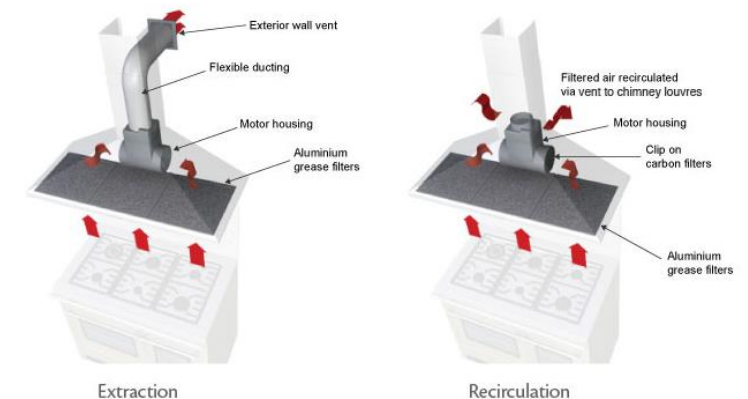
Ventilation (MVHR)

- ▶ Generally, all dwellings will be provided with MVHR units (*see example opposite*); the units reduce energy consumption, improve acoustic performance of the dwelling and also improve air quality
 - The MVHR unit also assists in reducing the dwelling emission rate (SAPS)
- ▶ The MVHR unit should be provided with automatic summer by-pass, delay timer and local boost control within each area served
- ▶ Cooker hoods should be ducted to external (utilising 220 x 90mm)
 - Ducted cooker hoods on towers should be considered with regard to 'stack effect'
 - For ducted systems to achieve optimum performance, manually opening a window may be necessary to provide an inlet air path
- ▶ Re-circulating cooker hoods can also be used in conjunction with MVHR systems, but do not discharge moist air directly to external

Vent-Axia Sentinel



Ducting/Venting



MAIN CHANGES IN THE VENTILATION REQUIREMENTS FOR BUILDINGS IN 2010

1. This edition of Approved Document F, *Ventilation*, replaces the 2006 edition and comes into force on 1 October 2010.
2. The following are the main changes to the legal requirements in the Building Regulations 2010 and the Building (Approved Inspectors etc) Regulations 2010, and in the technical guidance in Approved Document F.

Changes in the legal requirements

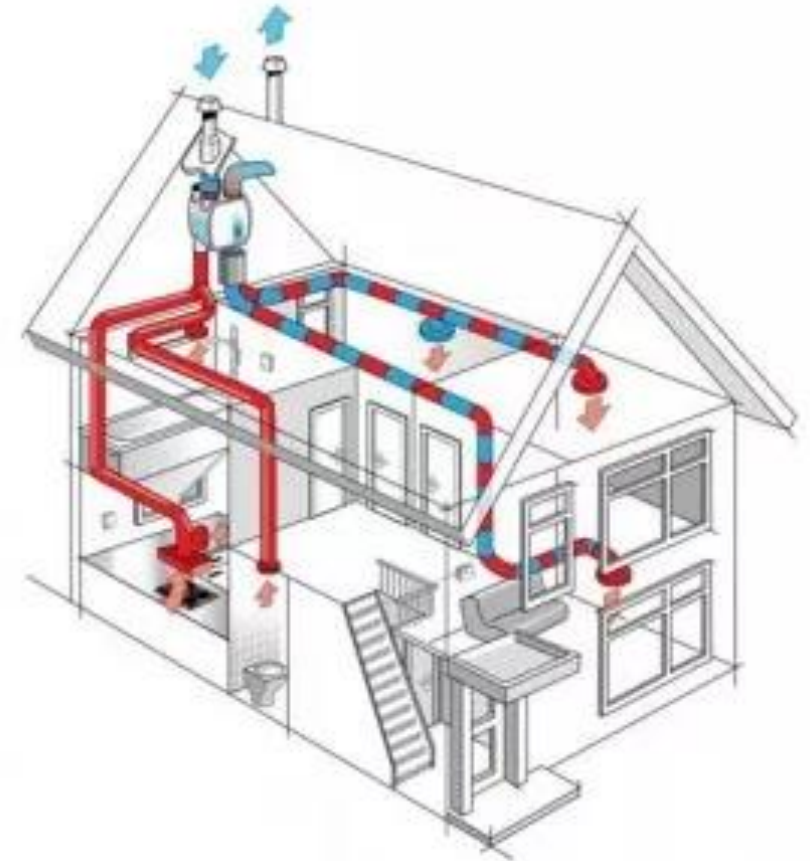
3. All fixed mechanical ventilation systems, where they can be tested and adjusted, shall be commissioned and a commissioning notice given to the Building Control Body.
4. For mechanical ventilation systems installed in new dwellings, air flow rates shall be measured on site and a notice given to the Building Control Body. This shall apply to intermittently-used extract fans and cooker hoods, as well as continuously running systems.
5. The owner shall be given sufficient information about the ventilation system and its maintenance requirements so that the ventilation system can be operated to provide adequate air flow.

Changes in the technical guidance

6. Ventilation provisions have been increased for dwellings with a design air permeability tighter than or equal to $5 \text{ m}^3/(\text{h.m}^2)$ at 50 Pa.
7. For passive stack ventilators, the stack diameter has been increased to 125 mm for all room types. Use of passive stack ventilation in inner wet rooms has been clarified.
8. The guidance for ventilation when a kitchen or bathroom in an existing dwelling is refurbished has been clarified.
9. Reference is made to a new *Domestic ventilation compliance guide* for guidance on installing, inspecting, testing and commissioning ventilation systems in dwellings. Guidance in Appendices D and E of the 2006 edition of Approved Document F, on installing passive stack ventilators and fans in dwellings, can now be found in Section 2 of the new guide.

Ventilation (MVHR)

- ▶ Ductwork connecting the unit to external should be insulated throughout its entire length (*both supply and extract*)
- ▶ Termination of the unit to external should be via a plenum, with a free area equivalent to twice the diameter of the duct, in order to reduce resistance
- ▶ Intake and exhaust terminals should be a minimum of 1.5m apart to prevent cross-contamination
- ▶ Supply and extract valves must be lockable to ensure ventilation rates remain as commissioned, as per British Plumbing Employers Council (BPEC) requirements



Fire Compartmentation

- ▶ Pipework and cabling entering the apartment would require fire-stopping using methods A, B or C (*see over*)

Table 14 Maximum nominal internal diameter of pipes passing through a compartment wall/floor (see paragraph 10.5 onwards)

Situation	Pipe material and maximum nominal internal diameter (mm)		
	(a) Non-combustible material ⁽¹⁾	(b) Lead, aluminium, aluminium alloy, uPVC ⁽²⁾ , fibre cement	(c) Any other material
1. Structure (but not a wall separating buildings) enclosing a protected shaft which is not a stairway or a lift shaft	160	110	40
2. Compartment wall or compartment floor between flats	160	160 (stack pipe) ⁽³⁾ 110 (branch pipe) ⁽³⁾	40
3. Any other situation	160	40	40

Notes:

1. Any non-combustible material (such as cast iron, copper or steel) which, if exposed to a temperature of 800°C, will not soften or fracture to the extent that flame or hot gas will pass through the wall of the pipe.
2. uPVC pipes complying with BS 4514:2001 and uPVC pipes complying with BS 5255:1989.
3. These diameters are only in relation to pipes forming part of an above-ground drainage system and enclosed as shown in Diagram 38. In other cases the maximum diameters against situation 3 apply.

Fire Compartmentation

- ▶ **Alternative A:** Proprietary Seals (any pipe diameter)
- ▶ **Alternative B:** Pipes with restricted diameter not more than the diameter in table 14 may be fire stopped without the need for a proprietary seal
- ▶ **Alternative C:** (as diagram 37)
- ▶ A fire-stopping company should be engaged as a consultant during the design stage

Intusleeve Duct

For fire sealing ducting penetrations

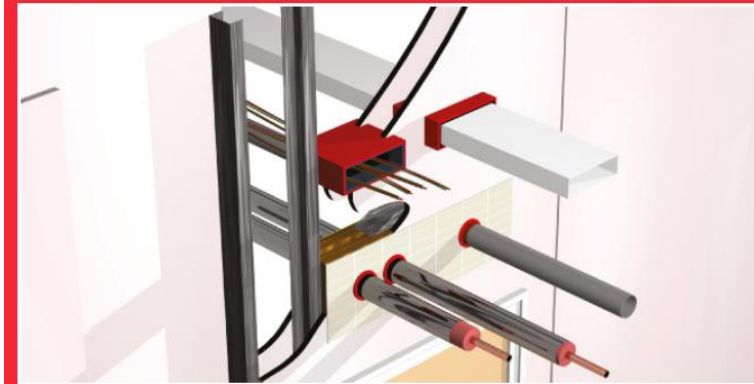
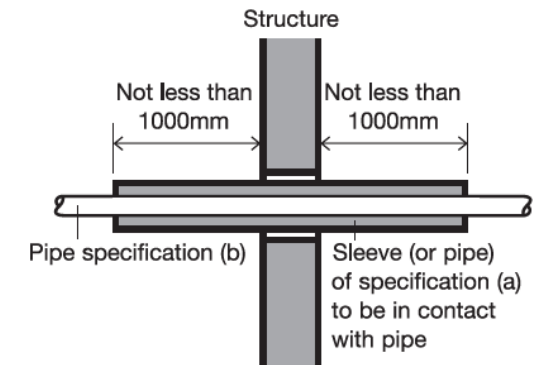


Diagram 37 Pipes penetrating structure

See para 10.8, alternative method C



Notes:

- 1 Make the opening in the structure as small as possible and provide fire-stopping between pipe and structure.
- 2 See Table 14 for materials specification.

Testing and Witnessing

- ▶ Within the dwellings, testing and witnessing is required to ensure the contractor has both carried out the installation to a satisfactory standard, and also that the design requirements have been met from a performance perspective
- ▶ Site Managers are responsible for ensuring the contractors have undertaken basic system checks in accordance with the developers quality check forms including:
 - Pressure testing of cold and hot water pipework
 - Initial air testing of soil and drainage stacks and main branches
 - Underfloor heating to be pressure tested and remain at test pressure until after final fix installation (commissioning)
- ▶ Site managers are also responsible for ensuring the contractors have been utilising their own internal procedural forms during the installation

Mechanical – 1st Fix (Example Test Sheet)

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SVPs & RWPs

#	Check Item	Acceptable?
1	Co-ordination of SVP rodding eyes completed to suit room layouts	Yes
2	Rodding eyes orientated and at correct level in accordance with agreed co-ordination	Yes
3	Stack pressure tests completed and passed	Yes
4	Insulation and ID	Yes
5	Supports installed where required	Yes
6	Pipe into expansion socket is installed and marked at correct height	Yes

Sign Off - SVP & RWPs

#	Check Item	Signature - Contractor	Signature - Developer
1	Accepted		

MECHANICAL PLUMBING

#	Check Item	Acceptable/ Not
1	Incoming Cold Water piped correctly from corridor to utility cupboard	Yes
2	Incoming Heating piped correctly from corridor to utility cupboard	Yes
3	M-Bus cable installed satisfactorily and test passed.	Yes
4	Hydraulic test complete. System left pressurised atBar until 2nd fix. Certificate issued.	Yes
5	Waste pipes installed and tested.	Yes
6	Setting out checked against drawing.	Yes
7	All open ends capped.	Yes
8	Surplus materials removed.	Yes
9	Protection applied and Unit left clear and tidy	Yes

Mechanical – 1st Fix – ctd. (Example)

Sign Off - Plumbing		
#	Accepted - Contractor	Accepted - Developer
1		
09/10/2018 16:28:59		

INSULATION		
#	Check Item	Acceptable?
1	Incoming Cold Water insulated with Kooltherm Phenolic from corridor to utility cupboard	Yes
2	Incoming Heating insulated with Kooltherm Phenolic from corridor to utility cupboard	Yes
3	Hot and cold pipework insulated with Kooltherm Phenolic throughout unit	Yes
4	All insulation materials approved by Design team	Yes
5	Insulation lengths and bores match pipework	Yes
6	Silver foil tape applied to all insulation joints and section ends	Yes
7	Directional arrows and ID bands at regular intervals	Yes
8	Surplus insulation and tape removed and area left clean	Yes

TRACE HEATING / HEAT MAINTENANCE TAPE		
#	Check Item	Acceptable?
1	Insulation resistance test carried out prior to installation and passed?	Yes
2	Installation with correct bend radii, free of kinks and outside hangers and pipe clips	Yes
3	Approved cable ties or tape used at correct spacing?	Yes
4	Insulation resistance test carried out AFTER installation and passed? Attach photo of test certificate.	Yes

Sign Off - Insulation			
#	Check Item	Signature Contractor	Signature
1	Accepted		Developer

Sign off - Trace Heating/ Heat maintenance tape			
#	Check Item	Accepted - Contractor	Accepted - Developer
1	Signatures		

VENTILATION		
#	Check Item	Acceptable
1	Setting out correct to drawing	Yes
2	Duct work installed to correct layout	Yes
3	Plenums and vent flexi joints fitted	Yes

Mechanical – 1st Fix – ctd. (Example)

#	Check Item	Acceptable
4	Duct work connected directly to outside grilles/plenums with no flexible joint	Yes
5	Duct work layout in MEP cupboard to be aligned with MVHR unit connection configuration.	Yes
6	All joints taped	Yes
7	Lagging present and undamaged	Yes

Sign Off - Ventilation			
#	Check Item	Signed - Contractor	Signed - Developer
1	Accepted		

SPRINKLERS		
#	Check Item	Acceptable
1	Sprinkler layout installed in accordance with reflected ceiling plan.	Yes
2	Hydraulic test complete.	Yes
3	Open ends capped & heads protected	Yes
4	Sprinkler pipe free from contact with cables	Yes

Sign Off - Sprinklers			
#	Check Item	Signed - Contractor	Signed - Developer
1	Accepted		

OTHER MECHANICAL - Installed correctly and insulated			
#	System	Acceptable	Photo
1		Yes	

Other Comments?

SIGN OFF			
#	Check Item	Subcontractor	Witnessed by Developer
1	All works described above inspected and free from defects		

Mechanical – 2nd Fix (Example)

20

Items to Check:		
#	Check Item	Acceptable?
1	Installed in accordance with current revision of drawing?	Yes
2	Level and square?	Yes
3	Free from damage?	Yes
4	All waste & feed pipes clipped and laid?	Yes
5	Feed pipes lagged?	Yes
6	Protection in place?	Yes

Bath - Sign Off			
#	Check Item	Signed - Contractor	Signed Developer
1	Bath installation is acceptable		

PLUMBING		
#	Check Item	Acceptable?
1	Sanitaryware (wc, basin, mixers, showers, shower tray, bath) installed	
2	Taps, showerheads, controllers fitted, fixed to pattresses, straight	
3	Kitchen taps & wastes installed	
4	Hydraulic test complete to final fix items outlets (to be witnessed by M&E Manager)	

Signed - Plumbing			
#	Check Item	Subcontractor	Developer
1	Signatures		
2	Hydraulic test witnessed and accepted by M&E Manager		

OTHER MECHANICAL				
#	Check Item	Acceptable	Signed s/c	Signed Developer
1	Chilled water hydraulic test complete to unit			
2	All pipework joints and valves insulated correctly and vapour sealed			

Any Other System (for tests or inspections not able to be carried out previously)				
#	System	Acceptable?	Signed S/C	Signed Developer
	Other Comments?			

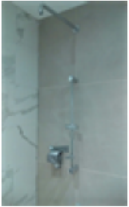
Mechanical – Finals (Example)

FINAL SOIL & WASTE AIR TEST (List stack no.s)			
#	Stack No. Witnessed and Passed by M&E Manager	Signature Contractor	Signature Developer M&E Manager

PLUMBING		
#	Check Item	Acceptable?
1	Shower doors, enclosures installed, straight and complete	
2	Bath screens	
3	Shower hose & rail	Yes
4	WC seats	Yes
5	Flow restrictors	Yes
6	Towel rails	
7	Shower head	Yes
8	Gully gratings	
9	Wash basins	Yes

Images

#3



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#4



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#9



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Signed - Plumbing		
#	Check Item	Subcontractor
1	Signatures	

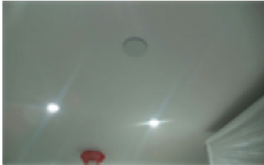
VENTILATION		
#	Check Item	Acceptable
1	Flexi joints short and taut to unit and valves	Yes
2	MVHR grilles	Yes
3	Linear grilles	Yes

Signed - Ventilation		
#	Check Item	Subcontractor
1	Signature	

SPRINKLERS		
#	Check Item	Acceptable
1	Cover plates fitted and flush to ceiling	Yes

Images

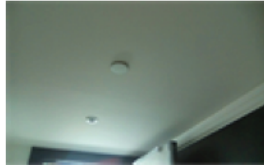
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Signed - Sprinklers		
#	Check Item	Subcontractor
1	Signatures	

Final Fix Checks

- ▶ Final fix checks should include:
 - Minimum 4.5bar hot and cold water test
 - Air test of the soil and waste from the main stack to the trap of each appliance/white goods
 - A check that the underfloor heating has maintained pressure since first fix pressure test
 - Heating test pressure

Commissioning

- ▶ Commissioning of dwellings where systems require witnessing include:
 - Underfloor heating flow rates and performance
 - Cooling system air flow rates and air balancing (*including demonstration of controls operation for both systems*)
 - Hot and cold water flow, temperature and timing tests
 - Ventilation air flow rates and air balancing in accordance with Approved Document F
 - It is essential that, once final commissioning has been undertaken, valves are not tampered with, as this will result in non-compliance with Part F
- ▶ All systems are to be commissioned in accordance with the developers commissioning procedures, but as a minimum requirement with CIBSE commissioning codes (*see opposite*)
- ▶ Ensure the contractor is locking valves post commissioning
- ▶ Developer should also appoint an independent commissioning manager in order to verify all design criteria has been met

Activity number	Activity description	Commissioning management organisation (CMO)	Building services contractor (BSC)	Main contractor (MC)	Consulting engineer (CE)
1	Review design drawings and specifications for commissioning requirements	Action and advise CE. Coordinate any comments from BSC and MC.	Advise MC of any comments.	Liaise and assist all parties.	Review comments and action as appropriate.
2	Review installation drawings and technical submissions from BSC for commissioning requirements.	Action and advise MC/CE.	Prepare and submit for review. Action any comments as instructed by MC.	Coordinate, supervise and direct/instruct as appropriate.	Review, comment and issue directives to MC if applicable.
3	Review installations with respect to compliance with specifications and drawing intent for commissioning.	Supervise inspection of installations, and issue reports to MC.	Receive CMO reports, and action as necessary.	Coordinate, supervise, and direct/instruct as appropriate.	Review, comment and issue directives to MC if applicable.
4	Production of detailed coordinated commissioning programme, including revisions and updating.	Procure information from BSC. Prepare programme, discuss with MC, and issue to all parties for comment.	Submit information, and liaise with CMO.	Review programme with regard to impact on construction process. Issue comments and approve.	Review, comment and accept.

Figure 2: Part of example responsibility matrix. (Source: CIBSE Commissioning Code M)

Thank you for listening

Any Questions?