



8 MECHANICAL SERVICES

8.2 HEATING and VENTILATION SYSTEM

GENERAL DESCRIPTION

- Description of “Full Heat Recovery” Heating System
- Sales Floor Ventilation System
- Air Handling Unit
- Comfort Cycle Ceiling Mounted Cassette Units
- Over Door Heaters
- Underfloor Heating
- LPHW dosing pot
- LPHW Pressurisation unit
- LPHW Circulation pump
- Bursting Discs
- Cashiers room comfort cooling/heating system
- Ventilation Fans
- AHU Intake/Discharge Louvres
- Ductwork
- Anti Vibration Mountings
- Silencers
- Grilles, Diffusers & Weather Louvres
- Door Air Transfer
- Supports
- Flexible Ductwork
- Fire Dampers
- Access Doors
- Spares
- Commissioning



8.2 HEATING AND VENTILATION

DESCRIPTION OF “FULL HEAT RECOVERY” HEATING SYSTEM

The standard system must utilise waste heat recovered from the refrigeration packs this optimised solution is controlled by a CAREL panel and provides heating and ventilation to the retail area. A gas supply is not required.

However, some sites may not be suitable for this heating system, if certain criteria cannot be met. Only if it is not possible to achieve these criteria can a gas fired system be provided. Sanction for this deviation from BIW will have to be obtained from Aldi. Specification details for this system are included at the end of this section ref 8.2.3.1.

The work will comprise the installation of:

- A ducted fresh air supply and extract system complete with heat recovery unit and summer bypass damper provision, to serve the sales area. The supply air being delivered to the store sales area via dedicated ceiling mounted cassette units as detailed later within this specification.
- Sundry small extract systems.

All the ventilation ductwork is to be undertaken by a specialist ductwork contractor, who is also to provide all necessary wiring diagrams, starters etc. for equipment of his supply, and is to be responsible for commissioning the ventilation system. It is in the Mechanical Contractor's own interest to advise the ductwork specialist of the requirements laid out elsewhere in this specification regarding system commissioning.

SALES FLOOR HEATING/VENTILATING SYSTEM

This project is to utilise waste heat reclaimed from the refrigeration plant, this being recovered into water via a refrigerant to water heat exchanger located at the two CO₂ refrigeration packs. The water will be pumped (dependent upon the final system proposed.) either to

- a) ceiling mounted Biddle cassette units located within the retail sales area as well as the over door heaters, with the system pipework layout / route being arranged as per the BIW drawing (Hydronic system). Or alternatively to
- b) An arrangement of at least two heating flow and return manifolds located within the warehouse at the rear of the store, as illustrated upon the mechanical services drawings (Under-floor System). These manifolds will be selected to serve the various heating zones as illustrated for this specific scheme. The manifolds will also include at least one circuit connection that will utilized to supply the two over door heaters located at the front of the store.

The pressurization unit, buffer vessel (where applicable), and dosing pot shall be located above the warehouse walk-in fridge/freezer, unless specifically noted upon the drawings.

The pump set/dirt separator and pressurisation unit above the freezer will require a drip tray to be installed below, this tray will have a gravity drain



The ventilation shall be provided via a Biddle heat recovery unit located at high level above the warehouse walk-in fridge/freezer (unless illustrated otherwise), All equipment above the walk-ins is to be supported from the roof structure only. The supply air ventilation ductwork will be distributed above the ceiling of the sales floor area and connect directly onto the inlet manifold of two dedicated cassette units (refer to drawing for specific location).

Upon initial start up the HRU will run on low speed and in recirculation mode to aid the initial heating of the sales area. Once store is operational, the HRU will modulate to fresh air supply with the supply temperature being raised via the integral plate heat exchanger. The supply air temperature will subsequently be raised to a pre-set temperature by an electric 9kW duct mounted heater. This heater will be fully self-contained providing modulating heat output and including integral flow switch and high limit thermal protection.

The volume of fresh air supplied to the store will vary in accordance with the CO² sensor located within the return air flow to the system.

The fresh air intake and discharge air connections shall NOT incorporate silencers unless specifically indicated on the drawings to meet local requirements.

The installation of the Biddle heat recovery unit is to allow access for maintenance, this unit is to be installed before the fridge/freezers are built.

The AHU shall be Installed generally as shown on the drawings, ensuring all section access doors are not fouled by either mechanical/electrical services or any access ladders, etc.

Suitable flexible duct connections are to be incorporated at each connection to the unit, and all rotating assemblies are to be resiliently mounted.

The supply air from the Biddle HRU (as applied with the underfloor heating installation) is ducted to four ceiling mount supply air grilles. The supply air temperature being set at the above mention electric supply air heater battery. Please refer to the BIW drawing for the necessary power supply location isolation requirements.

The supply air from the Biddle HRU (as applied with the Hydronic heating installation) is ducted on to bespoke Biddle fresh air ceiling cassettes, these cassettes will boost the air temperature when necessary. Please refer to the BIW drawing for the necessary valve arrangement

The fan speed within the Ceiling mounted cassette will vary dependent upon the sales area temperature requirements.

The mechanical services contractor shall furnish the project electrician with all electrical requirements via Biddle. 02476 384233 or sales@biddle-air.co.uk

The Contractor will be responsible for advising the Structural Engineer of the dimensions and weight of the AHU to enable structural support steelwork to be incorporated to suit.

Manufacturer - See Schedule of Suppliers.

AIR HANDLING UNIT

Provide and install, generally as shown on the drawings:

1 No

- Biddle HR 3500 Heat recovery unit
- Electrical supply 230/1/50Hz - Max demand 2.76kW - Amps 12A



- Horizontal air discharge as shown on the drawing
- Horizontal return air connection
- Fan motor to be inverter controlled. See controls section.
Duty; 0.972 m³/s @ 300 Pa + silencer Pd

SUPPLY AIR (DUCT MOUNTED) HEATER

An AAH Ltd, duct mounted electric heater battery shall be applied to the ventilation system, when installed in conjunction with the underfloor heating scheme. The product shall be selected to fit directly into the main 450mm dia. supply ductwork the product reference shall be as follows: -

Model = **C450E9** circular heater

Power supply = **9kw** 3ph unit

This equipment shall be supplied with the following components

- AAH/8 3 phase Temperature Controller
- SSR max 135Kw, maximum current 187amps per phase @ 400v On/Off
- Air Flow Switch 604X, volt free contacts, range 20 – 300pa Over
- Heat Cut-out OHC5, volt free contacts, max capacity 16amps Supply Fan1, maximum 650w @ 230v Fan terminals are temperature controlled Supply Fan2, maximum 650w @ 230v. Constant run
- 2 digit 0.56" 7 segment LED Display Push buttons (PCB mounted) up/down LEDs
 - Power on – green
 - Heater on – amber
 - Error - red
 - 0-10-volt signal for set point temperature. Open or closed loop option.

The controller shall be designed to meet the current EU regulations for EMC

OVER DOOR HEATERS

Biddle over door heaters are to be provided to the inner retils side doors. Each heater will be connected to the same heat recovery pipe system as per the ceiling cassettes. These heaters will be mounted at ceiling height (3.5m).

Water flowrate will be 0.14l/s per door heater

2No Biddle DF-M-150-W4-F Air Curtains c/w PIR with overrun set to 15min.

The hard-wired controllers will be located in the welfare staff corridor adjacent the other building controls.

Wiring is to be concealed or chased.

Each heater will have an isolation, commissioning and bypass valve (for flushing).

UNDERFLOOR HEATING

The proposed underfloor heating system shall be in the form of In-Slab Radiant Heating-applying Quattro 25/20 with specific branch connection provided to serve the Over Door Heaters

Building Design Requirement

The underfloor system arrangement shall be selected in accord with the manufacturers (Uponor) requirements and is to maintain the required internal comfort condition of

- 21°C within checkout areas and



- 19 degrees centigrade within the general sales floor, wellbeing
- Pipework shall be installed to the warehouse area although this will not be activated unless specifically noted upon the design drawings.

The heating will operate by thermally activating the concrete slab structure. The system will operate in conjunction with a refrigeration pack utilising the generated waste heat provided via the CO₂ refrigeration plant.

Systems requirements

Uponor Quattro 25-20 is the proposed system for the concrete slabs within the project included within this specification. The thermal mass of the concrete slab is to be utilised by positioning the pipes directly in this structural component. The Construction typically consists of a

- 175mm ground bearing concrete slab,
- 60mm sand and cement screed and a
- bedded 15mm Terrazzo tile floor covering.

The actual structural slab requirements shall be confirmed with the architect and structural engineers to ensure that the require installation of the pipework is coordinated with the overall construction programme.

The embedded pipes will be secured to the bottom layer of reinforcement within the 175mm concrete slab typically 75mm from SFL

Note that for intermediate levels using permanent formwork, the construction differs and should be considered on a project by project basis however, in line with the above principle

Design heating outputs are as follows:

Sales area:

- 48w/m²
- Pipe spacing's 300mm
- F/R Temps: 45/30 (typically)
- Space temperature: 19°C
- 6 zones of control

Checkout area:

- 61w/m²
- Pipe spacing's 150mm
- F/R Temps: 45/30 (typically)
- Space temperature: 21°C
- 1 zone of control
- Plus 2 Over door heaters

Wellbeing area:

- 61w/m²
- Pipe spacing's 300mm
- F/R Temps: 45/30 (typically)
- Space temperature: 21°C
- 2 zones of control



Warehouse area:

- 48w/m²
- Pipe spacing's 300mm
- F/R Temps: 45/30 (typically)
- Space temperature: 19°C
- 1 zones of control

System Description

Pipe coils are to be installed insitu with integrated connection pipes of individual length for the specific installation requirements: the following components shall be applied to this scheme arrangement.

- Uponor Comfort Plus 20x2mm & 25x2.3mm PE-Xa pipe made from high-pressure cross-linked polyethylene according to the Engel process, with diffusion barrier and additional PEX outer layer for protection against mechanical stress, pipe assembly patented (patent no.: US 4614208), pipe according to DIN16892 and DIN 4729, oxygen-proof according to DIN 4726, DIN Reg. no.: 3V211 PE-X

The pipes are to be fixed in accordance with BS EN 1264/ 15377

Protective tubes are to be used for feeding the connection pipes upwards/downwards out of the concrete slab depending on manifold locations. Several circuits can be connected in series or/and in parallel.

Manifolds

The In-Slab heating circuits will connect to a 2 magna manifold, consisting of:

- fibre glass reinforced polyamide modules for connection with basic kit, connection right or left with flat sealing, or connection from below with optional elbow set, supply with lock shield valve for balancing (with adjusting ring) and shutoff, adjusting ring for balancing without tools.
- loop connection G3/4" or G1" euro-cone
- loop pitch 50 mm
- header pitch 225 mm
- max. pressure: 6 bar
- max. temperature: 70°C

Note - 2 additional ports are to be provided for the future connection the over door heaters which will be installed by the relevant M&E contractor during the fit out phase.

Over door heaters

The 2 over door heater will be supplied directly from the Magna Manifolds, these will be piped using Uponor MCLP pre insulated pipework, the pipework will be installed by the Mechanical contractor during the fit out phase. Material for the installation will be provided by Uponor directly as part of the heating package. The connections will be made using Uponor RTM (Ring Tension Memory technology) these are a permanent connection and require no specialist tooling.



The pipe run should be suspended within the false ceiling construction fixed into cable/basket tray supplied and installed by the mechanical installation contractor.

Control

Control of the system shall be broken arranged as the area schedule illustrated above. Each area shall include an air temperature sensor which will form part of the operation pack and BMS function supplied and installed by Carrell.

Uponor shall provide individual thermal actuators to open and close the zones accordingly. The thermal actuators will close the zones should there be a risk of condensation or should the temperatures in the zone overheat.

This operation of the actuators shall be regulated accordingly and there will be an interface between the operation of the thermal actuators and the operation of the circulatory pump. The system flow circuit is not intended to completely close as the system is designed as a heat sink.

A failsafe operating arrangement shall be programmed into the operation sequence, so that the cashier area and 50% percent of the sales floor must remain open, with a minimum of 1/3 pump operation based on the system design flow rate. This is in order to maintain the systems heat sink.

Carrell (the BMS Supplier) shall be required to incorporate this requirement. The contractor is to ensure that they are provided with the operating details of any specific installation prior to installation.

Integrity Testing

Before the concrete slab is poured, the pipe coils should be subjected pressure test according to BS EN 15377. The test pressure must be twice the operating pressure or at least **4 bar**.

The integrity and the test pressure of all pipe coils must be checked before and during concrete and documented. **Spot checks are not sufficient.**

A specialised system installation engineer must be present during concrete pouring so that any damage can be rectified immediately.

Prior to commissioning, the system must be subjected to a final integrity test according to the official contract procedure for building works (DIN 18380) with operating medium and a minimum test pressure of 1.3 times the operating pressure at any point of the system or at least **1 bar**.

Project Management

The specialist contractor must allow for the provision of suitably qualified engineers to ensure the complete design in accordance with

BS EN 15377-1 and

BS EN 15251, installation and commissioning of the Quattro in slab system.

System to be designed, supplied, installed and commissioned by the specialist contractor;

Uponor LTD. The Pavilion, Blackmoor Lane, Watford, WD18 8GA

Contacts:

James Griffiths – Head of Special Projects Tel: 07973 234 258 : james.griffiths@uponor.com

David Kington – Contract Manager Tel: 07971 540 742: david.kington@uponor.com



Uponor MLCP (Multi-Layer Composite Pipework) for the Over-door Heater installation

Multi-Layer composite pipe consisting of a lap-welded aluminum (100% oxygen proof) diffusion barrier; with an inner layer of polyethylene with a minimum roughness $k=0.0004\text{mm}$ ensuring a lower pressure loss and an outer layer of polyethylene all having high temperature resistant polyethylene in accordance with DIN 16883 and diffusion tight exceeding the requirements of DIN 4726.

All pipes to have full WRAS scheme approval
Approval numbers:

WRAS Approval Number: 1102036

RTM (Click-fit) range of push-fit and BSP threaded fittings for use with Uponor PE-RT/AL/PE-RT MLCP.

WRAS Approval Number: 1102044

Riser System with press fittings and brass bodies for use with Uponor PE-RT/AL/PE-RT MLCP.

WRAS Approval Number: 1111077

Press-fit fittings with a PPSU or brass body for use with Uponor PE-RT/AL/PE-RT MLCP.

Pipe is supplied in coils in sizes from 12-32mm or in straight lengths in 3 & 5m bars for sizes from 16-32mm (in 3m bars) and 16-110mm (in 5m bars) as necessary to your job requirements.

Operating Conditions

The Uponor 25 year guarantee shall covers domestic and commercial building services applications for Uponor MLC pipe and fittings, including:

- Heating & Cooling systems and fan coil installations where the water temperature does not continuously exceed 80°C , or momentarily exceed 95°C (no more than 100 hours a year), and maximum operating pressure of 10 bar. Also, the system must be installed with room and water temperature controls in accordance with the current Building Regulations Parts L1 (Energy – Dwellings) and L2 (Energy – Non Dwellings) for England and Wales, or an equivalent national standard for Scotland or Republic of Ireland.
- Hot water services installations where the water temperature does not continuously exceed 70°C , or momentarily exceed 95°C (no more than 100 hours a year), and maximum operating pressure of 10 bar.
- Cold water services installations, including riser pipe work, where the maximum operating pressure does not exceed 10 bar. Boosted cold water systems should incorporate adequate surge suppression equipment where there is a risk of damage caused by hydraulic surges or water hammer.

These systems and equipment shall be installed in accordance with manufacturer's installation instructions and complying with the relevant local and national regulations.

Fittings

Press Fittings – Metal press (plated brass with aluminium press sleeves) in sizes 12-50mm.

Press Fittings – PPSU press (PPSU with stainless steel press sleeves) in sizes 16-50mm.



Modular riser – Metal press fittings (plated brass) used in conjunction with precision engineered base fittings (plated brass) and unique locking pins. Modular design allows for compact connections, especially suitable for riser applications. For pipe sizes 63-110mm.

The MLCP fittings product range includes all common plumbing configurations (e.g. reducers, elbows, tees etc) as well as male and female threaded adaptors, compression adaptors and copper adaptors.

For large diameter pipe work 40-63mm metal press fittings with stainless steel pressure sleeves will be used and for pipe sizes of 63mm to 110mm the modular fittings range will be used.

Uponor RTM fittings are intended for the jointing of Uponor MLCP in sizes 16mm - 32mm (where the size refers to the outside diameter of the pipe).

Fixings

Fitting and equipment connections as well as the connection of measuring and control devices are to be installed torsion-free. All pipes are to be installed in such a manner that the thermal length variation (temperature change) is not obstructed.

No trays may be used if UPONOR MLC pipes are installed open on the ceiling with clips. The following table represents the maximum mounting distance “L” between the individual pipe clips for different pipe dimensions.

Pipe dims, OD x s (mm)	Maximum mounting distance between pipe clips, L			Pipe weight with 10°C water filling and without insulation	
	Horizontal Coil (m)	Straight (m)	Vertical (m)	Coil (kg/m)	Straight lengths (kg/m)
12 x 1.6	1.2	-	1.7	0.128	-
16 x 2	1.2	1.6	1.7	0.218	0.231
20 x 2.25	1.3	1.6	1.7	0.338	0.368
25 x 2.5	1.5	1.8	2	0.529	0.557
32 x 3	1.6	1.8	2.1	0.854	0.854
40 x 4	-	2	2.2	-	1.31
50 x 4.5	-	2	2.6	-	2.062
63 x 6	-	2.2	2.85	-	3.265
75 x 7.5	-	2.4	3.1	-	4.615
90 x 8.5	-	2.4	3.1	-	6.741
110 x 10	-	2.4	3.1	-	9.987

Type and distance between the pipe fastenings is dependent on the pressure, temperature and medium. Dimensioning of the pipe supports is to be determined from the total mass (pipe weight + medium weight + insulation weight) in accordance with generally accepted rules of technology. It is recommended to set the pipe supports, if possible, in the proximity of the fitting and connections.

Pipe Bending

12 – 32mm OD MLCP can be formed into a bend by hand, by bending spring or with a bending tool. Bending Radii must not be less than those specified in the table below. OD = outside pipe diameter & s = pipe wall thickness.



Pipe dims, OD x s (mm)	Bending radius by hand (mm)	Bending radius with internal spring (mm)	Bending radius with external spring (mm)	Bending radius with Uponor bending tool (mm)	Bending radius with REMS bend- ing tool (mm)
12 x 1.6	(5 x OD) 60	(4 x OD) 48	-	-	-
16 x 2	(5 x OD) 80	(4 x OD) 64	(4 x OD) 64	46	-
20 x 2.25	(5 x OD) 100	(4 x OD) 80	(4 x OD) 80	80	-
25 x 2.5	(5 x OD) 125	(4 x OD) 100	(4 x OD) 100	83	-
32 x 3	(5 x OD) 160	(4 x OD) 128	-	111	-
40 x 4	-	-	-	-	160
50 x 4.5	-	-	-	-	200
63 x 6	-	-	-	-	252

The pipe will be secured and located in accordance with the Uponor standard installation detail, this will include copex type covering for pipes passing across expansion joints and for pipes transiting one zone to another.

Prior to contract completion/hand over

During the heating season, the contractor shall ensure that the underfloor system installation will be online a min of 3 weeks prior to handover.

DOSING POT

Supply and install, generally as shown on the drawings, a chemical dosing pot. The unit to be provided with 20mm connections to the heating system pipework, and be complete with all isolation valves, as recommended by the manufacturer and required for correct operation.

LPHW CIRCULATION PUMP

The mechanical contractor is to provide the circulation pump. This is to be located externally and concealed in a weather proof enclosure.

The pump will be manufactured by Grundfos Model = **MAGNA3 40-150F 230v**

With a duty of **1.8Kg/s @80kPa**

The pump will be located on the return pipe and will come complete with an inline commissioning station, flushing bypass loop for pipe work cleaning/flushing and an inline Spriotech dirt separator ref BE050LM.

The pump will have a permanent power supply and the CAREL panel will provide stop/star and fault indication.

PRESSURISATION SYSTEM

Supply and install, generally as shown on the drawings, the following pressurisation system;

- Pisces Pressurisation system
- 24 litre Expansion Vessel

The unit to be fed with a 15mm MCWS connection incorporating all isolation valves, safety valve, water main protection valves etc. as recommended by the manufacturer and required by local water regulations.

The system is to be provided with 20mm connections to the heating pipework.



BURSTING DISCS

Supply and install two bursting discs, one on the flow, one on the return

These are to be located externally as close to the refrigeration packs as practically possible on the heating flow and return pipe work.

The discs are to be manufactured by Assentech or equal and approved and will be 25mm SRA (FS) continental rupture disc in a 1000 PSIG max RVI tite seal holder.

Each disc is to be rated to burst at 6bar pressure and come complete with an isolation valve to allow repair and replacement.

Each disc is to be installed in accordance with the manufacturers recommendations.

Assentech Ltd

Mount Pleasant Farm, Gorran, St Austell, Cornwall, PL26 6LR

Tel 01726 844707

CASHIERS ROOM COMFORT COOLING / HEATING UNIT

Supply and install into the Cashiers Office a wall mounted heating/cooling unit, exact location to be agreed on site.

The external air cooled condensing unit is to be mounted on a paving slab located adjacent the plant room wall and next to the welfare area exit door, exact location to be agreed on site and the contractor is to allow for a security cage.

The interconnecting pipe work, cables and condensate drain is to be run in the ceiling void above the cashier's office, exact route to be agreed on site.

The equipment shall comprise of;

1no. Fujitsu ASYG12LMCA 3.4Kw high wall mounted system, complete with hard wired controller

1No. Wired controller with lockable cover

1No. Modbus Interface

Remote controller with weekly timer: provides a 7-day schedule timer.

F-GAS Regulations

The mechanical services contractor is to comply with the requirements of the F-Gas regulations including systems with less than 3kg of charge. The necessary documentation shall be forwarded to "Corporate Property" at Aldi HQ, Holley Lane, Atherstone, Warks CV9 2SQ **within 2 weeks of handover**

Condensate Drain

From the cooling unit a condensate drain is to be taken into the ceiling void and run to drain at a convenient internal drain point to be agreed. If not local drain is available then the contractor will provide a suitable pump with safety interlock wired.

Installation Specialist

The Mechanical Services contractor shall include for the interconnecting refrigeration pipe work and cabling to be installed, piped and commissioned in accordance with Part 2 (M) and Part 2 (E) of the standard specification.

Control System

Description of System

The system is to be controlled by the BMS system and shall be supplied with a compatible mod bus to communicate with the BMS system.



The room controller is to be hard wired and enclosed in a lockable clear Plexiglas enclosure

The Mechanical Contractor is to include for the supply, installation and commissioning of the specialist control equipment and wiring. The Electrical Contractor will be responsible for the installation of all power wiring (10amp 1ph to the external unit).

Insulation

Description of Installation

The Contractor is to include for the insulation to be installed by an approved insulation specialist.

The areas to be treated are;

- a) All refrigeration pipework.
- b) All condensate pipework within ceiling voids
No duct covers, panelling or other concealment to be fixed until the insulation has been inspected and approved by the Services Consultant or his representative.
Please refer to Section 2 of the standard Specification for full details of insulation requirements.

VENTILATION FANS

Supply and install in the locations shown on the drawing, the small fans as detailed in the Schedule of Equipment.

Manufacturer – See Schedule of Suppliers, or equal and approved.

AHU INTAKE/DISCHARGE LOUVRES/COWLS

Fresh air intake and extract air discharge louvres/cowls are to be provided in the locations shown on the drawing. The louvres/cowls detailed in the Schedule are for tender purposes only and the contractor must confirm the actual available space with the Project Manager before ordering louvers of an equivalent face area. The Contractor is to allow for making connections to the louvers.

DUCTWORK

Ductwork within the ceiling void is to be of either rectangular section or spiral wound type of equivalent cross sectional area) to the R10 range of preferred duct sizes with suitable pre formed fittings and brackets as required. Elsewhere ductwork is to be of rectangular section.

Ductwork to comply generally with DW 142, and particularly with the following details:

ITEM	CIRCULAR	RECTANGULAR
Joints	Fig 76	Fig 41/42
Supports	25 x 3 split clip, min	Fig 142 min
Conns to Equipment	Fig 44	Fig 44
Strengthening	None (Min sheet 0,8 TK)	Fig 8A
Branches	Fig 100	Fig 62

BOTH

Access Doors	Double skin insulated
Turning Vanes	Aerofoil blades to be secured and adequately supported
Balancing dampers	Up to 150mm Single blade, over 150mm Opposed multiblade, with locking device in all cases.



Shut off dampers as balancing dampers, but with neoprene edge seals.

ANTI VIBRATION MOUNTINGS

Great care is to be exercised in preventing noise from the system entering the building. To this end the fan units are to be mounted on suitable anti vibration mounts. It is also recommended that the units are suspended.

SILENCERS

Supply and install as shown, duct size silencers to maintain a noise level within the sales area to reduce the noise breakout externally.
Manufacturer – See Schedule of Suppliers.

CROSS TALK ATTENUATOR

The air transfer duct between the corridor and into the cash room is to incorporate an anti-cross talk attenuator.

GRILLES, DIFFUSERS & WEATHER LOUVRES

Install grilles, diffusers and weather louvers generally as shown on the drawings and in accordance with the schedule.

Manufacturer – See Schedule of Suppliers.

DOOR AIR TRANSFER

Air transfer through doors shall be by “undercut” doors, provided by the door manufacturer.

SUPPORTS

Supports are to comply with DW142 and are to incorporate a resilient material to prevent metal to metal contact.
Grilles and diffusers are to be independently supported so that no additional weight is added to the ceiling/tile/structure

FLEXIBLE DUCTWORK

Any flexible ductwork is to be of the insulated type, with a maximum acceptable length of 500mm, and is to be securely fixed in accordance with the manufacturers recommendations. Flexible ducts shall be the same size as the metal ducts serving them. All metal ducts feeding a flexible duct shall terminate with a down turned bend, such that the flexible duct drop is substantially vertical.

FIRE DAMPERS

Supply and install fusible link fire dampers in the locations shown on the drawings. The fire dampers shall be installed and built into the structure such that the fire resistance equals that of the barrier it penetrates.



Manufacturer – See Schedule of Suppliers, or equal and approved.

ACCESS DOORS

The ductwork shall incorporate access doors in the following locations:

- At each side of all heating/cooling batteries.
- At each side of all filters.
- At each side of all attenuators.
- At each air flow sensor.
- At one side of each fire damper.
- At one side of each damper.
- At the base of any duct riser.

Note: This is the minimum amount expected.

SPARES

The Contractor is to provide and secure within the relevant fan section on the AHU, 1 No set of spare filters.

COMMISSIONING

2 weeks before handover the refrigeration contractor will take lead on the process of managing this stage of the project, the mechanical contractor will provide all assistance and specialist commissioning engineers to achieve this goal.

During the defects/warranty period the Refrigeration Contractor will be responsible for all reactive service callouts from the Heating and Refrigeration systems. The Refrigeration Contractor will be responsible for managing & resolving reactive service calls, in conjunction with the Mechanical Contractor.

8 MECHANICAL SERVICES

8.2.1 CONTROL SYSTEM

GENERAL DESCRIPTION

- Description of System
- BMS System
- Controls Information
- Control Panel Access Keys

The BMS System is to be served by a complete and comprehensive system of automatic controls.

CAREL BMS Panel Deliveries, commissioning and Installation:

The BMS solution is provided by CAREL



The Mechanical Contractor is to include for the supply, installation and commissioning of the specialist control equipment. The Electrical Contractor will be responsible for fixing all wall mounted equipment and the installation of all wiring in accordance with the Carel installation guide.

Equipment to be supplied and commissioned by Carel as listed in the Schedule of Suppliers.

The Mechanical Contractor will be responsible for taking delivery of all the control items and fixing pipeline and duct mounted equipment, and for providing the specialists wiring diagram to the Electrical Contractor. The Electrical Contractor shall install wall mounted equipment and undertake all the wiring to BMS panels (including the indoor panel and ancillaries). All the cables are to be terminated inside the panel and wired into the labelled terminal blocks. (Full list of terminal blocks is available on BMS panel drawing which will be included within each panel). The CAREL control specialist will undertake the commissioning upon completion of the wiring. CAREL will not take responsibility if the commissioning is delayed due to poorly installed or unfinished wiring.

On completion of installation the Control Specialist is to test out the BMS control wiring and set up and commission the whole of the control installation.

BMS SYSTEM

Panel

Main Control Panel 1000 h x 600 w x 250 d, this currently under review and additional space should be allowed for.

The Control Panel shall be fitted with:

1. Defeatable isolator inside the panel
2. Internal pocket for wiring diagram
3. Permanent fuse chart

Retail area panel (Indoor panel)

Installed inside the retail area, preferably in the middle of retail area, behind the false ceiling. This panel require 5A fused spur

Car park panel (Outdoor panel)

Installed outside to measure day/night Lux, this panel can be installed on the roof area or any other suitable outside wall.

Fascia's to be in white traffolyte with black lettering laid out in accordance with and incorporate the features shown on detail drawing. Indicator lamps to be Telemecanique ZB2 range or similar and be of the colours shown on the drawing.

BMS System Features

- a) Occupancy time is 0600 to 2200 hours, seven days per week.
- b) The heat recovery ventilation (HRV) will operate 24/7 and in out of hours mode it will work in heat recovery only.



- c) Optimum start and frost protection via a single inside (sales area) and single outside detector and fan hold off stat.
- d) AHU to start at full recirculation until an average room temperature of 21°C is achieved. The damper assembly is then to run at 10% fresh air. "Free cooling" is to be provided (subject to frost protection of the heater battery) should room temperature exceed 23°C. This will necessitate the running of the main extract fan to achieve 100% fresh air circulation. Damper motors to be capable of driving a 15mm square shaft. The main extract fan should not normally run in 'winter' mode
- e) The mechanical contractor is to electrically commission the Carel inverter drive to the AHU. The unit is to be mounted adjacent the BMS control panel, and wired by the electrical contractor.
- f) AHU fan to "run-on" for 5 mins at "end of day" to provide heat dissipation
- g) On AHU fan air flow failure, the CAREL panel is to alarm
- h) AHU to return to full recirculation at end of day.
- i) Automatic Summer-Winter selection, which in "winter" enables the Arctic Circle valve. A summer/winter switch must not be provided.
- j) A one-hour extension to the heating and ventilation system operating period shall be initiated by a push button on the main control panel.
- k) Airflow switches for both the AHU fan and the main extract fan with indicator lamps on the panel to warn of failure. The airflow switches form part of the Carel BMS control package.
- l) A dirty filter pressure differential switch across the AHU filter with indicator lamp on the panel. The pressure differential switches form part of the Carel BMS control package.
- m) A dirty filter pressure differential switch across the heat recovery filter with indicator lamp on the panel. The pressure differential switches form part of the Carel BMS control package.
- n) The fire alarm system is to be interlocked with both the AHU and main extract fan such that in an alarm condition:
 - The AHU supply and extract fans stop
 - The AHU and main extract fans can be activated individually by switching to "manual" for smoke control duty.
 - Resetting of the fire alarm system will cause the AHU and main extract fan to resume normal automatic operation.
- n) Any control signal between fire alarm panel and the BMS panel shall be 24v only, 230v relays will not be allowed within the fire panel.

The control interface shall be provided by utilising a 24v dc supply emanating from the fire alarm panel. All switching shall also be within the fire alarm panel and shall provide a 24v dc controlled signal to the BMS panel to activate a 24v dc relay within the BMS control panel.
- o) Any BMS panel fault is to identified by the PVPRO alarm panel in the cash office.
- p) The refrigeration heat recovery system shall comprise of;



- Two terminals within the BMS control panel to provide a 0 – 10 v signal to the refrigeration pack heat reclaim control panel. Terminals to be labelled as 'Arctic Circle Valve'.
 - Control wiring between the refrigeration pack and the 0 – 10 volt terminals in the BMS control panel shall be supplied and installed by the refrigeration contractor.
 - Commissioning of the refrigeration heat reclaim system will be the subject of a co-ordinated meeting. The Mechanical Services contractor shall arrange a co-ordination meeting between the controls specialist and the refrigeration company when the controls specialist, and the refrigeration contractor shall re-commission their individual system with the heat reclaim system enabled.
- q) In the case of air quality sensors being installed, both damper positions will be controlled to manage the air quality requirements by the BMS algorithm. Air quality sensors are not part of the standard Carel BMS package, however they can be purchased separately from Carel (part number DPDQ502000).
- r) Control of retail area temperature is based on the average of 4 sensors installed within the retail space. All sensors and required panel form part of the Carel BMS control package. The sensors are to be wired by the electrical contractor.
- s) All the optimisation and energy saving features are built into the BMS panel. No third parties should alter any control algorithm via signal, BMS, digital or any other form of input.

CONTROLS INFORMATION

The controls specialist shall be required to provide the following documentation:

For information:

- Complete schematic diagram showing all items of equipment to be controlled, all items of control equipment and their interconnecting wiring.

All Terminals shall be uniquely identified by letter, number or combination thereof.

- Location plan showing the required location and means of fixing of each item of control equipment to be fixed by others than the Controls Specialist.
- Scale drawings of the control panel facia showing details of the face plate, switch and lamp locations etc. and the proposed lettering and wording to be provided to the face plate.

This information is to be submitted to the Consultant for information/comment only. The responsibility of ensuring the system operates as specified lies with the Controls Specialist.

Should the Controls Specialist require clarification of the system operating principle, he should obtain such, in writing, from the Consultant prior to production of the above information.

For O & M Manuals:

- Each of the drawings above revised to "As Fitted" status.
- Manufacturers' literature covering all the items of equipment utilised.



This information is to be made available to the Mechanical Services Contractor in the quantities necessary and on the time scale appropriate to enable the draft manuals to be provided 2 weeks before project completion.

CONTROL PANEL ACCESS KEYS

Provide 3 No control panel access keys each mounted on a plastic key fob identifying their purpose.

BREEAM Projects

Ene 04 – Low or Zero Carbon Energy Technology

Specifications for Low or Zero Carbon technologies utilised:

Potential specification upgrade of arctic circle system to achieve optional Excellent rating.

Specification of 'free cooling' system.



8 MECHANICAL SERVICES

8.2.2 INSULATION

GENERAL DESCRIPTION

- Description of Installation
- Pipe work
- Ductwork

DESCRIPTION OF INSTALLATION

The Contractor is to include for the insulation to be installed by an approved insulation specialist.

The areas to be treated are:

- All pipework except small bore pipe work where exposed within occupied rooms.
- All pipework in plant rooms.
- AHU supply air duct and fresh air intake duct.
- AHU return air duct.

No duct covers, paneling or other concealment to be fixed until the insulation has been inspected and approved by the Services Consultant or his representative.

PIPEWORK

On satisfactory completion of the hydraulic tests, all pipe work is to be cleaned and ironwork painted prior to the installation of the insulation in accordance with the following:

Exposed pipe work in rooms is to remain unlagged. All other is to be insulated with Koolphen bore coated rigid sections with mitred corners, cut to fit on site, or long fibre glass rigid sections, FRS950.

Finish – Class `O` faced.

Particular attention will be paid to insulation behind the toilet paneling.

SERVICE	SIZE	KOOLPHEN* THICKNESS	GLASSFIBRE* THICKNESS
Heating	Up to 50	20mm	40mm
HWS	Up to 42	20mm	32mm
TCWS	Up to 42	20mm	32mm
MCWS	Up to 42	20mm	40mm

* Or equivalent and approved by MEP

All sections are to be correctly bonded and fixed to produce a secure installation, in accordance with the manufacturer's recommendations.



Pipe work “lagged together” will not be accepted.

DUCTWORK

To be insulated with 50mm thick Mineral wool or Glass fiber Rigid Duct Insulation (for rectangular ducts), and 50mm thick Lamella Flexible blanket (for circular ducts), Class “O” faced (or equivalent and approved by MEP). The insulation to be bonded to the ductwork with a suitable adhesive in accordance with the manufacturers recommendations and be additionally secured in place with stick pins, or in the case of circular ductwork, chicken wire.

MECHANICAL SERVICES

8.2.3 PARTIAL HEAT RECOVERY SYSTEM

THIS IS NO LONGER A NORMALLY ACCEPTABLE SOLUTION . THESE CLAUSES ARE PRESENTED HERE TO DETAIL THE HEATING SYSTEM TO BE USED SHOULD THE ARCTIC CIRCLE CRITEREA NOT BE MET.

ALDI APPROVAL MUST BE OBTAINED TO USE THIS SYSTEM

The system will comprise a room sealed naturally aspirated gas fired air handling unit generating warm air to serve the retail space. The average temperature between 6:00am and 8:00pm of the retail space is to be maintained at 21°C and not lower than 16°C overnight. The Cashier and Staff Room will be heated by small electric panel radiators (by others)

GAS FIRED AHU

Provide and install, generally as shown on the drawings:

1 no.

- Reznor UK Ltd SDH073 gas fired high efficiency sealed combustion AHU rated at 71kW heat output, complete with integral power venting, cabinet enclosed centrifugal blower and all integral gas and safety controls.
- (1y) Long blower cabinet
- (2a) Natural gas
- (4d) Modulating 0-10v burner with GM44 interface board
- (5b) Heat exchanger SS 409
- Hand controls to suit direction of airflow
- (7a) Duct flange front 50mm
- (8k) 5.5kW 3 phase motor supplement
- (9a) Vertical flue and combustion air spigots
- (10j) 2” 50mm filter with G4 synthetic disposable filters
- (11b) Rear duct spigot connection
- (17a) Constant running fan relay (CRFR)
- (53f) Premium insulation for cabinets
- On coil 18.50°C
- S.A.T. 39 °C
- Electrical supply 400/3/50Hz
- Vertical or horizontal air discharge as shown on the drawing
- Horizontal return air connection



Duty; 10599m³/hr @ 350Pa + silencer Pd

Note:

1. Exact flue quantities, to route the flue as shown on the drawing, shall be determined by the Mechanical Contractor.
2. The Mechanical Contractor shall add the silencer pressure drops to figure shown above to obtain full external static requirements.

Generally, in accordance with Reznor quotation 09-04044-0401 Revision A dated 23.04.09, revised to date.

PARTIAL HEAT RECOVERY COIL

A Reznor Duct mounted 50kW refrigeration heat recovery coil is to be installed within the return air duct and be protected by G4 panel filters, generally as shown on the drawing.

- The refrigeration specialist will install the associated pipe work, but the mechanical services contractor shall allow to install the coil into the ductwork.

MAIN EXTRACT FAN (Partial heat recovery projects only)

Install generally as shown on the drawing;

1 No Extract fan, ref F1
Flakt Woods Accent 3 Model G8/760 box fan

- Extract Volume 2.88 cu.m/sec
- External Pd 283 Pa + AHU extract silencer
pd as advised by manufacturer
- Electricity Supply 400/3/50 Hz

Manufacturer – See Schedule of Suppliers.

Note: The speed controller must be vertically mounted, please ensure the Electrical Contractor is aware of this requirement.

8.2.3.1 GAS INSTALLATION

GENERAL DESCRIPTION

- Description of Installation
- Incoming Gas Supply
- Underground Pipe work
- Internal Gas Service
- Jointing
- Final Connections
- Provisional Sum



8.2.3.1 GAS INSTALLATION

DESCRIPTION OF INSTALLATION

The Contractor shall be responsible for the provision of a suitable gas supply. The work will comprise the provision of internal pipe work to serve the AHU. The gas meter, which is to incorporate an outlet gas cock, shall be provided by the local gas transport company, via Aldi's gas supplier.

Aldi's gas supplier is:

British Gas
Corporate Siteworks
Business Sales @ Cardiff
Helmont House
Churchill Way
Cardiff CF10 2NB

INCOMING GAS SUPPLY

The Consultant or Contractor will have made preliminary enquiries to the gas supply company. The Contractor shall, upon appointment, take over the responsibility for the ordering and progressing of the installation of the gas supply and U16 gas meter unless the gas company specified differently and to meet the construction programme.

The interface point between the infrastructure company and the gas supplier company is the gas meter outlet. The underground pipe work must be supplied by the infrastructure company and the gas company has to install the gas meter within the meter room.

UNDERGROUND PIPEWORK (CERTAIN PROJECTS)

The majority of projects have the gas meter located within the building. If, however the meter is shown in remote meter housing, the Mechanical Services Contractor is to allow for the installation of the underground pipe work from the meter to the boiler room.

The underground pipe work is to be run in yellow MDPE.

The Mechanical Services Contractor is to bring the Contractor's attention to the following requirements:

Pipe work is to be laid on a 100mm sand bed at a depth of 600mm, to the top of the pipe, and after testing is to be covered with a 100mm depth of sand before covering with selected backfill. Backfill to 250mm below finished ground level with selected soil, lay yellow warning tape (tape to read "DANGER – caution gas pipe below"), and backfill to ground level.

A spacing of 350mm from any water pipe is to be maintained.

All trenching and back filling is to be undertaken by the Ground Worker.



INTERNAL GAS SERVICE

The incoming gas pipe work is to penetrate the building at 450 AFFL, 150mm from any corner and is to be laid to falls with plugged tees on the bottom of all drops to low level. The gas meter will be mounted at high level in the cleaner's room (unless shown otherwise). The gas pipe is to rise vertically, with no sets, to the gas meter. From the outlet side of the meter the pipe is to be routed as indicated on the drawing.

No gas pipe work to be run in ceiling spaces or other enclosed voids, unless otherwise specifically indicated on the drawings.

Supply and install into the gas main adjacent the gas meter a 50mm gas solenoid shut off valve with 1no. thermal link and 1no. remote emergency gas knock off button mounted adjacent to the plant room exit door. Valve to be suitable for 240v AC operation and shall auto reset on restoration of power.

Valve to be wired (by others) so as to close on:

- Fire Alarm
- Activation of knock off button
- Activation of the thermal link
- Mains Failure

JOINTING

All screwed joints are to be made with approved jointing compound such as Single Wrap or Permarite GT or equal and approved. PTFE jointing will not be permitted.

FINAL CONNECTIONS

The Contractor is to allow for making all final gas connections, each to incorporate an isolating valve.