

SECTION FOUR: MECHANICAL WORKS

PARTICULAR MECHANICAL SERVICES PROVISION

4.01 Introduction

The mechanical services installation includes for the supply, erection, connection, testing and commissioning of all materials.

This element of the works generally consists of, but is not necessarily limited to, the following:

- Installation of an Air Source Heat Pump (ASHP) system, including external and internal units and all interconnecting pipework, cabling and systems.
- Plant room installation including ASHP system controllers
- Installation of under-floor heating pipework and ancillary equipment, including manifolds, interconnecting pipework and all necessary controllers and sensors.
- Installation of a warm air curtain and associated controllers/contacts
- Mains cold water extension from the existing school building to serve the proposed works.
- Mains cold water installation within the proposed building.
- Installation of localised point of use electric water heaters.
- Thermal insulation / pipe decoration to all pipework.
- Extract ventilation works.
- Builders work associated with services.
- Pre commissioning and cleansing.
- Testing and commissioning.
- Provision of record documentation.

4.02 Design Criteria and Operating Parameters

The mechanical services fit out works are to be installed to operate within and achieve the following conditions:

Internal Design Temperatures:

Winter	Classrooms	21 °C ± 2 °C
	Corridors	19 °C ± 2 °C
Summer		22 °C ± 2 °C

External Design Temperature:

Summer / Winter 29 °CdB 19 °CwB/-2 °C100% sat.

HTG pipework (above ground) - Copper tube to BS2871, Part 1 Table X. Joints to be capillary made using lead free solder and acid free flux.

HTG pipework (under-floor) - Polybutylene pipes with EVOH oxygen barrier to Class S of BS EN 7291 BS7291.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

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|--------------------------|---|---|
| MCWS pipework (internal) | - | Copper tube to BS2871, Part 1 Table X. Joints to be capillary made using lead free solder and acid free flux. |
| MCWS pipework (external) | - | Unplasticized MDPE to BS3505 |
| Refrigerant pipework | - | Copper tube to BS2871, Part 2 designated C106. Internal bore cleanliness to BS2871Part 2 Section 19 |
| Condensate pipework | - | Unplasticized MDPE to BS3505 |
| Pipework sleeves | - | All pipework through the structure shall be sleeved with a similar oversized material as the service to allow for movement. |

Unless otherwise stated in this Specification, the installations shall confirm to current requirements of the following:

- a. Latest relevant BS Standards and Codes of Practice
- b. Workplace (Health, Safety & Welfare) Regulations
- c. Local Authority Regulations and By-Laws
- d. Electricity Supply Regulations
- e. Statutory Authorities/Undertakers By-laws, Regulations and Recommendations
- f. CIBSE Guides and Commissioning Codes
- g. IEE Regulations 17th Edition including all the latest amendments
- h. Local Water Authority By-laws
- i. The Electricity at Work Regulations 1989
- j. All current Technical Memoranda
- k. Building Services Research and Information Association Guides and Technical Memoranda

Obtain an understanding of the above and ensure that the installations comply in all respects.

If compliance with the design or Specification may result in non-compliance with any Regulations or Codes of Practice when systems are installed or in operation, the CA must be informed.

Submission of a tender will be taken as confirmation that the completed installation will comply with all the Regulations listed or referred to in the Specification.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

4.03 Drawings

The tender drawings referred to in this Specification have been prepared for tendering purposes only.

The Contractor shall be responsible for preparing fully co-ordinated working drawings necessary for the successful co-ordination of all items covered by this specification and any additional work specified under variation orders issued during the progress of the works. All drawings will be subject to the approval by the CA.

The cost of preparing all drawings shall be included in the tender price.

4.04 Schedule of Rates and Quantities

For the purposes of pricing variations the Contractor shall, within 5 working days of its request, provide three copies of a fully priced schedule of rates and quantities.

The prices shall be the installed cost to the Employer, including materials, labour, carriage, overhead, supervision, profit, etc. and shall be used for costing variations for work of similar character executed under similar conditions as far as may be reasonable.

The Schedule shall include every item on which the Tender is based and each item shall be priced to show unit rate.

Lump sums and average will not be accepted. The sub-total and totals must agree with the sum inserted in the Summary of Costs.

4.05 Description of Works

The project consists of the installation of mechanical services to the proposed extension to the school. This will consist of an air source heat pump to provide heating/cooling to the proposed building via an under-floor heating installation. The project also consists of all associated controls, thermal insulation, external works and testing / commissioning as part of the installation. Cold water provisions are to be provided from an extension of the mains cold water supply serving the existing school building, while hot water provisions are to be provided by point of use electric water heaters. Mechanical extraction is to be supplied to W.C. areas of the proposed extension.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

4.07 External Works

4.07.1 **Cold Water Mains**

The contractor is to include for the supply, delivery, installation, testing and commissioning of the following (to be read in conjunction with tender drawings 4282-M01 & 4282-M02):

To run a new 28mm mains cold water supply (MCWS) connection from the existing riser located within the Store as indicated on the tender drawings, within the suspended ceiling in the existing building. These works will be disruptive to the school, as isolation can only be achieved at the entry point into the existing building. The internal works associated with extending the MCWS will therefore need to be undertaken during a period of inactivity at the school (i.e. during a 'half term' period, evening or weekend).

The contractor is to undertake initial pressure tests prior to the modification of any MCWS pipework to ensure that adequate water pressure can be achieved to reach the proposed extension works and meet all water demands required by proposed specified fittings. All water pressure test results are to be supplied to the CA for discussion and approval.

If it is deemed that insufficient pressure exists to suit the proposed works, then the Contractor is to allow for the installation of a booster pump system within the existing cold water storage tank housing, before running the proposed 28mm MCWS pipework within the existing ceiling void. This item and its installation must be priced separately to allow its removal from the contract if not required.

The booster pump system is to be a DutyPoint Systems (01452 300592) unit and comprise of the following equipment:

1no. ScubaTank VX230-407 (incorporating insulated tank and lid, submersible pump, pressure valve, non return valve, discharge connection and power lead)

The Contractor is to include for any support frames, mounting and/or anti-vibration fixings needed to meet the supplier's installation requirements, and the supply and fixing of same.

The extended MCWS to the proposed classroom block is to run within a trench in a position as indicated on the tender drawings.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

4.07.2 Air Source Heat Pump (ASHP) System

To be read in conjunction with tender drawing 4282-M03 & M04:

The Contractor shall be responsible for the supply, delivery, installation, testing and commissioning of the complete air source heat pump system including control wiring and provision of insulation, as detailed by the manufacturer and detailed below.

The installation of the following equipment shall be by an approved Mitsubishi Electric Air Conditioning installer. Both the specialist refrigeration installers and Mitsubishi Electric Air Conditioning shall carry out witnessing of the commissioning of the refrigerant system and all final connections.

The Contractor shall provide all system inter-connecting controls wiring, refrigerant and chilled/heating pipework. Cable and pipework are to be concealed either above the ceilings, within void and ducts, contained within the building fabric or below ground. The contractor shall provide all necessary design, drawing and calculations as needed to complete the proposed installation.

The system comprises of the following equipment, all to be supplied by Mitsubishi Electric Air Conditioning (01689 8810330).

Internal Units:

1no. PWFY-P100VM-E-AU VRF Water HEX Unit
1no. PAR-W21MAA-J Remote Controller

External Units:

1no. PUHY-P200YHM-A R410A Outdoor Unit

External units are to be installed on a concrete base in an enclosure as detailed on the tender drawings.

Internal units are to be floor standing within the Plant area.

All condensers shall be mounted on resilient mountings in such a manner that the plant supports are isolated from the floor or structure.

All rotating plant shall be statically and dynamically balanced.

Mechanical vibration shall be practically eliminated by the use of anti-vibration mountings, spring hangers and flexible connections to ensure an amplitude of vibration damping efficiency in excess of 95% from the building structure.

Mountings to be 'Unistrut' and anti-vibration pads to be 'Teco' pads or similar approved.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

All possible steps shall be taken (e.g. by the use of sound insulation, anti-vibration mountings and careful selections of fans, ducts, bends, dampers, grilles and other equipment) to reduce the noise produced by the equipment.

The contractor shall include for a one year maintenance contract (from practical completion) to cover all the above equipment and installation, with guaranteed maximum 24 hour response time. The contractor shall ensure that the warranty and maintenance contract he provided is underwritten by Mitsubishi Electric Air Conditioning.

All external refrigerant pipework routes are to be as indicated on the tender drawings. Refrigerant pipework is to be 12mm copper tube to BS2871 within trench.

All pipework within the trench is to be fully insulated along its entire length, and be in accordance with BS.6700, BS.5422 and BS.5970. Insulation shall be generally phenolic foam CFC free rigid sections as manufactured by Kooltherm Insulation Products Ltd, or equal approved type Koolphen K. All pipework shall also be wrapped in 'Armaflex' Outdoor Insulation tape, or similar approved.

Pipework trenches shall be approximately 500mm in depth, complete with corrugated MDPE ducting.

Approval shall be sought from Mitsubishi Electric Air Conditioning specialist upon completion of external ductwork, pipework and insulation prior to closing of trench works.

4.08 Internal Works

4.08.1 Under-Floor Heating Scope of Works

To be read in conjunction with tender drawing 4282-M03:

The Contractor shall be responsible for the supply, delivery, installation, testing and commissioning of the complete under-floor heating system including control wiring as detailed on the tender drawing:

The contractor is to supply and fit Wavin Osma 'Pocketed Polystyrene' under-floor heating system, all as per Section 3 of the main specification.

Each Under Floor Heating (UFH) room/area shall have an independent thermostat (Wavin Osma UFH 12V programmable thermostat – ref: 52UH173) to control actuators on the UFH headers. There shall also be a connection to a central control centre (Wavin Osma UFH 12V Control Centre – ref: 52UH108), installed within the Plant area, as provided by the UFH supplier. Wiring between the room thermostat and control centre is to be undertaken by the Contractor.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

Under-floor heating zones are to have individual 4 port manifolds installed as indicated on the tender drawings (Wavin Osma Tigris 3 port manifold – ref: 68UH004). Contractor is to liaise with the specialist supplier to co-ordinate all on site works that may be required as part of the installation process.

The manifolds will be provided complete with Wavin Osma isolating and regulating valves (ref: 47UH019), temperature gauges (ref: 47UH750), pump sets, air vents, drain cocks, wall brackets with rubber isolating inserts and flow indicators. The contractor is to include for the 'Unistrut' support frames and the supply and fixing of same, all co-ordinated with the under-floor specialist. All manifold are to be boxed in to suit Architects specification.

The pipes shall enter the floor screed surrounded by 200mm long corrugated sleeve, 100mm of this shall remain exposed once the screed has been laid.

The under-floor heating pipework must be 16mm polybutylene or polyethylene tube with EVOH oxygen barrier to Class S of BS EN 7291. The pipe work must be covered by a 50 year guarantee, be fully recyclable and conform to the environmental policy submitted. Maximum length of pipework to be 120m.

Under-floor pipes shall be laid in a serpentine pattern, with 150mm centres within the classrooms and 300mm centres within the corridor areas as shown on the tender drawings, starting at the external facades of rooms, or as indicated. This is to ensure maximum comfort levels by means the areas of highest loss receiving the most heat.

During laying of the insulation and pipework, areas where foot traffic or other works occur shall be boarded out with at least 5mm thick plywood sheets (13mm if traffic is heavy) to protect the installation from damage prior to the screed being laid. Care should be taken not to damage the works when laying the sheets themselves.

Joints in the slab, screed or in any under-floor heating installation are not permitted. The under-floor heating circuit loops must be installed in one continuous length without any joints. In the event of accidental damage to the pipework post installation the pipework circuit must be replaced in its entirety. The under-floor pipework must be fully inspected and certified as pressure tested and joint free by the CA prior to laying of screed.

Upon completion, the system will be filled with water and pressure tested to 2.5 bar (being twice the normal system working pressure). The system will be left under pressure test until the screeding process is completed.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

All components for the under-floor heating system, as detailed above, shall be supplied by:

OSMA Underfloor Heating
Wavin UK (Holdings) Ltd
The Dart Buildings
Grenadier Road
Exeter Business Park,
Exeter
EX1 3QF.
Tel: 01392 444 122

The Contractor is to confirm with the specialist supplier as to all ancillary articles that may be required to facilitate the installation of the underfloor heating system.

A distribution schematic of circuits shall be mounted in the Plant Room in a frame with polycarbonate glazing.

4.08.2 Circulating Pump Scope of Works

To be read in conjunction with tender drawing 4282-M03:

The Contractor shall be responsible for the supply, delivery, installation, testing and commissioning of the complete circulatory system including control wiring as detailed on the tender drawing:

The Contractor shall allow for 1 no. Grundfos UPSD32-120 variable speed run/standby pump complete with connections and isolating valves located within the Plant area. Refer to heating system schematic on drawing 4282-M04 for details.

Manifold circulation pumps are to be provided by the supplier of the UFH system as part of the manifold arrangement.

The UFH circulation pumps shall be variable speed pumps and operate on a constant pressure curve to compensate for the opening and closing of the system actuators.

The contractor is to allow for all associated works, including pipework and interconnecting wiring to connect the pumps to the heating system and control panel.

All pumps are to be provided by:

Grundfos Pumps Ltd
Grovebury Road
Leighton Buzzard
Bedfordshire LU7 4TL
Telephone: 01525 850000

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

4.08.3 Pressurisation Vessel Scope of Works

To be read in conjunction with tender drawing 4282-M04:

The Contractor shall be responsible for the supply, delivery, installation, testing and commissioning of the complete pressurisation system including control wiring as detailed on the tender drawing:

The Contractor is to install 1 no. DutyPoint Quantum Plus pressurization c/w 1no. 80 litre expansion vessel as per the tender drawings, to be floor mounted within the proposed Plant area. The expansion vessel and pressurization unit shall be mounted on resilient mountings in such a manner that the plant supports are isolated from the structure.

Expansion vessel and pressurisation set to be supplied and installed by:

DutyPoint Systems,
Shepherd Road,
Gloucester,
GL2 5EL
Tel: 01452 300592

4.08.4 Heating Distribution Pipework Scope of Works

To be read in conjunction with tender drawing 4282-M04:

The Contractor shall be responsible for the supply, delivery, installation, testing and commissioning of the heating distribution system including provision of insulation, as detailed on the tender drawing:

The Contractor is to supply all roof level distribution copper distribution pipework as indicated on the tender drawings, including all valves and fittings as deemed necessary. All pipework is to be concealed within the ceiling void.

All pipework drops are to be fully boxed in with access panels for maintenance and commissioning purposes.

Heating pipework is to be fully insulated, automatic air vents (AAV's) are to be installed at all high points within the system and drain points installed at low points of the system.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

4.08.4 Warm Air Curtain Scope of Works

To be read in conjunction with tender drawing 4282-M03:

The Contractor shall be responsible for the supply, delivery, installation, testing and commissioning of the warm air curtain heating system including control wiring and provision of insulation, as detailed on the tender drawing:

The Contractor is to supply 1 no. Dimplex CAB15E electrically operated wall mounted warm air curtain as supplied by Dimplex (0845 600 5111), complete with all necessary controls and mounting brackets above the main entrance to the proposed extension as shown on the tender drawing. The warm air curtains shall be activated by door-switches linked to an over run timer initially set to 5 minutes. All door switches are to be wired flush mounted. Door contacts are to be provided by the approved security specialist – refer to Electrical Specification for details.

4.08 HWS Scope of Works

To be read in conjunction with tender drawing 4282- M02:

The Contractor shall allow in his tender bid for the design, supply, delivery, installation, testing commissioning of the complete hot water service scope of works as detailed on the tender drawing:

Installation of the following electric point of use water heaters:

Classrooms 1 & 2:

Heatrae Sadia Multipoint 30V wall mounted water heater to be installed within Plant area. Unit to come c/w 2no. thermostatic blending valves to serve 2no. sink units

Multipoint 30V – Product code: 95:050:152
Thermostatic blending valve (2) - Product code: 95:970:354

Insulated hot water service from water heater to run at low level within the Plant area to feed sink units within Classrooms 1 & 2. Blended water to be provided to each outlet via thermostatic blending valve located beneath benching forming each sink unit.

Pipe connection sizes:

Cold inlet to water heater - 15mm copper connection
Hot water outlet - 22mm copper connection

Classroom 3:

Heatrae Sadia Hotflo 10 water heater c/w thermostatic blending valve, expansion vessel and pressure relief valve to be located beneath the benching forming the sink unit.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

Hotflo 10 –	Product code: 95:050:148
Thermostatic blending valve -	Product code: 95:970:354
Expansion kit -	Product code: 95:970:356
Pressure reducing valve -	Product code: 95:970:352

Blended hot water service from water heater to run at low level within/behind the benching to directly feed sink unit

Pipe connection sizes:

Cold inlet to water heater -	15mm copper connection
Hot water outlet -	15mm copper connection

Classroom 4:

Heatrae Sadia Hotflo 10 water heater c/w thermostatic blending valve, expansion vessel and pressure relief valve to be located beneath the benching forming the sink unit.

Hotflo 10 –	Product code: 95:050:148
Thermostatic blending valve -	Product code: 95:970:354
Expansion kit -	Product code: 95:970:356
Pressure reducing valve -	Product code: 95:970:352

Blended hot water service from water heater to run at low level within/behind the benching to directly feed sink unit

Pipe connection sizes:

Cold inlet to water heater -	15mm copper connection
Hot water outlet -	15mm copper connection

Disabled W.C.:

Heatrae Sadia Hotflo 10 high level wall mounted water heater c/w thermostatic blending valve, expansion vessel and pressure relief valve to feed wash hand basin.

Hotflo 10 –	Product code: 95:050:148
Thermostatic blending valve -	Product code: 95:970:354
Expansion kit -	Product code: 95:970:356
Pressure reducing valve -	Product code: 95:970:352

Blended hot water service from water heater to run at low level to directly feed sink unit

Pipe connection sizes:

Cold inlet to water heater -	15mm copper connection
Hot water outlet -	15mm copper connection

Allow for all associated works including pipework, valves, etc. All equipment to be installed in strict accordance with manufacturers recommendations.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

The Contractor shall supply, install and commission thermostatic blending valves in strict accordance with the manufacturer's instructions to all hot water outlets.

Thermostatic blending valves shall be tamperproof and shall be as supplied by Heatrae Sadia with non-return valves and strainers on each inlet connection.

The valves shall be pre-set at the manufacturer's works to provide a maximum draw-off temperature of 43°C and the Contractor shall test the valves on site to demonstrate to the Contract Administrator that the maximum draw-off temperature is not exceeded under any conditions (including isolation of cold water supply). The Contractor shall adjust the locking mechanism of the valves on site as necessary to achieve the above requirements. The blending valves shall be positioned so as to be as unobtrusive as possible.

The Contractor shall agree the actual location and pipework arrangement for each heater with the Contract Administrator on site.

Isolating valves shall be provided to all hot water service outlets. All isolating valves are to be high quality stainless ¼ turn lever type with nitrile or EPDM seals. Provide drain points at all low points of the system.

Upon completion of the works, carry out pre-commissioning water cleansing and treatment as detailed within a later section.

Any holes within the fabric of the building present from installation of pipework to be made good.

4.09 CWS Scope of Works

To be read in conjunction with tender drawing 4282-M02:

The contractor shall allow for the following works to the CWS arrangement including the supply, delivery, installation, testing commissioning of the service as contained within the tender drawings:

Provide new 28mm dia. incoming cold water as detailed on the drawing and above external works description to serve the cold water requirements to the proposed extension works. As the service enters the building provide a drain cock, a double non-return valve and water isolating valve.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

The incoming cold water pipework is to enter the building within the Plant area. Cold water pipework is to run within service boxing within the Plant area to rise to above ceiling distribution runs to serve 4no. water fountains, 4no. sink units, 1no. wash hand basin, 1no. W.C. and associated water heaters as indicated on the tender drawings. Pipework drops to outlets are to be as indicated on the tender drawings to suit Architects layouts.

The Contractor is to provide 1no. 15mm CWS L/L connection to the proposed Dutypoint Systems Quantam pressurisation unit and associated 80 litre expansion vessel to be installed within the Plant area.

The Contractor is also to provide 1 no. Permadrip irrigation system, as supplied by Access Irrigation Ltd (01788 823811), complete with drip line, pump and tank set. A 15mm CWS copper connection is to be made available to allow connection of the Permadrip unit. A 15mm CWS connection is to be made from the Permadrip unit to rise to above ceiling level within the service boxing located within the Plant area for connection to the roof irrigation pipework.

Contractor is to liaise with manufacturer as to plant space requirements, connections and any other technical requirements deemed necessary prior to installation.

4.13

Ventilation Services Scope of Works

To be read in conjunction with tender drawing 4282-M03:

The contractor shall allow for the following works to the ventilation services connected with the above description and as contained within the tender drawings:

Install 1no. mechanical extract fan within the Disabled W.C. Extract fan to be ducted vertically to external to suit Architects specifications. Fan unit is to be wired to proposed lighting / PIR circuit, refer to Electrical drawing 4282-E01 for details.

Fan unit is to be installed with insulated rigid 100mm diameter ductwork upto the condense trap, and then insulated flexible ducting to outside. An external roof cowl will be required to suit the proposed 'green' roof layout (contractor is to liaise with roof installer as to exact requirements of roof cowl).

Fan manufacturer - Vent-Axia (0844 856 0590)
Fan description - VA Minivent SKT with timer
Product Code - 248810A

Extract fan unit to come complete with:

Condensing trap - Product code – 563516

SECTION FOUR: MECHANICAL WORKS

4.14 Automatic controls associated with mechanical services

The contractor shall allow in his tender bid to supply, deliver, install and commission the mechanical and associated electrical/control services as detailed on the tender drawings and referred to in this Specification.

The mechanical system comprises of the following equipment that will require controls systems:

- Air source heat pump systems
- Under-floor heating system
- Circulating pumps associated with the above systems

The air source heat pump units are to be controlled via a PAR-21MAA remote controller, as to be supplied by Mitsubishi Electric. The controller will have the ability to set full day / week programs for the operation of the heating plant, linked with an external remote weather compensated temperature sensor. Flow temperatures for both heating/cooling are determined by the weather compensator for winter and summer operations. The controller will provide the option to have the plant operated either via 8 programmable time functions during a day, or via desired temperature set points. The controller shall be mounted as part of the PWFY-P100VM-E-AU VRF Indoor unit.

The building is divided into 7 zones, each served by a manifold and pump set so as to provide under-floor heating, to be installed by Wavin Osma. The design water flow temperature is to be 45°C to provide a room temperature of 21°C, with a minimum external temp. of -2°C.

The underfloor heating system is to be controlled via 7no. digital touchpad room thermostats as supplied by Wavin Osma (ref: 52UH173), wirelessly linked to 1no. digital control centre installed within the Plant area (ref: 52UH108) to provide both heating and cooling to the proposed building. The control centre can be pre-programmed with 7 day time-clock functions and optimised start functions. The digital room thermostats provide the option to over-ride the settings from the control centre to allow the occupants full control of the level of heating. The digital controllers are linked to the actuators that form the manifold to control the temperature settings.

A control panel to accommodate the manual/automatic switching associated with the air source heat pump, under-floor heating controller and circulating pump shall be supplied and installed by Advanced Control Solutions. This panel is to be wall mounted in the Plant area and be light grey RAL 7032. All wiring and interconnecting programming is to be undertaken by Advance Control Solutions, including all commissioning and required testing.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

Control panel to be supplied and installed by:

Advanced Control Solutions
7 Bakersgate Courtyard
Ash Road
Pirbright
Surrey GU24 0NJ
Tel: 01483 237812

The control panels shall be divided into two sections, one for power and one for controls. The controls section shall be lockable using an approved key. The power section shall be door isolator interlocked. The power section shall not contain any items of equipment likely to be accessed during normal plant operation and maintenance.

The controls section shall incorporate a 13A RCD protected socket outlet supplied from the live side of the isolator to supply power for a laptop computer.

All exposed live electrical terminations and equipment within both power and control sections shall be shrouded against accidental contact. The panel shall be designed to provide a minimum of IP55 protection.

All control circuits shall be low voltage 24Vac and supplied from a transformer with a minimum rating of 200 VA. Field wiring should be wired individually from the control panel, the use of multi-core cables with joint boxes will not be permitted. Controls related equipment shall be wired via isolation terminals. MCB's shall provide protection for all fans, pumps and control circuits. Fuses shall not normally be used.

An MCB identification chart shall be supplied and permanently fixed in the section of the control panel housing the MCB's. A copy of the as fitted panel wiring diagram shall be located within the controls section of the control panel in a mounted document wallet. Fascia switches and indicators shall be identified with engraved Traffolyte labels. Switches to override automatic operation shall have the inscription 'Hand/Off/Auto'. The control panel shall have its designated asset number engraved on a yellow Traffolyte label.

The control panel will incorporate user friendly systems for the control of the internal environment whilst providing an uncompromised controls system package to meet the design criteria and zonal/area objectives.

The automatic controls system will be designed with energy considerations in mind to ensure that the plant and systems operate at optimum efficiency and ensuring that running costs are kept to a controlled and economic level.

The whole of the controls package associated with the mechanical services installation shall be installed strictly in accordance with the requirements of the 17th Edition of the IEE Wiring Regulations (including latest amendments) and the Standard Specifications.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

4.15 Thermal Insulation & Pipe Decoration

Thermal Insulation

Thermal insulation shall be applied to all heating, hot and cold water services in accordance with the Standard Specification, BS.6700, BS.5422 and BS.5970. This shall include all heating pipework not contributing useful heat. Insulation shall be generally phenolic foam CFC free rigid sections as manufactured by Kooltherm Insulation Products Ltd, or equal approved type Koolphen K. The manufacturers K Block pipe supports shall be used throughout to ensure continuity of vapour barrier and insulation coverings etc.

Insulation finishes shall be as follows: -

i) Concealed within Building

All heating/cooling and cold water services above suspended ceilings, in voids, ducts, roof spaces, service shafts and elsewhere where concealed shall be insulated with reinforced aluminium foil faced pre-formed rigid phenolic foam sections. Exposed ends of insulation shall be fitted with aluminium end caps.

ii) Within External Ducting

All external refrigerant pipework is to be insulated with phenolic foam CFC free rigid sections as manufactured by Kooltherm Insulation Products Ltd, or equal approved type Koolphen K. All pipework shall also be wrapped in 'Armaflex' Outdoor Insulation tape, or similar approved.

Pipe Decoration

All pipework that is exposed within the building, and is not to be insulated or concealed, shall be protected with 2 coats of gloss paint, of a colour to match the proposed skirting / walls / etc, to suit.

4.16 Builders Works

All builders work associated with the proposed alteration works are detailed within the main contract.

The contractor is to check all dimensions where specified on site prior to ordering any materials.

SECTION FOUR: MECHANICAL WORKS

4.18 Pre-Commissioning Cleansing and Water Treatment

General

Update existing pipe work systems whilst flushing, chemical cleaning and sterilising the new systems.

Flush new open and closed circuit systems through to remove the scale and debris collected within the systems. On completion of flushing, chemically clean, with the exception of domestic water systems.

Disinfect and sterilise new domestic water systems.

Dose new closed circuit systems on completion of the flushing and chemical cleaning operations with an agreed chemical treatment. Check level of any existing chemical, treatment and add additional treatment as necessary.

Provide a method statement covering all pre-commissioning works and subsequent water treatment. The statement is to cover each system and include details of the chemicals proposed. The method statement is to be submitted to the Engineer in sufficient time for comment before the work is carried out.

Flushing

Flushing and cleaning of new closed circuit water systems is to be carried out strictly in accordance with BSRIA Application Guide 8/91, latest edition.

All necessary strainers, test points, drains, vents and bypasses required to allow full compliance with the Guidance to be provided. The temporary flushing tank, pump and meter required for the process are also to be provided.

Open circuit systems are to be flushed through in section as necessary to thoroughly clean the system.

The contractor is to certify that all flushing has been properly carried out.

Chemical Cleaning

On completion of system flushing, all circuits, other than domestic water systems, shall be chemically cleaned, in accordance with BSRIA Application Guide 1/89, latest edition.

All chemical cleaning work, including draining, flushing and rinsing out the system shall be undertaken by a specialist company provided by the Contractor. Upon completion of the process, the specialist shall issue a certificate for each system confirming that it has been properly chemically cleaned and rinsed out in accordance with the above Guide.

SECTION FOUR: MECHANICAL WORKS

Disinfection and Sterilisation

Disinfection work shall be carried out in accordance with BS6700: Section 13 as a minimum standard.

New water pipes shall be sterilised before any system is brought into use. Before sterilisation, pipework, storage tanks and equipment shall be cleaned and flushed out to remove dirt and debris, such flushing being continued until the drain runs clear. Flushing shall be carried out in sections to ensure an adequate flushing velocity in all pipework.

Test Certificates

On completion of the above flushing, cleaning and sterilisation processes, the contractor is to have water samples analysed from each system to show final water quality. The test certificates shall be incorporated in the Operating and Maintenance Manuals.

On open circuit systems, the water samples shall be tested for bacteriological content to ensure that the water is of potable quality.

If the system fails to comply with the required standards, then it shall be re-treated as required by this Section and re-tested.

4.19

Testing and Commissioning

On completion of the works, carry out testing and commissioning of all systems affected by the works detailed within this specification and below:

- Complete heating system
- Air source heat pump refrigerant systems (to be tested and commissioned by Mitsubishi Electric specialist / installer)
- Hot and cold water systems
- Tests as prescribed in BS 7671 and the Guidance Notes published by the IEE.

Testing Records

Keep a systematic record of tests. Distribute records as indicated.

Commissioning shall be undertaken by a specialist commissioning contractor, who is to be a member of the Commissioning Specialist Association. All operatives are to be skilled in their relevant trades. This contractor is to advise on all aspects of commissioning.

Commissioning of systems to be in accordance with the following:

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

Apparatus and Instruments

Use Apparatus and Instruments detailed in CIBSE Commissioning Code B, Appendix B3.1. Apply tolerances defined in Appendix B3.2.

Measurement

Carry out measurements in accordance with CIBSE Commissioning Code C, Appendix C2.1.

Commissioning of the plant and equipment is in accordance with manufacturer's recommendations for setting them work.

Ensure all instruments used during commissioning have calibration certificates, which are within 3 months of the current date and are suitable for the system parameters being commissioned.

If commissioning should coincide with a seasonal period as it will be difficult to attain a full load and/or normal operation. The controls are then to be commissioned upon the best information available, and then recommissioned at a later date (during the defects liability period), when a suitable load and/or operational conditions are available.

4282: St. Margaret's Clitherow Catholic Primary School, Neasdon
Proposed Extension to Provide Teaching Accommodation

SECTION FOUR: MECHANICAL WORKS

Appendix - A

List of Tender Drawings

- 4282 – M01: Proposed Ground Floor Layout-
Mechanical Services within Existing School
- 4282 – M02: Proposed Ground Floor Layout-
CWS & HWS Services
- 4282 – M03: Proposed Ground Floor Layout-
Under-floor Heating & Ventilation Services
- 4282 – M04: Proposed Ground Floor Layout-
Heating Distribution Services & Schematic Layout

Appendix - B

Schedule of Preferred Manufacturers

- 1. Under-floor heating - Wavin Osma
- 2. Water heaters - Heatrae Sadia
- 3. Air source heat plant - Mitsubishi Electric
- 4. Extract fans - Vent-Axia
- 5. Irrigation system - Access Irrigation
- 6. Heating pumps - Grundfos
- 7. Pressurisation Unit - DutyPoint Systems

SECTION FOUR: MECHANICAL WORKS

COLLECTION	PAGE
	4/1
	4/2
	4/3
	4/4
	4/5
	4/6
	4/7
	4/8
	4/9
	4/10
	4/11
	4/12
	4/13
	4/14
	4/15
	4/16
	4/17
	4/18
	4/19
	4/20