Meath Heat Pump

Bundle 8

Volume A.2.3 Specification

Part 1 of 4: Project Particulars

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1 GENERAL INFORMATION

1.1 SITE LOCATION

The site locations are at 6 schools across Co Meath:

8.1 – SCOIL NA RITHE (GAELSCOIL NA RÍTHE)

Address:
Bóthar Dhroim Rí (Drumree Road),
Domhnach Seachnaill (Dunshaughlin),
Co. Meath,
Eircode: A85 D266

8.2 - OUR LADY OF MERCY NATIONAL SCHOOL, KELLS

Official Name (commonly used): Our Lady of Mercy Primary School
Address:
Navan Road,
Kells,
Co. Meath,
Ireland

8.3 – CASTLEJORDAN CENTRAL NATIONAL SCHOOL

Address:
Castlejordan,
Tullamore,
Co. Offaly,
Eircode: R35 NX94

8.4 – S N CÚIL AN MHUILINN (CULMULLEN NATIONAL SCHOOL)

Address:
Culmullen,
Drumree,
Co. Meath,
Eircode: A85 D212

8.6 – UGHTYNEILL NATIONAL SCHOOL

Address:
Ughtyneill,
Moynalty,
Co. Meath,
Eircode: A82 VW95

8.7 – ST OLIVER'S POST PRIMARY SCHOOL

Address:
Cavan Road,
Oldcastle,
Co. Meath,
Eircode: A82 RK76

1.2 DESCRIPTION OF THE PROJECT

The Meath schools Heat Pump Project is a part of the Pathfinder 2025 Programme which will target CO2 emission reduction and will assist the Department of Education and Youth to explore options and test various solutions. The objective of this heat pump programme is to install and evaluate a heating system where the heat pump is provided and designed to address a portion of the heating load while a high efficiency boiler makes up the remaining load. In addition to the heat pump installation, the scope will include control system works and a supporting / backup boiler as required. This approach will optimise the heat pump with supporting / back up heat from the high efficiency boiler. This will enable heat pumps to heat the school during frequent moderate heating season temperatures, where heat pumps operate most efficiently and enable the most effective use of the investment and minimise the running costs to the school. Where oil is the existing primary fuel, this will be removed and replaced by LPG to act in tandem with the heat pumps.

Each school has a different scope of works depending how the condition of the existing plant room equipment, boilers, pumps and headers. The extent of works on each site is as per the drawings.

1.3 DRAWING SCHEDULE

See Document Issue Sheet

1.4 PROJECT TEAM

1.4.1 The Employer

The Employer is Louth Meath ETB.

1.4.2 The Contract Administrator

The term Contract Administrator (CA) is used throughout this specification and his duties will be carried out by:

- the Engineer: ***Stephen Kernaghan, Semple & McKillop***

1.4.3 Design Team

- Building Services Engineer: ***Semple & McKillop Consulting Engineers, Castleblayney***
  Stephen Kernaghan
- PSDP: ***Semple & McKillop Consulting Engineers, Castleblayney***
  Síle O'Connor
- Quantity Surveyor: ***McGahon Surveyors, Dundalk***
  Patrick Beggs

1.4.4 Utilities

- Gas Supply: ***Flogas, Tom Wall (087-6865125)***
- ***ESB:*** ***Various***

1.5 DEFECTS LIABILITY PERIOD

The Contractor shall remain liable for any noted defects and latent defects which may arise from the Works for a period of 12 months from the date of Practical Completion. Contractual responsibilities in relation to the Defects Liability Period are detailed in the Conditions of Contract and in Part 2: General Responsibilities.

1.6 MECHANICAL WORKS

This document has been prepared using the Common Arrangement of Sections and this Mechanical Works Specification comprises the following:

- NBE 50: Removals & Building Works
- NBE 51: Heating Centre Installation
- NBE 54: Gas Installation
- NBE 58: Building Management System Installation

1.7 NOTE ON MECHANICAL SPECIFICATION STRUCTURE

Mechanical Specification: Part 1: Project Particulars contains information specific to this

project and shall be read in conjunction with the drawings and other parts of the specification i.e. Parts 2-4 included. For details on the required specific equipment technical specification, refer to Part 4: Equipment Schedules and also Part 1: Project Particulars and the drawings. Where an item of equipment is not specified within Part 1, Part 4 nor specified/indicated on the drawings, the materials specification described for those equipment elements in Part 3: Standard Clauses shall apply. The equipment schedules also reference Part 3: Standard Clauses for certain materials and in general, Part 3 clauses shall apply for any item not specified elsewhere. Part 3 workmanship clauses shall apply throughout unless stated or specified otherwise in Part 1 or on the electrical drawings.

In the event that an apparent contradiction exists between any of the specification parts or between any of the specification parts and the drawings, this shall be addressed in writing to the Employer's Representative during the tender period for clarification. If an apparent contradiction is not identified during the tender process, then it shall be at the discretion of the Employer's Representative to identify which document or clause takes precedence. Claims raised post-tender in relation to apparent contradictions shall not be entertained and the onus shall remain with the contractor to highlight any such issues during the tendering period. This in no way over-rides the order of precedence of information as defined within the Contract.

2 OVERVIEW OF MECHANICAL WORKS

2.1 GENERAL

This project is concerned with mechanical upgrade works at the 6 schools listed above. Works will be carried out during summer holiday period.

2.2 SCOPE OF CONTRACT WORKS

2.2.1 Overall Contract

This project incorporates the removal of existing heating plant to various degrees & installation of replacement heating plant including wiring. Installation of air source heat pump and boiler house equipment with BMS system alterations and associated wiring. The Contractor shall allow for a full drain down and re-filling of the entire heating system c/w 5% Fernox inhibitor. See mechanical spec part 3 for performance spec. It also includes associated builder's works and electrical installation.

2.2.2 Programme

The provisional contract commencement period shall be June - September for a 12-week programme. All works shall be completed within the school by the 18th September 2026. The project shall be tested, commissioned, all 'As Installed' drawings submitted and all payments completed prior to substantial completion. All contract dates shall be verified after tender return date.

The contractor shall produce a fully detailed programme showing the sequence of site operations, including time limits, and when each operation shall be commenced and completed for the electrical & builder works. One copy shall be forwarded to the consulting engineers and one copy retained on site and kept up to date by the regular recording of progress at bi-weekly site discussions.

As the programme is a short contract, close down of the site for contractor holidays shall not be permitted as highlighted under the tendering section of this specification.

The contractor shall make all necessary prior arrangements with his suppliers and shall co ordinate the activities of the public utilities in good time so that the contract dates for possession and handover may be met.

2.2.3 Mechanical Works

Mechanical works required to facilitate the above include:

Removals (50)

- Disconnection & removal of heating plant services within the school to various degrees

- Removal of any existing fuel oil installations

Builder's Works

- Trenching associated with installation of site services
- Builder works associated with electrical & mechanical installation
- Remedial and painting works associated with electrical & mechanical installation

Heating Centre (51)

- Installation of new Air Source Heat Pump technology and associated buffer vessels
- Installation of distribution headers, circulation pumps, pipework, valves and insulation, see drawings for extent.
- Installation of buffer vessels
- Installation of Plate Heat Exchangers

Building Management System (56)

- Installation of field devices within the school
- New BEMS panels and alterations to existing BMS panels to include energy metering and heat metering in every school.

2.3 DESIGN CRITERIA:

The criteria listed below apply to all Sections included in the Contract unless specified otherwise:

Department of Education & Youth Technical Guidance Documents and School Design Guidelines

https://www.gov.ie/en/department-of-education/publications/technical-guidance-documentsschool-design-guides/

Statutory Requirements & Regulations

- Building Regulations Part F, J & L
- European Energy Performance of Buildings Directive – Nearly Zero Energy Building (NZEB)
- Standards
- Building Control Regulations 1997-2017
- Building Control (Amendment) Regulations 2015
- Construction Product Regulations 2013
- Electricity Regulation Act 1999
- I I.S. 10101:2020+A1:2024
- Safety, Health & Welfare at Work (General Application) 2007
- Department of Environment, Community & Local Government Fire Safety Codes of Practice
- Waste Management (Amendment) Act 2001
- Institute of Gas Engineers and Managers Utilisation Procedures (IGEM/UP1 Ed2)
- National Guidelines for the Control of Legionellosis in Ireland 2009
- EC European Compatibility Regulations 2007

N.B. Harmonised European Standards (hENs) shall be applied where available. Where no hEN is applicable, order of preference is for appropriate Irish Standards and then British Standards.

2.4 SPECIFIC STATUTORY REQUIREMENTS

2.4.1 Mechanical Certificates Required Prior to Practical Completion for each site:

a. Written confirmation that all installations are in accordance with construction issue consultant's drawings and specifications and current building regulations
b. Air Source Heat Pump commissioning certificates
c. Corrosion inhibitor level certification
d. Heating system pressure test witness and certificate
e. Heating system flow balancing commissioning certificate
f. Domestic hot water calorifier commissioning certificate where applicable
g. Domestic hot water return pump commissioning certificate where applicable
h. BEMS Test and commissioning certificate

In circumstances where a phased or partial handover is intended, then the contractor shall be responsible for preparation of phased hand over documentation of the above.

2.4.2 Construction Product Regulations (EU305/2011)

From 1 July 2013, all Construction Products covered by a Harmonised European Standard (hEN) or a European Technical Approval (ETA) are required to carry the CE mark. The CE mark indicates that a product has met the essential requirements of all the appropriate Directives and Regulations. The CPR requires Declaration of Performance documents (DoPs) to be available for all CE marked products.

The contractor must provide Declaration of Performance documents and CE certificates for all items at the time of product submittals.

2.4.3 Contractor Design Elements

The contractor shall refer to the Schedule of Ancillary & Commissioning for elements of the works that shall require design certificates from specialists and sub-specialists where a design element is undertaken by such parties. In such cases, the contractor shall ensure that relevant specialists and sub-specialists have professional indemnity insurance in place prior to their appointment and the contractor shall make all due allowances at tender stage for costs associated with same. Policy details will be required to be included on the relevant Ancillary Certificates as listed in the schedule above.

Examples of design elements shall be the provision of the BMS control panel, etc.

3 REMOVALS (50)

3.1 GENERAL

The following information details the requirements for all mechanical removals works necessary for the completion of this Contract. Where shutdowns of existing services are required to facilitate the works, the Contractor shall agree these with the School in advance. For programming of removals, see Contract Preliminaries.

All disposals shall be carried out in accordance with current legislation.

3.2 SCHOOL

Isolate, disconnect and remove all LPHW pipework and radiators within the school building. Isolate, disconnect and remove all plumbing pipework and equipment in schools with centralized hot water.

3.3 FUEL TANK

Remove all fuel oil tanks and exposed redundant oil pipework after draining, flushing and degassing. Remove tank base.

3.4 TESTING FOR SOIL CONTAMINATION

The Contractor shall undertake pressure test on pipeline from tank to boiler to verify the historical integrity of the pipeline.

4 BUILDER'S WORKS (50)

4.1 GENERAL

All builder's work shall be carried out by a competent contractor with reference to Building Regulations 2000, Technical Guidance Document D: Materials & Workmanship.

4.2 SCOPE OF WORK

4.2.1 Trenching

The Contractor shall allow for proposed route of service trench between the ASHP plinth and the boilerhouse as indicated on the site drawings. Area to be excavated must be assessed via a CAT or GPRS scan to determine location of existing services. Trench shall be filled, and surfaces made good on completion of services installation.

4.2.2 ASHP Plinth

Construct ASHP plinths externally as indicated on the site services drawing.

4.2.3 Protection of Existing Floors

The Contractor shall allow for adequate rigid protective covering on all existing floors where the contractor is working to prevent damage due to installation works. The Contractor shall provide for repair and restoration to any floors damaged as a consequence of the works.

4.2.4 Pipework Casing

The Contractor shall supply pipework casing as indicated on the drawings to the following specification:

- Baseboard; Gyproc plasterboard 12.5 thick-1 layer
- Carlite bonding plaster 8 thick-1 coat
- Gyproc finishing plaster 5 thick-1 coat
- Finish steel trowelled
- Frame softwood SC3 treated 50x50-300 vertically and horizontally to masonry

4.2.5 Pipework Supports – Roof Support System

Where pipework crosses roof structures it shall be supported on a proprietary rubber membrane support foot and uni-strut frame. Pipework shall be supported at 1500mm centres and all pipework to be insulated in 1 layer of rigid foam insulation, 1 layer of PIB insulation and cladded with non-reflective hammerclad/ventureclad.

4.2.6 Openings Associated with M&E Installation

The Contractor shall carry the all builders works opening and Fire stopping associated with the mechanical & electrical installations in and out of the plant rooms.

4.2.7 Painting within School

The Main Contractor shall provide the following painting services c/w wall preparation and 2 coats to match existing finishes throughout or as specified by client.

- Any works internally such as electrical sub mains or pipework routes internally. See drawing per school.

All painting shall include for the clean down of walls using sugar soap and filling and levelling of redundant fixing holes.

4.2.8 Painting within Boilerhouse

The Main Contractor shall provide the scrubbing down and painting floor of plantroom with 2 coats of red proprietary floor paint and ceiling & walls with 2 coats of primer and 2 coats of white emulsion paint. Door & frame shall be finished in 1 coat of primer & 3 no. coats of gloss. Painting shall take place before installation of equipment or pipework.

4.2.9 Firestopping

Refer to Part 3: Standard Clauses of the specification for details on fire-stopping of services. In addition to the details contained within the standard clauses, the contractor shall allow within their tender for Fire stopping mock up's of mechanical installations passing through fire walls in line with fire engineers and manufacturers requirements. Furthermore, fire stopping detail drawings and fire stopping register shall be submitted for review at the commencement of the project. It is a requirement for this project that every mechanical fire stopping location is photographed together with it being traffoylte labelled and cross referenced on as installed drawings and fire stopping register which shall form part of the O&M safety file. Certification shall comprise two elements – Specialist fire stopping certification (e.g. through floor/wall penetrations, sealing of pipes, provision of fire collars etc) and General Contractor fire stopping (fire stopping around door frames and general internal fire rated partitions). All opes shall be fully sealed with a fire stopping material whether they are through a fire compartment or not.

4.2.10 Builder's Clean

The Contractor shall provide a clean of all working areas before handover back to client.

5 HEATING CENTRE INSTALLATION (51)

5.1 GENERAL

The following information details the requirements for all LPHW installation works necessary within the Heating Centre for the completion of this Contract.

The heating system shall be installed so that all pumps, primary control valves and boilers are housed in the Heating Centre.

5.2 DESIGN CRITERIA

The main heating systems are designed to operate on the following design conditions;

Min. outside air temperature (Winter):	-3 °C
Min. outside air temperature (Mid Seasons):	5 °C
Max. room air temperature:	21 °C
LPHW flow temperature from Boiler:	75 °C
LPHW return temperature to Boiler:	55 °C
LPHW flow temperature from Buffer Tank:	55 °C
LPHW return temperature to Buffer Tank:	35 - 50 °C
LPHW flow temperature from Header:	55 - 70 °C
LPHW return temperature to Header:	35 - 50 °C

5.3 AIR SOURCE HEAT PUMP

The Contractor shall supply, install, test and commission fully packaged high efficiency, low noise, Air Source Heat Pumps (ASHP) mounted externally as indicated on the design drawings and as outlined in the Part 4: Equipment Schedules performance specification.

The ASHP shall provide the base heating load to the school and shall generate LPHW heating water at 55oC flow to maximise efficiencies and seasonal performance.

The Air Source Heat Pump shall comprise the following;

- Compressors to be a minimum of 2 Stage but Variable Speed Compressors preferred
- Refrigerant Circuits to be R290.

- AISI 316 Stainless Heat Exchangers with low air side pressure drop to reduce noise levels of fan rotation speeds

- Axial EC Fans with brushless DC electric motors. The maximum speed of rotation of the motor shall be 450 rpm to guarantee a very low noise level.

- Weather Compensated Control & Protection Devices

- Microprocessor Control to provide regulation of the water temperature, antifreeze protection, compressor timing, compressor automatic starting sequence and alarm reset. The control panel shall be supplied with a display showing all operational icons. The microprocessor shall be set for automatic defrost (when operating in severe ambient conditions) and for summer/winter change over. The microprocessor shall be connected to the BEMS system thus enabling remote control and management via MODBUS protocols.

- Sound Insulation via dampening systems and acoustic attenuation

- Head Pressure Control Unit at each ASHP

- Serial Interface Card shall be provided on each ASHP which shall enable the controller to communicate with the BEMS using Modbus protocol

- Master/Slave Cascade Control system to ensure that only the desired amount of capacity is enabled thus resulting in the system performing with optimum efficiency.

The Air Source Heat Pumps must be ErP compliant.

The Contractor shall provide for full servicing of the Air Source Heat Pumps before handover and again before the end of the defects period.

Refer to drawings and Part 4: Equipment Schedule for further details on the Air Source Heat Pumps.

5.4 PLATE HEAT EXCHANGER

A Plate Heat Exchanger shall be supplied installed, tested and commissioned as indicated on the design drawings. The Plate Heat Exchanger shall be the LPHW / LPHW. The Plate Heat Exchanger shall have AISI 316L stainless steel counter flow plates. All plate heat exchangers shall be provided with manufacturers purpose made bespoke insulation jackets, mounting feet and name plate to indicate test and operating pressures.

5.5 LPHW/LPHW DIRECT BUFFER VESSEL

1no. vertical LPHW/LPHW floor standing direct buffer vessel in each plant room shall be provided as indicated on the design drawings and shall be as described in Part 3 Standard Specification with a performance specification as outlined in Part 4 Equipment Schedules. A buffer vessel shall be provided and shall be made of mild steel construction must be fully insulated to provide a B or C thermal rating in accordance with ErP requirements.

5.6 PUMPS

LPHW circulation pumps shall be installed in the boilerhouse as detailed on the drawings and in Part 3: Standard Specification and Part 4: Equipment Schedule. Pumps shall be supplied with differential pressure transducer kits for sealed circuits and volt free contacts for connection to the BMS.

The pumps shall be a high-efficiency, constant-pressure, variable speed pumping unit, which shall utilize its own on-board variable speed drives to minimise energy consumption associated with pumping water at part load capacities.

Comply with manufacturer's recommendations regarding application and installation of pumps. For in-line pumps ensure that motor is positioned in accordance with manufacturer's requirements. Fix pump sets on concrete bases (where required) in accordance with manufacturer's instructions. Use anti-vibration mounting arrangements in all installations.

5.7 PIPEWORK & HEADERS

All LPHW heating pipework shall be medium grade black mild steel tube to EN 10255:2004 Medium as detailed in Part 3: Standard Specification except where noted on the drawings. Pipework shall be installed to form a two-pipe flow and return heating system.

All pipework shall be fully painted (red lead) upon completion of installation.

All pipework up to 50mm shall have screwed joints, pipework 50mm above shall be welded. All large pipework in plantroom areas shall be flanged to facilitate easy removal if required.

Headers shall be fabricated with 2 no. sets of blanked and valved stubs to allow for installation of future circuits, sized as shown on the drawings. In addition, 1 no. set of blanked stubs shall be provided at the supply end of the headers to facilitate the future installation of a packaged renewable energy plant via a plate heat exchanger.

5.8 PIPEWORK SUPPORT

The Contractor shall include for the provision of pipework support including installation of box brackets and unistrut brackets as required. The Contractor shall be permitted to make use of existing pipework supports where suitable with the agreement of the Technical Services Department and the Client's Representative.

5.9 PIPEWORK & VALVE LABELLING

Appropriate colour identification bands and flow directional arrows shall be affixed to all insulated pipework. All valves within the plantroom shall be provided with an engraved plastic circular label numbered to correspond with a wall-mounted valve chart erected in the plantroom upon completion of the contract. A valve chart shall also be provided as part of the Contractors completed O&M manuals.

5.10 THERMAL INSULATION

All expansion vessels, break-tanks, all pipework and valves shall be insulated with preformed sections of rigid mineral wool incorporating an aluminium foil laminate cover as detailed in Part 3: Standard Specification and shall be fitted in accordance with the manufacturer's instructions. The insulation shall also be applied to all connections, bends, tees and valves.

Proprietary jackets with Velcro fixings shall be used on all valves over 25 mm. Additional taping every 2 m shall be provided on the insulation within the heating centre plant room.

All insulation shall be Class A1, CFC and HCFC free with ozone depletion factor of zero.

Thermal conductivity shall not exceed 0.042 Wm^2K at 100^oC and thickness shall be in accordance with the following:

Pipe Diameter	15mm	22mm	28mm	35mm	42mm
Insulation Thickness	20mm	28mm	28mm	35mm	40mm

5.11 THERMOMETERS & PRESSURE GAUGES

Thermometers and pressure gauges shall be installed as shown on the drawings and as detailed in Part 3: Standard Specification.

5.12 VALVES

All valves shall be installed as shown on the drawings and as detailed in Part 3: Standard Specification. For the purposes of tendering, valves shall be taken as nominal line size.

5.13 DOSING POT

The Contractor shall supply and install 1 no. chemical dosing pot as shown on the drawings which shall come complete with fill point and all necessary isolating valves. For further details, see Part 4: Equipment Schedule.

5.14 MAGNETIC FILTER

The Contractor shall supply and install 1 no. magnetic dirt separator on the main heating return pipework and 1 no. magnetic air dirt separator on the main heating supply pipework for each system which shall come complete with all necessary isolating valves. For further details, see Part 4: Equipment Schedule.

5.15 AIR VENTING

Air vents shall be provided as necessary and be installed at the highest points of heating pipework installation. Each air vent shall be controlled by a lock-shield valve and air release pipes shall run to discharge at the nearest suitable visible point outside.

5.16 DRAIN COCKS

The heating pipework shall be installed to a gradient to allow effective draining down when required. All low points shall be fitted with drain cocks. The contractor shall indicate all low and high points and clearly indicate these on their 'As Installed' drawings.

5.17 CORROSION INHIBITOR

Prior to practical completion, a corrosion inhibitor shall be added (at a 5% system content ratio) to the system by a specialist sub-contractor. The mechanical contractor shall note all types of heat emitters, heating plant and heat exchangers associated with the systems. The type of inhibitor used should not adversely affect such equipment, in particular the heat exchanger within the boilers.

The contractor shall sample the system water on each side of the heat exchanger and provide a lab test and report on all samples from all schools to demonstrate the right quanity iof inhibitor in each system.

5.18 ANCILLARY BOILERHOUSE HEATING

The Contractor shall supply and install an electric oil-filled wall-mounted heater in the boilerhouse. It shall be controlled by a frost thermostat located beside the boilerhouse doors. For further details, see Part 4: Equipment Schedule.

5.19 CONDENSATE PIPEWORK

Carry out work in accordance with Technical Guidance Document 'H' and BS 5572, BS 6465 and BS EN 12056-2:2000 and BS 6465. Condensate pipework shall be installed in uPVC piping suitable for installations above ground in buildings and operating temperatures of 70oC as detailed in Part 2: Standard Clauses. uPVC pipework suitable for above ground soils and wastes installations is usually black, white or grey pipework. Terracotta colored pipework is only suitable for drainage below ground and must not be used above ground. Blank caps, rodding eyes or cleaning doors MUST be provided at all changes of direction to allow access for cleaning rods. All pipework shall be laid to falls at a maximum of 1:80, unless otherwise noted.

6 SOILS & WASTES INSTALLATION (52)

6.1 GENERAL

Carry out work in accordance with Building Regulations Technical Guidance Document 'H' and BS 5572, BS 6465 and EN 12056-2:2000 and BS 6465:2020. On delivery check that all components are in accordance with the requirements and are free from defects and damage. Reject any incorrect, defective or damaged items. Unless otherwise indicated, obtain all components from the same manufacturer.

Store delivered components in secure weatherproof accommodation, as recommended by the manufacturer. Ensure that the storage method does not cause damage to the components.

6.2 PIPEWORK INSTALLATION - GENERAL

Waste pipework within plant rooms and from condensate points shall be installed in uPVC piping suitable for installations above ground in buildings and operating temperatures of 70oC as detailed in Part 3: Standard Specification.

All fire-sleeves, vents, anti-syphons and traps shall be included as required. Blank caps, rodding eyes or cleaning doors MUST be provided at all changes of direction to allow access for cleaning rods.

All pipework shall be laid to falls at a minimum of 1:50 and maximum of 1:80, unless otherwise noted.

6.3 ACCESS POINTS IN DRAINAGE PIPELINES

Locate access points in the following positions: -

- At the end of all exposed waste pipes.
- At all changes in direction
- At right angle bends.
- At branches in iron pipelines.
- At the foot of all soil stacks and rainwater stacks.
- At any other location necessary to allow complete rodding of the system, or as scheduled.

Site access points in drainage pipelines to facilitate entry of cleaning tools and equipment.

6.4 FIRE SLEEVES

Provide fire sleeves on all plastics pipework as scheduled below where pipes pass through floor slabs and fire compartment/sub compartment walls as indicated:

UPVC soil & waste pipes - above 50mm

All other plastic pipe-work - 50mm and above.

On all pipework passing through walls or floor slabs, which do not require the fitting of fire sleeves, provide sleeve of next pipe size and fill annular space between with intumescent mastic.

7 PLUMBING INSTALLATION (53)

7.1 GENERAL

The following information details the requirements for all internal mains water, cold & hot installation works necessary for the completion of this Contract. All aspects of the installation must be installed in accordance with prevailing national and international standards with a specific focus on the prevention of legionella.

The Contractor shall install all domestic water services with the guidance contained in CIBSE TM13: 'Minimising Risk of Legionnaires' Disease' and HSE L8 ‘Legionnaire's Disease - Control of Legionella Bacteria in Water Systems’.

All water services systems should be installed in accordance with BS 6700: ‘Specification for Design, Installation and Testing and Maintenance of Services Supplying Water for Domestic Use within Buildings and their Curtilages’ and CIBSE Guide G: ‘Public Health & Plumbing Engineering’.

7.2 HOT WATER GENERATION

Hot water generation shall be provided as per the schematics and layouts for each school. Some schools have point of use water heaters and have no hot water generation. Hot water storage temperature must be locked at a minimum of 60^{o}C in order to provide protection against legionella. The entire installation shall be assembled, setup, commissioned and warranty provided by a local agent with a call-out response of 4 hours. See Part 4: Equipment Schedule for details.

The Contractor shall provide for full servicing of the calorifier before handover and again before the end of the defects period.

7.3 HOT WATER DISTRIBUTION

In some schools that have a central hot water shall be distributed from the boiler house, distribution shall be in copper pipework to IS EN 1057 as detailed in Part 3: Standard Specification and as shown on the design drawings. Domestic hot water installation as shown in the design drawings/schematics shall be installed to ensure the hot water is circulated at a minimum temperature of 55oC returned at no less than 50oC to mitigate against the proliferation of legionella. Commissioning data must include pipework temperatures measured throughout the system to guarantee that all sections of the return system are operating at the required temperature.

In compliance with ACOP L8, the contractor should ensure no dead legs are created either in new installations or modifications to existing systems.

7.4 FITTINGS

Fittings to be non-manipulative compression or integral solder ring type, above 50mm fittings are to be Hard Soldered (brazed). All installations shall comply with ACOP L8 for the prevention of legionella. Press fit or push fit type fittings are not permitted. No mixed metals are permitted on same system. Ensure/maintain earth path continuity where metallic and nonmetallic pipes are present or are introduced within the same pipe run.

7.5 PIPEWORK SUPPORT

The Contractor shall include for the provision of pipework support including paving, insulation, installation of box brackets and uni-strut brackets as required.

7.6 THERMAL INSULATION - INTERNAL

All pipework and valves within the boilerhouse, in casings, voids or attic spaces shall be fully insulated with rigid mineral wool with foil covering as detailed in Part 3: Standard Specification and shall be fitted in accordance with the manufacturer's instructions. All valves greater than 25mm shall be insulated with wrap-around blankets secured by Velcro fittings. All insulation shall be fitted in accordance with the manufacturer's instructions.

Thermal conductivity shall not exceed 0.035 WmK and thickness shall be in accordance with the following:

Pipe Diameter	15mm	22mm	28mm	35mm	42mm
Insulation Thickness	20mm	28mm	28mm	35mm	40mm

7.7 PIPEWORK & VALVE LABELLING

Appropriate colour identification bands and flow directional arrows shall be affixed to all insulated pipework. Rainwater collection pipework shall be clearly identified and all outlets marked as non-potable water. All valves within the boilerhouse shall be provided with an engraved plastic circular label numbered to correspond with a wall-mounted valve chart.

7.8 THERMOMETERS & PRESSURE GAUGES

Thermometers and pressure gauges shall be installed as indicated on the drawings and as detailed in Part 3: Standard Specification.

7.9 STERILISATION

All plumbing pipework shall be sterilised prior to handover as detailed in Part 3: Standard Specification and certification shall be provided within the Health & Safety File.

7.10 PIPEWORK TESTING

The complete mains, cold and hot water installations shall be fitted, jointed and pressure tested strictly in accordance with all relevant Irish and British Standards and Code of Practice and Part 3: Standard Specification.

All plumbing pipework shall be air tested to a pressure of 7 bar for a period of two hours.

7.11 PIPEWORK FINISHES

All exposed plumbing pipework should be painted to match the final wall colour. See Part 3: Standard Clauses for details.

8 BUILDING MANAGEMENT SYSTEM (58)

8.1 GENERAL

The following information details the requirements for all controls installation works necessary for the completion of this Contract . Some schools have modifications of existing panels and others are complete new BEMS systems. A BEMS drawing have been provided for each school to demonstrate extent of installation.

All time and temperature settings shall be agreed with the Consulting Engineer during commissioning. The contractor shall allow for 2 no. demonstrations of the controls system to the client on each site.

The contractor shall allow for a full service and checking of both systems at the end of the defects liability period.

8.2 CONTROL PANEL

All installation as detailed on the drawings shall have main equipment for Boilerhouse and linked to a front end display on the Principal's laptop computer.

Where new boilerhouse control panels are provided, they shall be provided with a colour touchscreen interface for access to setpoints, sensor readings and alarms. The touchscreen must be installed at 1500mm AFFL and should be supplied for on-site installation to allow for varying panel mounting heights

Panels shall be protected by Miniature Circuit Breakers. Fuses will not be acceptable. Panel labels and wording shall be agreed with the ER beforehand.

8.3 HEAT PUMP PLANT

Power for the new Air Source Heat Pumps (ASHP's) shall be derived from the local electrical distribution board. The BEMS shall enable / control and monitor the Air Source Heat Pumps on a time clock schedule or as heating demand dictates.

The ASHP's shall be provided with their own master / salve controller which shall provide the sequencing during heat demand on a duty / assist basis to maintain a primary flow temperature of 55oC. The BEMS shall monitor temperature in the flow & return pipework via immersion sensors. A BEMS immersion temperature sensor shall be located in the LPHW Heating buffer vessel to monitor the temperature of the heating water to ensure the heating flow water is maintained at 55oC.

If the water temperature in the LPHW buffer vessel is not at temperature, then the BEMS shall enable pump set PMP-001to run. This will supply LPHW heating water from the boiler circuit to the plate heat exchanger at elevated temperatures. The plate heat exchanger will increase flow temperature from the ASHP flow circuit to 70°C to serve the main heating loop. Heating Return from the secondary circuit shall be returned directly to the buffer vessel.

When the BEMS sensor sees that the target temperature has been achieved, it shall stop LPHW heating PMP001.

Only one of these two LPHW heating pump sets shall run at any given time. The controls shall be set up to ensure that the signal is only given to either PMP003 or PMP006, but never both pumps at the same time.

In addition, the Heat Pumps shall be Modbus compatible with a Modbus cable taken from the BEMS panel to the ASHP plant with information being capable of being extracted.

8.4 HEAT PUMP WARRANTY & MAINTENANCE REQUIREMENTS

1. Warranty Requirements

The Tenderer shall ensure that all heat pump equipment supplied and installed under this contract is covered by a **minimum warranty period of five (5) years** post date of substantial completion.

The warranty must ensure cover of:

- Compressor, refrigerant circuit, heat exchangers, controls, and all major components
- Labour, parts, diagnostics, and call-outs for warranty repairs
- No exclusions applied since operating due to typical operating profiles defined in this document

Warranty validity shall be dependent upon:

- Correct system design and installation
- Proper commissioning by competent personnel
- Operation within the design parameters described below
- Compliance with the maintenance regime set out in this section
- Internet connection for continuous diagnostics (applicable to certain manufacturers)

Where longer manufacturer warranties or reduced-frequency service requirements are available at no additional cost, or at a cost saving, the Tenderer **must include these within the tender**.

2. Service & Maintenance Requirements

The Tenderer shall allow for the minimum maintenance regime for the installed heat pump system in the tender pricing in order to maintain the 5-year warranty.

Service Frequency

- **One service visit preferably every two (2) years**, unless the equipment manufacturer explicitly requires a shorter interval (minimum one (1) year). *(Tenderers shall only price for annual servicing if supported by documented manufacturer requirements.)*
- It is in the Tenderer's interest to negotiate with heat pump manufacturers for longer service intervals in order to price their bid competitively.

Minimum Service Scope (Biennial Visit)

Each service visit must include at minimum:

- Inspection and performance review of the refrigerant circuit
- Verification of electrical connections and controls
- Checks on hydraulic conditions (flow rates, pressures, pump performance)
- Cleaning of filters, strainers, and debris screens
- Cleaning of coil and fins.
- Verification of correct operation, setpoints, and system sequencing
- Review of system logs and operational history to confirm stable operation

Maintenance must be carried out by competent personnel and appropriately recorded.

Tenderers, must include all maintenance requirements to maintain the heat pump warranty for the 5 year period post substantial completion, in their tender pricing.

3. Normal Design & Operating Parameters

For warranty purposes, "normal design conditions" refer to operation within the system's intended thermal and hydraulic envelope, including:

Project-Specific Operation

For the installations considered in this project:

- Systems are designed for **~55°C flow temperatures** to maximise efficiency and minimise equipment stress, with the ability to operate at higher temperatures during peak demand within heat pump limits.
- Backup boilers (gas/oil) will support peak loads and extreme conditions
- The buildings have predictable, daytime-based occupancy profiles and low annual running hours due to being schools
- Heat pumps will operate predominantly during controlled and stable load conditions

These factors result in:

- Predictable and stable thermal loads
- Reduced mechanical and thermal cycling
- Lower probability of component stress or degradation
- Improved reliability and long-term warranty compliance

4. Tender Note – Commercial & Technical Expectations

Tenderers must base their submission on the following assumptions:

- The systems are **conservatively designed** and operate comfortably within their capabilities
- There is **no reliance** on electric backup
- Operating conditions are stable due to predictable school occupancy profiles
- A **minimum 5-year warranty** must be provided
- Only the **biennial service visit** (once every two years) shall be priced into the tender unless the manufacturer requires otherwise
- Tenderers are strongly encouraged to **secure extended service intervals** from their suppliers to improve lifecycle cost efficiency

8.5 HEAT DISSIPATION

At the end of each time programme when the boilers are turned off, all control valves shall be fully opened and pumps shall remain activated for a period of 20 minutes to allow residual heat to be dissipated from boilers.

8.6 HEATING CIRCUITS

Each circuit shall have a 7-day time programme c/w three on/off periods per day and a 1-5 hour run-on timer located on the remote panel. Variable speed circulation pumps will be enabled on demand from any of the timeclock programmes or from each of the run-on timers.

8.7 DHW CONTROL

The Domestic Hot Water Primary Secondary Return Pump will be controlled by the DHW timeclock or run-on timer. DHW temperature will be controlled by a 3-port diverting valve operated by an immersion control thermostat. A high-limit thermostat will close the 3-port diverting valve if the set temperature is exceeded. DHW temperature shall be monitored via an immersion sensor in the cylinder and DHW return temperature via an immersion sensor in the return pipework.

8.8 UTILITY METERS

The contractor shall allow for the following pulsed energy meters to be monitored by the BMS:

- Mains Water Incoming Pulsed Meter
- Air Source Heat Pump to Buffer Vessel – Primary Heat Meter
- Boiler to Plate Heat Exchanger – Heat Meter
- VT heat Circuit to School – Heat Meter
- Gas Pulsed meter provided by the BEMS supplier
- Electrical pulsed meter on ASHP supply
- Electrical pulsed meter on main school supply.

Readings will be logged on an hourly basis with minimum storage of 1,000 logs and archived monthly to a remote spreadsheet. Utility Meters shall be as detailed in Part 4: Equipment Schedules.

8.9 HEAT METERS

Heat meters where shown on drawings shall be the ultrasonic static compact heat meter type, designed for application in heating systems. Each heat meter shall comprise of the following components:

- Ultrasonic flow sensor
- Calculator with integral hardware and software for measuring flow rate, temperature and energy consumption
- Temperature sensors
- Pulsed Input interface card for water sub-metering
- Remote reading via M-Bus or similar interface
- Power save mode
- 24 month memory
- Extensive diagnostic displays

All controls and final electrical wiring to heat meter modules shall be carried out by the Mechanical Contractor, from a local isolator supplied and installed by the Electrical Contractor. Containment systems shall be installed by the Mechanical Contractor and shall be high impact PVCu.

All interconnecting wiring associated with the installation shall be the LSOH type.

DoEY Heat Meter Specification:

Heat meters are to be inline ultrasonic heat meters with multi-position Installation capability; shall be mid directive 2014/32/eu annex mi-004 approved; Comply with en1434; shall be accuracy class 2 or better; shall provide at Minimum 1 pulse per kwh and shall be sized according to design flow rate.

Temperature sensors are to be direct mounted probes in contact with transfer Fluid.

Electricity meters shall provide minimum 1 pulse per kwh.

Gas meters shall provide minimum 1 pulse per $0.1m^3$.

Pulse output cables from each heat meter shall be installed and routed back to a designated termination point within the boiler house to facilitate future connection to a data logging system. The data logger shall be supplied and installed by others.

Pulse output cables shall be screened cable suitable for the transmission distance, installation environment and meter manufactures requirements. All pulse cables shall be installed as continuous runs without intermediate joints wherever practicable and shall be clearly labelled at both the meter and termination point.

The cable screen shall be properly terminated and earthed in accordance with good electrical practice to minimise electrical interference. Pulse signals shall be tested and verified during commissioning to confirm that pulses generated by the heat meters are detectable at the boiler house termination point without signal loss or degradation. Test results shall be recorded and submitted as part of the commissioning documentation.

To guarantee sufficient signal quality at Data logger in situations where cable distance exceeds 90 meters twisted screened cable should travel in isolation in segregated trunking compartment and be boosted at mid interval by use of pulse repeater/signal booster and ensure cable is grounded (one end) receiving end gateway data logger.

Pulse Testing to be included by Contractor:

The Contractor shall test and demonstrate that the pulse output generated by each heat/gas and electricity meter is successfully transmitted along the complete pulse cable and is detectable at the designated termination point within the boiler house. Test results shall be recorded and submitted as part of the commissioning documentation.

The Contractor shall ensure the following:

- Meter is accessible for taking manual readings and for maintenance purposes
- Flow and return temperature sensors are installed and in the correct pipes
- The direction of flow through the meter is correct The meter isn't installed at the highest point of pipework or immediately after pumps or near air vents
- The inline flow senor is installed in suUicient straight pipe length as per manufactures instructions and not too close to elbows, valves, pumps and tees or any situation where there is potential for eddy currents to develop.
- The correct meter is installed for the design flow rate
- The meter is installed downstream of the mag and particle filter
- Confirm heat meter is programmed to provide 1 pulse per kWh
- Take a flow reading and confirm if the flow reading is plausible versus design
- Confirm the display is functioning correctly
- Confirm the correct date and time is displayed on the meter
- Confirm that the pulse output from each heat meter is correctly transmitted via the associated pulse cable and that the pulse signal is detectable at the cable termination point located in the boiler house.

  The Heat Meter Commissioning Report in section 8.10 shall be completed by the Contractor and issued to the consultant for review.

8.10 ENERGY MONITORING

An energy monitoring facility shall be incorporated within the BMS utilising readings from the water meters, electricity meters and oil meter. These will be monitored and displayed via the BMS front end. Weekly usage figures shall be calculated and displayed. Values shall be compared against target figures provided by the Consulting Engineer and a traffic light system shall be utilised as follows:

Green: Usage figures fall within set parameters. No usage detected outside of school working hours.

Amber: Usage figures rise to within 125% of set parameters or short-term usage (no. of hours to be agreed with Consulting Engineer) detected outside of school working hours.

Red: Usage figures rise above 125% of set parameters or full-time usage detected outside of school hours as indicated by the activation status of the building security alarm.

N.B. The BMS shall include the facility to calculate 'degree days' in order to assess reasonable utility usage. It will also include a calendar facility to change set parameters according to month. A 'red' activation will trigger instant alerts via a GSM module to a designated mobile phone number.

ESB MIC Control

All schools shall have the BEMS monitoring the overall electrical meter and the Air Sourced heat pump electrical meter as well as controlling the ASHP supply. These meters shall be monitored on a minute by minute basis by the BEMS . The BEMS shall have a limitation set point for the MIC and as that is reached on the overall Electrical meter, the BEMS shall ramp back the ASHP supply so as not to exceed the overall MIC.

External Modem Connection

Every school shall have a power supply and CAT6A connection for an external Modem that the energy monitoring and system can be accessed remotely. The modem will be connected separately by another supplier.

The BEMS supplier shall also have remote access to the front end of the BEMS for access and review via a separate modem for their own use.

8.11 HEAT METER COMMISSIONING REPORT

SSRH Heat Meter Commissioning Report
October 2021_Version 1

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Heat Meter (HM) Commissioning Report

1. HM Location

SSRH Ref	SSRH500
Site Address	
Heat Meter Ref (e.g.: HM1)	
Heat Meter Location	
Eligible Heat	Yes ☐ No ☐

2. Installing Company

Company Name	
Company Address	
Contact Tel. No.	

3. HM Details

Has the correct Heat Meter been installed, as determined in the Designer's system specifications? Yes ☐ No ☐

In relation to the specified protection class (IP), is every cable diameter within the minimum and maximum diameter as specified by the manufacturer? Yes ☐ No ☐

Nominal Diameter		IP	
HM MID Class (E.g. Class 2)			

	Energy Calculator	Flow Sensor	Temp Sensor Pair
Manufacturer			
Type			
Model			
Serial Numbers			
Security Tag Numbers		NA	
Calibration Cert. No			
Calibration date			

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4. On site Heat Meter Checks

General	Answer
Before Heat Meter installation, has the circuit into which the flow sensor is to be installed been thoroughly flushed to remove debris?	Yes ☐ No ☐
Has the strainer, where fitted, been cleaned?	Yes ☐ No ☐
Is the Heat Meter protected from the risk of damage by shock and vibration, induced by the surroundings at the place of installation?	Yes ☐ No ☐
Is the Heat Meter not subjected to undue stresses caused by pipes and fitting?	Yes ☐ No ☐
Is the Heat Meter installed at a safe distance from sources of electromagnetic interference (switchgear, electric motor, fluorescent lights)?	Yes ☐ No ☐
Are the gaskets dedicated to the applications (e.g. temperature range, pressure, durability, medium)?	Yes ☐ No ☐
Are the accessories correctly installed according to the installation instructions of the manufacturer and operator?	Yes ☐ No ☐
Where called for, has the Heat Meter been correctly earthed?	Yes ☐ No ☐
If the Heat Meter operates from an AC mains supply, has it been wired in accordance with wiring regulations?	Yes ☐ No ☐

Flow Sensor	Answer
Is the Flow sensor installed in the direction of the flow?	Yes ☐ No ☐
Is the Flow Sensor location correct? (e.g., not adjacent to pumps & pipe bends)	Yes ☐ No ☐
Is the Flow sensor fitted to return pipework?	Yes ☐ No ☐
Has a filter and a de-aerator been installed to avoid dirt and air in the system?	Yes ☐ No ☐

Temperature Sensors	Answer
Are Temperature sensors labelled with serial numbers indicating a "matched pair"?	Yes ☐ No ☐
Is the 1st temperature sensor mounted within minimum required downstream distance of Flow Sensor or other heat sources such as a storage tank?	Yes ☐ No ☐
Is the 2nd Temperature Sensor is similarly mounted on associated Supply / Return section?	Yes ☐ No ☐
Are Temperature sensors installed as per manufacturer instructions (E.g. fitting correctly into the sensor pockets when these are required for safety reasons)?	Yes ☐ No ☐
Are the sensor pockets shorter than 140 mm?	Yes ☐ No ☐
If sensor pockets are shorter that 140 mm, do the sensors have the "EN 1434" mark?	Yes ☐ No ☐
Is remote HM readying capability available on the HM?	Yes ☐ No ☐
Is remote HM reading activated and operational on the HM?	Yes ☐ No ☐
Is central control/HMI with correct display of heat energy for the site?	Yes ☐ No ☐
Is there any risk of electrical interference?	Yes ☐ No ☐

Calculator	Answer
What is the system working fluid? (e.g. water/ ethylene glycol/ propylene glycol)	
Is Flow sensor configured on calculator for system working fluids? (e.g. water/ glycol solution)	Yes ☐ No ☐
Is the Flow sensor configured on calculator for Return mounting before start-up? (e.g. to ensure correct compensation for density change with temperature)	Yes ☐ No ☐
Has the Application been set to "Heating" in the energy calculator	Yes ☐ No ☐
Has the calculator been configured for local storage of energy data	Yes ☐ No ☐
Enter the Supply & Return temperatures that are in the Energy Calculator (° C)	
Enter the Volumetric Flow (m3/h) that is in the calculator	
Enter the Energy Output (Kwh) that is in the calculator	
Is the Heat meter data sampling interval equal or less than 15 min?	Yes ☐ No ☐

Controls	Answer
Is the Heat Meter seen to be functioning when the heating system starts operating?	Yes ☐ No ☐
Is remote HM readying capability available on the HM?	Yes ☐ No ☐
Is remote HM reading activated and operational on the HM?	Yes ☐ No ☐
Is central control/HMI with correct display of heat energy for the site?	Yes ☐ No ☐
Is there any risk of electrical interference?	Yes ☐ No ☐

5. Declaration

☐ I confirm that the Heat Meter referenced above has been installed fully in accordance with Manufacturers' instructions and the information provided above is correct.

Name of Installer (in capital letters)	
Date Installed	
Signature of Installer	

9 FIRE PROTECTION SERVICES (59)

A fire extinguisher and fire blanket shall be installed in the boilerhouse as detailed on the drawings and in Part 4: Equipment Schedules. Exact locations to be agreed on site in conjunction with the Employer's Representative / Fire Engineer.

All fire extinguishers shall conform to BS EN 3-3:1996 - 'Portable Fire Extinguishers. Construction, Resistance to Pressure, Mechanical Tests' and BS EN 3-7:2007 'Portable Fire Extinguishers. Characteristics, Performance Requirements and Test Methods'. All usage, siting, inspection and maintenance of portable fire extinguishers shall comply with IS 291: 2015. Refer to Part 4: Equipment Schedules for details for extinguishers.

Extinguishers 5kg and above shall be mounted so that the carrying handle is 1m above floor level. Smaller extinguishers shall be mounted so that the handle is 1.5m above floor level.

The Contractor shall also allow for the following:

- Providing wall brackets for all extinguishers and for mounting all extinguishers
- Provision and mounting wall mounted signage above all fire extinguishers identifying fire point and extinguisher type/usage.
- Provision and mounting of fire action signs as detailed on the drawings
- Provision and mounting fire assembly signs as detailed on the drawings
- Agreeing exact locations of extinguishers and signs with the Employer's Representative prior to installation

10 ELECTRICAL WORKS (62)

10.1 GENERAL

The contractor shall provide all power supplies associated with the mechanical installation including field wiring associated with BMS controls, field wiring associated with local temperature control and removal and re-location works to facilitate the works.

The contractor shall supply and install all cables, cable trays, trunking, conduits etc., and accessories to provide a complete and working mechanical wiring system generally as described hereafter and on the contract drawings. All cables shall be LSF (LSZH) insulated.

All containment systems shall be continuous throughout their duration.

10.2 XLPE/SWA/LSF ARMOURED DISTRIBUTION CABLES

Distribution cables from the main distribution to the upgraded BMS panel in the boilerhouse shall be complete with separate circuit protective conductor (CPC) fixed to the main cable by means of cable ties at 300mm intervals. Separate CPC's shall be sized in accordance with the drawings and ET101: 2008/A1: 2011. Cross sectional areas (CSA's) of the various sub-main cables and other final circuit cabling shall be as detailed in respective sections of the specification or as indicated on the electrical distribution schematic.

XLPE/SWA/LSF cables shall be:

- 600/1000 volt grade of the sizes detailed in the schedules/drawings with high conductivity plain copper wires.
- Insulated with extruded XLPE
- Cores shaped, numbered or coloured for identification and sheathed with LSF.
- Armoured with a single layer of galvanised steel wires, sheathed overall with LSF. (Not in the case of Hi-Tuf cable).

Conductors shall be plain annealed copper with XLPE insulation. Bedding shall be thermosetting low smoke and fume compound. Armour shall be galvanised steel wire with an LSF thermosetting compound sheath.

Manufacture shall be to BS 6724, insulation to BS 6724, armour to BS 1442, Sheath to BS 6724 and shall comply with BS 4066, Pt 3 and IEC 332, Pt 3 Cat C flame tests. Conductors shall be circular or shaped, stranded or solid as determined by cable sizes.

All cabling shall be manufactured by a BASEC approved manufacturer.

External services including wiring to lighting, power and emergency lighting to be wired in same.

10.3 FIRE ALARM INSTALLATION & MODIFICATIONS

The Contractor shall provide 2 no. fire alarm interfaces within the boilerhouse as detailed on the drawings and for the re-location of existing smoke detectors as previously noted. The Contractor shall note that enhanced grade fire resistant cable with PH120 class shall be used for the re-location of existing smoke detectors and loops shall only be wired using 2-core cable. A fire resistant cable with a lesser PH classification than PH120 and if not of enhanced grade status, shall not be permitted on this project. The cable shall comply with the following circuit integrity standards:

- BS 5839-1:2002 Clause 26.2e Enhanced.
- BS 8434-2:2003.
- BS EN 50200 PH120.
- BS 6387 C, W & Z.
- 600/1000 Volt Grade stranded
- 2-hour Fire Rating according to IEC 331 Sheath Colour Red for Fire Alarm System Wiring Indication
- 2 Core & Earth Type

All cabling shall be manufactured by a BASEC approved manufacturer.

Cables shall be installed strictly in accordance with the manufacturer's requirements.

In summary, enhanced fire resistant cables shall be installed as other non-metallic sheathed cables: -

Within ceiling voids & roofspace they shall be clipped direct using metallic 'P' clips (to meet clause 26.2 of BS5839 for fixing of fire cable) to the underside of the floor slabs/structure at 300mm intervals or 500mm intervals if fixed to wire tray (using metallic cable tie straps). No other forms of fixing shall be acceptable. Fire alarm cabling shall be completely segregated from electrical services at all times.

Where conduits terminate into the control panel base, couplers and brass bushings with lead washers shall be utilised.

At each detector base, a galvanised throughway/U box is required in conjunction with 20mm PG glands, (colour = red), for safe, secure and tidy termination of the fire alarm cabling. Detectors shall be supported by bridging supports and under no circumstances should they rely solely on the ceiling slab for support.

Where located below ceiling level, all fire alarm cabling shall be contained within galvanised conduit – at all times. All drops to sounders, beacons & manual call points shall be made in 25mm flush mounted galvanised conduit. The contractor shall install suRface boxes and the use of flanged couplers and brass bushings with lead washers is required.

Fire alarm cabling shall be at least 300mm apart from 230V mains cabling in all circumstances.

The cables shall be in accordance with IEC 331, BS 4066, BS 6387 Part 1 and IEC 332 Part 1 and Part 3.

They shall be screened to provide 100% protection from external electro-magnetic interference.

The cables shall have low smoke emission, low toxicity and shall not propagate a fire. They shall be halogen free and have flame retardant properties to BS6425 Part 1.

10.4 TWO-COMPARTMENT TRUNKING INSTALLATION

A two-compartment trunking system installation for the containment of 230VAC circuits and extra-low voltage cabling (ELV) in separate compartments shall be installed in the boilerhouse and throughout the school (see drawings for extent of school installation). Structured cabling shall be contained on a dedicated wire basket system. Sufficient spare capacity shall be retained on all trunking systems to ensure that a minimum of 45% free capacity exists on all trunking systems. Gusset bends shall be used at all changes in direction. All lid sections shall be fitted with at least 2 toggles.

The trunking shall be manufactured from 1.2mm galvanised sheet steel with inwardly turned flanges and overlapping covers and be complete with all necessary accessories i.e. couplers, end plates, bends, cross-overs, junction units etc to give a complete and working installation. All interconnections shall be factory manufactured and the production of 'On-site' manufactured connections shall not be permitted. Copper links shall be provided on trunking to ensure electrical continuity by means of tinned copper secured by screws, nuts and shockproof washers. Where trunking passes through walls, floors and fire compartments generally internal fire barriers shall be fitted. A proprietary fire barrier such as a fire cushion or fire pillow shall be used and under no circumstances will 'Rockwool' or any other form of glass fibre wool be acceptable. Externally, the trunking shall also be firestopped to maintain the fire integrity of the surrounding structure and/or building fabric.

Indicative service routes are shown on the contract drawings. The contractor shall include for the completed containment installation throughout the entire school. It shall not be acceptable to install cabling without containment.

10.5 SUPPORT FOR TRUNKING

The contractor shall allow for the provision and installation of a suitable support and suspension system to carry all trunking installations throughout. This shall be achieved by means of suitably sized proprietary Unistrut hanger/suspension support system. These hangers shall be spaced at intervals of not greater than 1.0m and when fully loaded shall not deflect more than 5mm between supports.

Where installed in ceiling voids, all trunking shall be suspended so as not to allow more than a 5mm deflection at any point on a horizontal run using Unistrut brackets secured to the underside of the floor slab using threaded rods cut to length. Where installed in roofspace, upstands fabricated in Unistrut shall be utilised to support the containment off the ceiling structure by a minimum distance of 200mm to the underside of the containment. It shall not be acceptable to lay containment directly onto the ceiling structure (e.g. the joists).

The components which comprise the cable trunking support system shall be as manufactured by Boss Flamco, Unistrut or equivalent. The hangers shall be constructed from galvanised steel and shall be screwed to the building fabric. The threaded rods shall be 10mm diameter (minimum) mounted and fixed using anchors (or equivalent) suitable for each application. Unistrut shall generally be 41x41mm.

10.5.1 Capacity Factors

The contractor shall ensure that trunking capacity factors are not exceeded over and above those detailed in Annex 52A of ET101: 2008 / A1: 2011.

10.6 GALVANISED CONDUIT

The installation shall be carried out in galvanised conduit generally. Under no circumstances should PVC conduit be installed. Galvanised conduit (and trunking) shall be used for containment of all sub-circuit mains cabling to lighting and power appliances and to contain data cabling and also fire alarm and other ELV services etc.

All conduits shall be screwed heavy gauge hot dipped galvanised inside and out Class 4, in accordance with BS 4568, BS 6053 and BS 6099 as appropriate utilizing flange couplings and lead washers.

Flanged couplers with lead washers and brass bushons shall be used as opposed to standard couplers at all conduit terminations.

All conduit to be used in external locations shall be anti-corrosion treated both before and after installation, as shall all associated accessories, fixtures and fittings e.g. BESA boxes, saddles, couplers, associated adaptable boxes etc.

10.7 FINAL CONNECTIONS

All items of fixed equipment shall be provided with suitably sized final connections complying with the following:

- Heat resistant flexible cables enclosed in surface mounted galvanised steel conduit.
- Final connections to all pumps, fans items of plant which vibrate etc shall be carried out from the local isolator using LSF cables enclosed in IP65 rated sheathed flexible metallic conduit as per Kopex or Adaptaflex glanded at both ends.

10.8 WIRING OF MECHANICAL SERVICES

All mechanical equipment and plant shall be wired and connected as detailed on the contract drawings. The contractor shall pay particular attention to drawings containing mechanical field wiring and the BMS schematic, which shows mechanical wiring to be installed and wired back to the BMS control panel in the plant room. The contractor shall supply and install all associated cabling to the positions indicated on these drawings. All locally powered motorised valves are also shown on the contract drawings which shall be wired and connected. Isolators shall also be provided.

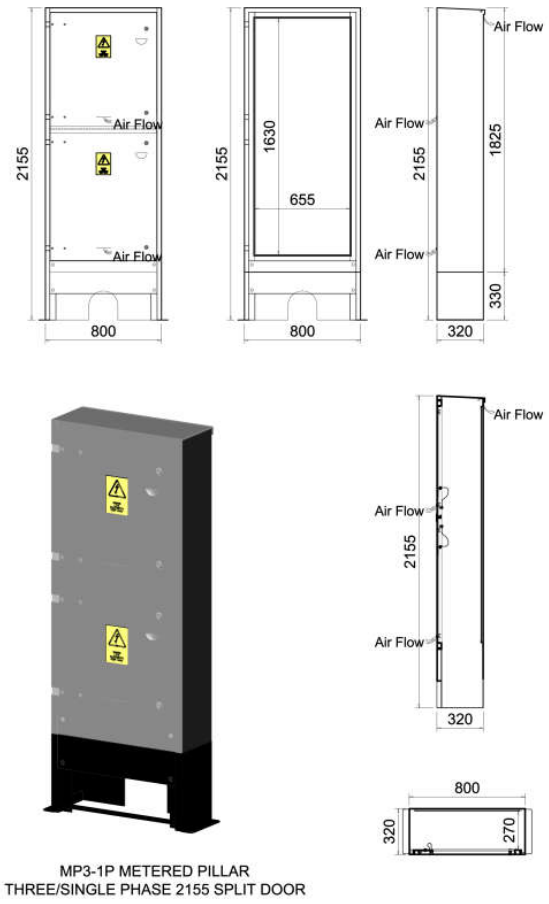
The contractor shall provide a complete galvanised steel trunking system around the perimeter of the boilerhouse at high-level with reference to pipework routes. All cabling shall be LSF enclosed in galvanised trunking and conduit.

10.9 ESB METERING PILLAR

The contractor shall allow for the supply and installation of ESB approved whole current or CT metering pillars depending on the building MIC rating from the list of ESB manufacturers. (Renley, RFE, Pilltown Engineering etc)

10.9.1 For supplies up to 49kVA MIC (Whole Current)

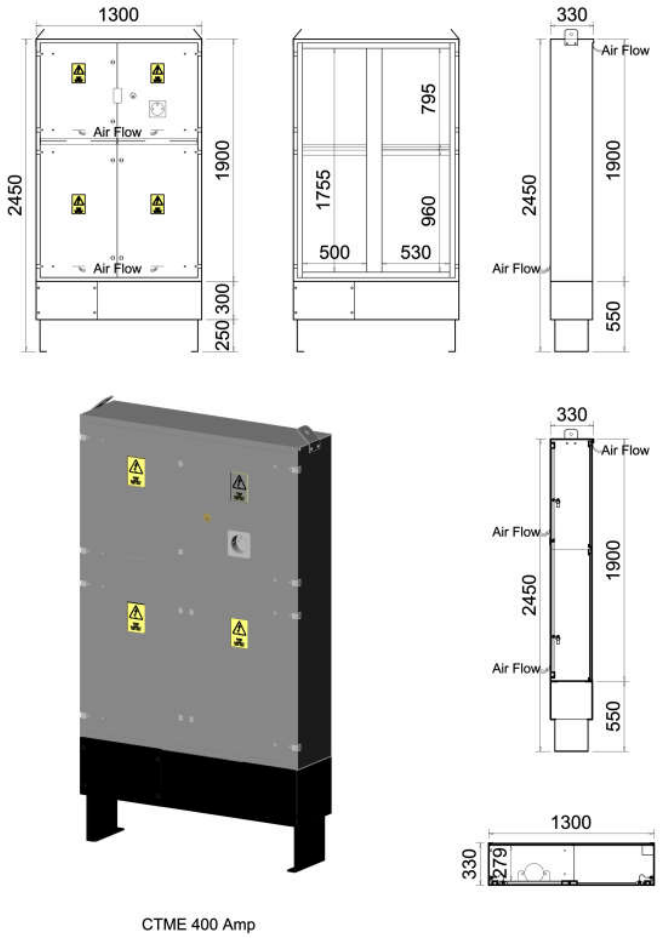
- Split Door Cabinet – Three/Single Phase Metered c/w Customer Section
- Enclosure comes complete with lock, vents, mounting plate
- Approved to ESB Specification
- 3mm Mild Steel (Grade DD11, BS EN 10111:1998)
- Hot Dip Galvanising (BS EN ISO 1461:1999) to a thickness of 70 microns
- 180 Degree Hinged Door -Tri Locks
- Bitumised Plinth up to 350mm from the bottom
- IP44 Rating
- Height (mm) 2155, Width (mm) 800, Depth (mm) 320



10.9.2 or supplies greater than 49kVA MIC (CT Metering)

- 3mm H/D galvanised
- ESB Approved Design
- Free standing enclosure
- Doors are capable of opening 180 degree
- Four Doors
- Fire Retardant Backboards
- Yale Locking Top Right Door
- 8mm Tri-Locks on other Doors
- Key safe Installed
- Plinth with Removable Face

- Customer Compartment Isolated
- CT Chamber & Cable Trunking (sealed) Installed
- IP44 Rated
- Height (mm) 2450, Width (mm) 1300, Depth (mm) 330



CTME 400 Amp

10.10 Off loader Switchboard Description Of Works

Factory built assembly switchgear shall be provided for switchgear for this project. The baseline switchgear shall be based on cubic framework with Schneider electric NSX electrical components.

10.11 MAIN SWITCHBOARD (OFF-LOADER PANEL SWITCHBOARD)

The proposed main switchboard arrangement required to facilitate the project is detailed on specific LV switchgear drawings. The electrical contractor shall appoint a specialist panel manufacturer to carry out the layout design, construction, installation and commissioning of the same.

The board shall be freestanding sheet steel cubicle pattern switchboard suitable for bottom cable entry incoming and bottom & top exit outgoing.

The switchboard shall comprise all components indicated on the drawings and be a factory built assembly Multi cubicle type to Form 4 Type 3, front access, as defined by BS EN 60439-1 and shall comply with EN 50051, EN 50001/2, BS EN 60 - 439-1:1994, and IEC 60439-1. The switch panel shall be designed to suit the cable entry from above and shall be RAL 7035 in colour.

It shall be fitted with bus bars mounted in a segregated chamber to the rear of cable ways and chambers containing the switch and control devices. The location of the bus bars shall be such that top cable entry/exit is viable. ACBs shall be withdrawable. MCCBs requirements detailed below.

10.11.1 Framework

The panels shall be cubic framework and constructed from 2.5mm thick Zintec or similar sheet steel, which shall be treated with an epoxy self-etching filler primer undercoat and two finish coats of stove enamelled synthetic paint to an approved RAL colour. The panel shall have total front access and be provided with removable lifting eyes if necessary.

Doors shall be fitted with hinges utilising screws as their top and bottom pivot points and requiring a tool to remove the door and flush mounted key operated locks. The switchboard enclosure shall be suitable for mounting in an dedicated space within the building and have an IP rating of at least IP3x as defined by BSEN 60529. Individual sections of the panel shall be interlocked so that doors cannot be opened until the supply has been isolated.

The main incomer and all outgoing supply cables shall be top entry and exit. The main isolator shall be industry standard mounted to the lower left corner of the board.

The modular system shall be based on a size of 192 mm. This modular size secures the maximum versatility and therefore allows all the individual requirements from the client or consulting engineer to be built in the switchboard. The framework shall offer;

- Maximum versatility
- Short delivery time of assembled switchboard
- Easy to rearrange and make changes

- Easy to extend for future additions and/or alterations

- Type tested according to EN 61439-1, verified by KEMA, ASTA, SABS, Det Norske Veritas,UL and Germanischer Lloyd

- Excellent documentation - Design software, technical assembly Instruction, projecting manual, temperature-rise calculation software etc. All information shall be provided as part of switchboard submission for approval by the electrical reserved specialist's sub-specialist.

- Capability of having bus-bar systems rating up to 7000 amps

- Short-circuit test Icw up to 120 kA and Ipk up to 264 kA

10.11.2 Main Earthing Cubicle

A main earthing cubicle shall be provided as an integral part of the main off loader switchboard. This cubicle shall be complete with a suitably sized copper bus bar or terminal bar to accommodate the connection of the main earthing conductor and the main equipotential bonding conductors as installed by the electrical contractor. All cable connections to this bar shall be lugged and bolted. All cables shall be identified at the connection point with an industry standard cable ferrule.

10.11.3 Bus bars

All bus bars and bus bar connections shall be of the sizes shown on the drawings, be of hard drawn, square edged, high conductivity solid bare, copper complying with BS 1432. All bus bar and associated connections shall be firmly secured and supported on self-extinguishing polyester, ceramic or fibre type mountings. Bar rating shall be certified as being capable of withstanding a short-circuit current of 50kA rms, 105kA peak, for a minimum of 1 second. Bus bars shall be rated at 800A minimum.

Interconnection of bus bars between sections of the assembly shall be achieved using captive nuts in one bus bar, the bus bar from the next section overlapping and being connected using bolts and Bellville type washers as required to form a maintenance-free joint. The main bus bars shall not be connected by fish-plates.

10.11.4 Internal Cabling

Phase ways in three phase sections shall be coloured in accordance with the harmonised cable colours and not red/yellow/blue. Any cabling shall be single core LSF (6491X) pattern, solid or stranded conductor as appropriate.

10.11.5 Rubber Mats

The electrical contractor shall supply and install a suitable rubber mat complying with BS 91 - 1976 adjacent the main off loader switchboard. The mat shall be 1 metre wide and shall run the complete length of the main switchboard.

10.11.6 Commissioning of Plant

The electrical reserved contractor shall allow for the main switchboard to be commissioned by the panel manufacturer on site before the project is handed over and for the instruction of the staff in its operation. Factory visits shall be arranged for the engineer to visit the panel manufactures plant and witness testing prior to the board leaving the factory. All costs associated with such visits shall be borne by the electrical contractor and his switchboard specialist.

10.11.7 'As Installed' switchboard Drawing

The electrical contractor shall allow for the provision of an 'A1' framed drawing of the switchboard to be installed adjacent to the main off loader panel. The drawing shall be fitted with a framed Perspex cover.

10.11.8 Main Protective Device (ACB)

Schneider adjustable ACB (main breaker) shall be provided with shunt trip auxiliary contacts which shall be linked to a fire fighter's electrical isolation switch located in main school lobby at the fire panel. The shunt trip shall only operate the main breaker upon operation of the fireman's isolating switch. A loss of utility supply or internal electrical distribution system supply shall not signal the shunt to operate the main breaker.

10.11.9 MCCB's

The MCCB's shall match be Schneider NSX MCCB's as per the following technical specification. All MCCB's shall be motorised type to enable load stepping of future standby generator. All MCCB's shall be manufactured to BS EN ISO9001 and comply with BS 4572. Compliance with international standards, IEC 61439-2, UL, CSA, JIS & CCC. All MCCB's shall be complete with Thermal and Magnetic overload settings as indicated in the technical specification below.

All switching toggles shall be in the up/down operation. All MCCB's shall be Traffolyte labelled. Spare spaces shall be fitted with blank labels for future engraving.

MCCB's Technical Specification

To meet the following specification:

- Shall comply to IEC 60947-2
- Rated current as per schematic
- Rating and model number indicated clearly on the front of the housing and with clear "ON" and "OFF" indication
- With thermal magnetic trip unit (TMD)

- Breaking capacity (Icu) 50kA
- Ics = 100% Icu as per IS/IEC 60947-2
- Suitable for isolation
- Class II front face
- Adjustable thermal setting 0.7 – 1 x In
- Adjustable short-circuit from 5 – 10 x Ir
- c/w rotary handle
- As Schneider Electric 'Compact NSX'

All MCCB's shall be relevant British Standards BS 3871 Part 2. All switching shall be in the up/down operation. A number of MCCB's are indicated as having short circuit (magnetic only) protection only as thermal overload protection shall form part of an upstream installation. MCCB's shall be capable of withstanding a short circuit current of 20kA minimum for 5 seconds.

All MCCB's shall be Traffolyte labelled. Spare spaces shall be fitted with blank labels for future engraving. Manufacture shall be uniform throughout to provide for accurate discrimination in the event of a fault.

10.11.10 Devices installation

Each device shall be installed onto a dedicated mounting plate. Each mounting plate shall have an independent fixing system affording them to be transformed and moved anywhere in the switchboard and to ensure the switchboard can be expanded.

Front plates shall be installed in front of all control and protection equipment with IEC 144 IP54 classification, in order to avoid direct access without a tool to the devices and consequently to the active parts.

10.11.11 Private Energy Multi-Metering Modbus

Smart meters shall be installed. The proposed meters shall be installed local to each breaker within the main off loader switchboard. The proposed meters shall offer uncomplicated operation and high accuracy measurement of three-phase voltage, current, frequency, Watts, VAr, VA, energy, power factor, and total harmonic distortion measurement of both phase and system, current and voltage.

Each meter shall be complete with a communication bus and operate on Modbus protocol with data transmitted across the schools network for integration with the BEMS installation. The data extracted from the meters shall be transmitted onto the BEMS front end by the controls specialist.

The contractor shall be responsible for obtaining and configuring the required static IP address from the client's service provider in order for the remote monitoring via the BEMS to be fully enabled prior to practical completion. All costs associated with arranging this shall be included at tender stage.

The baseline Modbus meter shall be manufactured by Socomec Diris A20 or equal & approved.

Switchgear specialist shall allow and present a set of DIN rail terminals for linking/interfacing the private meters onto the BMS panel by 3rd parties