Unit A6, M4 Business Park, Maynooth Road, Celbridge, Co. Kildare, W23 VFY7 (Tel: 01-6274103)

Salesian College,
Celbridge,
Co. Kildare,
W23W0XK

ROLL NUMBER: 61661P

'VOLUME A2'
OF THE
WORKS SPECIFICATION

PARTICULAR SPECIFICATION

TENDER ISSUE (T1)

Document Control: VA2/J26-039

Rev:	Date:	Prepared By:		Quality Check By:	
T1	**03/11/2026**	**Ellaine Olaya**		**G Benndorf**	

Table of Contents

GENERAL 4
Site visit 5
Builders work and attendances 6
Cleaning 7
Co-ordination 8
Project Supervisor Construction Stage (PSCS) 9
O&M manuals 10
Timescale and working hours 13
Declaration of Performance/CE markings 14
(51) MECHANICAL WORKS 15
51.01 Survey of the existing heating centre in the boilerhouse and the existing space heating installation in the building 15
51.02 Decommissioning of the existing mechanical services and plant installed in the existing boilerhouse 16
51.03 Internal gas pipework in the boilerhouse 17
51.04 Gas isolation valves 19
51.05 Gas detection system 20
51.06 New gas boilers and low loss header in the boilerhouse 26
51.12 Flues for the new boilers 33
51.08 Condensate pipework from the new boilers and flues in the boilerhouse 37
51.09 Condensate neutraliser 37
51.10 LPHW Pipework, fittings, valves and accessories in the boilerhouse 38
51.11 Insulation on LPHW pipework and water services pipework in the building 46
51.12 Pressurisation unit and expansion vessels in the boilerhouse 50
51.13 Circulating pumps in the boilerhouse 53
51.14 Dosing pot in the boilerhouse 55
51.15 Dirt separator with magnet on main flow header to the low loss header 56
51.16 Frost heater in the main boilerhouse 58
51.17 Flush out, pressure test and corrosion inhibitor in the boilerhouse 58
51.18 Fire extinguishers in the boilerhouse 59
51.19 Pressure test of all new pipework in the boilerhouse 60
51.20 Drain down of existing heating system and re-fill 60
51.21 Testing of water 61
51.22 Decommissioning of existing MCC controls panel in the boilerhouse 62
51.23 New MCC controls panel to be installed in the boilerhouse 62
51.24 Decommissioning of the existing space heating installation throughout the building 71
51.25 Decommisioning and removal of the existing pipework serving the existing radiators 72
51.26 Low water content radiators 73

51.27 LPHW Pipework and pipework supports for space heating in the building 78
51.28 Radiator valves 85
51.29 Two-port valves & associated thermostat 85
51.30 Flush out and pressure test all new pipework installed in the building 88
51.31 Commissioning of new heating system in the boilerhouse and the building 88
51.32 Gas fired radiant heaters 88
(61) ELECTRICAL WORKS 90
61.01 General electrical specification 90
61.02 Cable carrier 90
61.03 Sub-mains cable to the new MCC controls panel for the boilerhouse 95
61.04 Attendances to the MCC controls panel in the main boilerhouse 97
61.05 Testing and commissioning 100
61.06 Cabling, wiring and cable sizes 101
61.07 Attendances to the gas detection system in the boilerhouse 103
61.08 Fire alarm works to the boilerhouse 105
61.09 Decommissioning of the existing electrical installation in the boilerhouse 108
61.10 Attendances to the two-port valves and local room stats 108

GENERAL

The intention of this specification issued is to describe and provide for a complete installation. The Contractor is advised that the work to be executed as described in these documents shall be complete in every detail, notwithstanding that every item involved may not be specifically mentioned or described.

The Contractor shall be held to allow for all materials and labour necessary for an entire and complete installation and shall not avail of any unmentioned error or omission should such exist.

This project entails works in decommissioning and replacing the existing space heating installation and heating centre in the building.

Refer to the **Invitation to Tender Letter for details**

No extension or significant Architectural works shall form part of this contract.

The Contractor shall appoint a suitably qualified Building Contractor to carry out the builder's works and building finishes works as specified in these documents.

All works shall be in compliance with all relevant Building Regulations, Irish Standards, British Standards, CIBSE Guidelines and Good Engineering Practices.

The Contractor shall be required to ensure all necessary flexibilities & resources are available to the project to meet the deadlines and programmes.

The Contractor shall liaise with all his relevant Contractors regarding the programme and order of works and any concerns he may have over the completion date should be raised prior to the awarding of the contract.

The Contractor shall take all reasonable care to ensure all site workers and visitors are not endangered by any element of their works. The Contractor must ensure that the works are completed as soon as possible and/or within the agreed program time frame. It is the Contractor's responsibility to raise any concerns over the proposed works with the Employers Representative prior to commencement of works.

Failure to inform the Employers Representative of any such concerns will be deemed that the contractor has accepted the design and scope of works to be fault free.

This specification will set out in general terms the data to be used by the Contractor in order to submit a tender bid for the works as identified. This shall include the production of a complete set of services installation drawings. The

procurement, delivery, supply, handling, erection, installation and commissioning of the services as there under described as may be seen or inferred from the enclosed documents from the Consulting Engineer.

The Contractor shall satisfy himself that the installation is in accordance with all codes and standards. All works described shall comply with:

i) The Safety, Health and Welfare Act 2005
ii) Requirements of the Health and Safety Authority / SI 138.
iii) Requirements of the Fire Officer.
iv) All Irish Building Regulations including Building Control (Amendment) Regulations (BC(A)R), S.I. 9 of 2014.
v) Factories Act / Statutory Instruments.
vi) Client Safety Protocol.
vii) Client Specifications.
viii) Chartered Institute of Building Services Engineers.
ix) The Tender Drawings.
x) The Contract Preliminaries.
xi) All relevant Irish, British, European Standards and Codes of Practice.
xii) The ETCI National Rules for Electrical Installations.
xiii) I.S. 10101:2020 National Rules for Electrical Installations.
xiv) I.S. 820:2019 Non-domestic gas installations (Edition 3)

The Contractor shall familiarise himself with the above and the obligations therein.

Site visit

Applicants interested in visiting the building will need to contact Salesian College at 016272166 to arrange an appropriate appointment to visit the site during the tender period.

If the Contractor cannot get in contact with the Client, please contact Galileo Energy Services so that they can arrange access to the building for the Contractor.

Tenderers shall arrange to visit the site to ascertain for themselves the full extent and nature of the works and to familiarise themselves with the general site conditions, to its accessibility, modifications to existing mechanical installations equipment and specialist equipment and the supply of and conditions affecting labour and of executing the contract generally.

As child protection policies and Data Protection policies are deployed in the building, the tendering Contractor MUST NOT arrive to site without prior appointment.

Tenderers shall note that no claim in respect of lack of knowledge of prevailing site conditions, builders work or existing services can be considered.

The tender drawings are based on the best information available at the time of preparation and by visiting the site the Contractor shall satisfy himself of the exact extent and nature of works involved.

Builders work and attendances

All builders work associated with the execution of the works shall be carried out under this contract by the Contractor. The appointed Contractor shall be completely responsible for all builder's work. A suitably qualified Building Contractor shall be employed by the Contractor to carry out the building works and building finishes associated with this contract.

Due allowance for this item must be allowed for in the tender price. **See 'Builders Work Schedule' in 'Volume C1' of this document and this specification for details on all builder's work required and building finishing works required.**

The Contractor shall prepare any working drawings if necessary, agree all details with the Employer's Representative, mark out and be responsible for correctness, and the cost of any unnecessary work due to the Contractor failing to comply with this condition shall be the Contractors responsibility.

The Contractor shall ensure that cutting away and general attendance is reduced to a minimum and must not impede or delay the carrying out or completion or this work. The permission of the Employer's Representative shall be secured before cutting or chasing is commenced.

The Contractor shall be responsible for the preparation of the following:

- All builders work and building finishing works associated with the execution of the works.
- All required opes through walls, roofs, floors, etc. for services.
- All required internal trenching, external trenching, etc. for services.
- All required attendances to the building of the LPG gas tank compound.
- Painting.
- Builders work drawings, including all necessary opes for installation.
- Technical submittals, for all items of plant and equipment that vary from the specified equipment herein.
- Ensuring that all services/installation details are completely integrated with all aspects of the building elements, to the satisfaction of the Client.

Cleaning

General:

The Contractor shall be totally responsible for the cleaning and tidy-up of the internal and external areas where all works shall occur, once all works are completed.

The Contractor shall be responsible for the cleanliness of all areas where and surrounding access areas where works are being carried out during the construction period.

The Contractor shall allow for the cleaning of all areas and removal of all rubbish before the anticipated handover date for the project.

All areas where works are to be carried out shall be cleaned and tidied to the satisfaction of the Client and if the cleaning is not to the satisfaction of the Client, the Client shall employ cleaners to complete the cleaning at the Contractor's expense.

All external areas and internal areas shall be cleaned and tidied to the satisfaction of the Client and if the cleaning is not to the satisfaction of the Client, the Client shall employ professional cleaners to complete the cleaning at the Contractor's expense.

Professional contract cleaners:

The Contractor shall allow for employing a professional cleaning company to clean all the internal areas in the building where works are to be carried out. The Contractor shall employ professional contract cleaners to clean all the internal areas in the building where works are to be carried out.

The Contractor shall be responsible for the cleanliness of all areas where and surrounding access areas where works are being carried out during the construction period. All internal areas where works are to be carried out shall be cleaned and tidied to the satisfaction of the Client and if the cleaning is not to the satisfaction of the Client, the Client shall employ their own professional cleaners to complete the cleaning at the Contractor's expense.

Internal Areas:

For all internal areas, the Contractor shall clean the rooms to ensure the rooms/areas where the Contractor was working is free from all dust and is fit for immediate use once works have been completed in the rooms.

Immediately after all builders works, decommissioning works or installations works are carried out, the Contractor shall allow for the cleaning up and making good of all floors, walls and windows to remove all dust, rubble and dirt.

The Contractor shall also be responsible for the removal of rubbish and decommissioned material/equipment from the building and site and providing adequate number of skips to do so.

The Contractor shall allow for the hoovering and cleaning of all floors where works were carried out in the building by the Contractor.

Further to items listed above, allow for cleaning down the following:

- All debris, packing cases, excess materials, plant and materials are to be removed off the site entirely
- All marks, scratches and minor defects are to be made good
- Decoration to be finally inspected and touched up as required
- All fittings such as electrical items, mechanical items and sanitary ware to be cleaned down completely
- Where opes are bored through internal and external walls, the walls shall be washed down and cleaned
- All floors are to be cleaned out completely
- All tiled surfaces are to be cleaned of all grit washed as directed and polished to manufacturer's recommendations
- All painted work is to be cleaned down and washed

External Areas:

For external areas, the Contractor shall allow for removing any debris, materials, rubbles, dust, etc. where works have been carried out to ensure the external areas where the Contractor was working is clean and is fit for immediate use once works have ended prior to opening of the building.

The Contractor is to ensure that all external areas where works have been carried out, are to be left free of all dirt and debris and builder's materials and parking of construction vehicles, etc. and the roadways are to be thoroughly cleaned as and when required.

The Contractor shall also be responsible for the removal of rubbish and decommissioned material/equipment from the rooms/areas identified and providing adequate number of skips to do so.

Co-ordination

The Contractor shall act as lead co-ordinator for the entire project i.e. all building works, mechanical works, electrical works, etc. required to complete the project.

The Contractor shall be responsible particularly for the detailed installation design and co-ordination with other services and structures for the entire installations.

The co-ordination of the builders works, mechanical installations and electrical installations shall be the sole responsibility of the Contractor.

The Contractor shall agree all methods, sequences timing and all relevant details of the works within his contract with the Employers Representative in advance and shall not deviate from this agreement unless otherwise agreed in writing with the Employers Representative.

No adjustments will be made to the contract sum where additional work is required due to poor co-ordination or where the Employer's Representative has not been informed in good time of a co-ordination difficulty that could have been resolved by a design decision had the issue and its full implications been advised to the Employer's Representative in good time. The Contractor shall liaise with all other trades when co-ordinating their works.

The Contractor is deemed to have included all costs associated with co-ordination of each service and the building fabric. These costs shall be deemed to include all necessary pipework offsets, containment offsets, re-routing, etc. No claims for additional costs shall be accepted after receipt of tenders.

Project Supervisor Construction Stage (PSCS)

The successful Tendering Contractor shall act as the Project Supervisor for Construction Stage (PSCS) and the cost to fulfill this role shall be included in the Contractors submitted tender price. The role of the PSCS is to manage and co-ordinate health and safety matters during the construction stage.

The PSCS shall be appointed by the Client/School Authority to carry out the role as PSCS for the project.

The successful Contractor is to appoint competent persons as Supervisor for the Construction Phase (PSCS) in accordance with the current Health & Safety Legislation, with particular regard to the Safety, Health and Welfare at Work (Construction) Regulations 2006 and the Health & Safety Act 2005.

The duties of the PSCS include the following:

- Advise the Client of the requirements of the Construction Regulations

- Identify hazards arising from the design or from the technical, organizational, planning or time related aspects of the project.
- Where possible, eliminate the hazards or reduce the risks, in advance & during, the construction stage (by implementing the General Principles of Prevention).
- Coordinate the implementation of the construction regulations by contractors, welfare facilities on site & safe working procedures.
- Organize the required co-operation between contractors.
- Ensure all workers have appropriate safety training, including Safe Pass & CSCS.
- Communicate necessary control measures, safety management systems and safety principles to contractors & workers.
- Cooperate with the PSDP & Design Team to ensure safety.
- Prepare a written Construction Stage Safety and Health Plan for the project, from the Preliminary/ Design Process Safety Plan.
- Coordinate the implementation of Temporary Work Certification.
- Collect & prepare information for the Safety file for the completed structure and give it to the PSDP.
- Notify the Health & Safety Authority and the client of non-compliance with any written directions issued
- Coordinate the reporting of accidents to the HSA.

The Project Supervisor Construction Stage must notify the Health and Safety Authority of any site where:

- The construction work is planned to last longer than 30 working days; or
- The volume of construction work is scheduled to exceed 500 person-days.

A working day is any day where the construction work is carried out, even if the work is of short duration, or the day is a holiday, or over a weekend. A person day is one individual, whether they be supervisors or other employee(s), carrying out work for one normal shift. The notice must be submitted before the commencement of work on site. The particulars required to be notified are set out in the Approved Form AF2.

O&M manuals

General:

The Contractor shall allow for supplying and providing an Operation & Maintenance (O&M) manual for the works to be carried out in the building.

O&M Manuals:

As highlighted above, the Contractor shall provide a Class D Operating & Maintenance manual for the works carried out in the building. The Contractor shall allow for the supply and installation of a hard and soft copy of the O&M manual to the building. For a soft copy, the Contractor shall install the O&M manual on a USB stick that shall be included in the hard copy to be handed over to the Client.

All operation and maintenance manuals along with their associated record drawings shall be prepared in accordance with the requirements of BSRIA document 1/871 Operating and Maintenance Manuals for Building Services Installations.

The manuals must therefore contain all necessary technical information on each item of equipment and the associated components which have been used to assemble and construct the system(s). Three no. hard copies and three no. soft copies of the final approved O&M documentation will be required.

In addition, manuals for each system must contain information on the design intent of the system, commissioning and testing results and reports of how the components of the system are adjusted to achieve the design intent, line diagrams to show how the system is arranged in the building giving the location of all equipment and components, its control system, how the system must be set in the normal operating mode and in the event of any emergency.

Routine check that must be made and a list of spares which should be kept and a list of any special tools which may be required.

The manuals must be prepared in such a way that an Engineer without any previous knowledge of the Project may use them to operate and maintain the system.

Contents of Manual of each manual:

Each Operating and Maintenance Manual shall be specific in respect of the complete Contract Works and shall include the following sections:

- Section 1 Description
- Section 2 Plant and Engineering Systems
- Section 3 Operating and Maintenance Procedures
- Section 4 Commissioning and Testing
- Section 5 As-Built drawings

Section 1 – Description

This section shall comprise:

- A detailed description of each building services system.
- General description of all plant and equipment.
- Design data for the system and for each item of plant which affects the performance of the system.

Section 2 - Plant and Engineering Systems

This section shall comprise:

- Detailed technical information as published.
- Manufacturers drawings (where applicable) showing all components of the plant item with each component number in accordance with parts list
- Parts list for each item of plant.
- Manufacturers addresses and telephone numbers.
- Complete instructions for ordering replacement parts in a manner that will prevent errors/misunderstanding including order number for plant.
- Colour coding identification schedule for each building services system.

Section 3 - Operating and Maintenance Procedures

- A step-by-step method of starting, operating and shutting down a system and how this affects other systems. The procedure for an emergency shut-down.
- A list of routine checks that should be made and frequency of the checks.
- A comprehensive schedule of routine maintenance based on Manufacturer's recommendations for items of plant etc. This program should state clearly what work should be done for each day, week, month, year or given number of hours.
- A list of tools and keys which will be required in the operation and maintenance of the systems.
- Fault finding procedures.

Section 4 - Commissioning and Test Report

The report for each system shall contain a record of all the parameters which affect the performance of the system at the time of commissioning. The report shall be comprehensive and shall contain a record of the settings of all valves and controls and any other adjustable components so that the system may be reset to the commissioned state by reference to the report.

Presentation

- Indexing System

Each volume shall be numbered and shall be divided into sections using an appropriate numbering system

- Paper Sizes

  The manual will contain manufacturer's literature which will be different sizes. Large pages will be folded and small pages will be fitted in plastic pockets with a reinforced edge punched for filing in A4 lever arch files. The page size shall be standardised for all volumes using A4 paper (210 x 297mm) with four holes punched centrally in the longer side 80mm apart.

- Section Dividers

  Stiff cardboard section dividers with extended tabs shall be used; these shall be SUMMIT Ring Book Guides or equivalent.

- Files for Manual

  A4 lever arch files with rigid plastic coated covers shall be used which shall be EMGEE or equivalent. Inlaid lettering on the front cover shall indicate the title, i.e. Operating and Maintenance Manual, the Name of the Project and Volume Number. A label shall be fitted in the window on the spine of the file listing its contents.

Section 5 – As-built Drawings

The Contractor shall include for a complete set of as-built drawings which shall incorporate all works carried out and completed by the Contractor.

All services, trunking/tray, routes and circuits within the building shall be identified on these drawings. To facilitate submission of record drawings, the Contractor shall keep on site a complete set of all drawings used on the Contract Works, on which he shall mark alterations to the designs shown thereon as such alterations are carried out.

Timescale and working hours

See Invitation to Tender Letter for details

It will be a condition of appointment that the Contractor can meet this programme.

Each tendering contractor should allow fully with his tender price for sufficient resources for the safe execution of the contract for the anticipated programme as outlined above. The project is programmed to be completed within a short

timeframe and the Contractor must allow for the necessary resources to complete the works within this timeframe.

The Contractor shall be responsible to resource the project so that all works as identified on the tender drawings and specifications are completed in a safe and satisfactory manner before the proposed completion date.

In any event, the Contractor must allow for sufficient resources to complete all the works identified for the project and hand over to the client before the dates highlighted. No additional cost will be paid for overtime working. The Contractor's Tender is deemed to include for the cost of all necessary overtime, attendances and all other expenses that may be necessary to execute and complete the works within the Contract Period.

Declaration of Performance/CE markings

Refer to item 61.0 in 'Volume A1 – General Contract Conditions and Preliminaries for the Works'.

(51) MECHANICAL WORKS

GENERAL

The Contractor shall be responsible for all mechanical works as identified in these tender documents. The Contractor shall ensure that the full price for this work is included in the tender price. This section of the specification outlines the mechanical services installation and describes the particular requirements of the mechanical services to be installed and the works carried out.

This section is intended to be read in conjunction with all other technical and non-technical sections of the specification. Where this section is at variance with any other sections of the tender documents, the tenderer shall obtain clarification from the Employers Representative before tendering. Failure to do so will be deemed to imply that the most onerous requirements have been included for.

51.01 Survey of the existing heating centre in the boilerhouse and the existing space heating installation in the building

General:

The Contractor shall allow for one full day for carrying out a detailed survey of the existing mechanical installation in the building and in the boilerhouse before any plant or materials are ordered for the works.

Boilerhouse:

Once appointed, the Contractor shall carry out a detailed survey of the following in the boilerhouse:

- Location, model, details and size of the existing oil-fired cast-iron sectional boiler, associated burner and the associated flue in the boilerhouse.
- Location, details and size of the existing heating services pipework throughout the boilerhouse.
- Location, details and sizes of the existing oil and water services pipework throughout the boilerhouse.
- Location, details and sizes of the existing heating circuits and existing flow and return headers in the boilerhouse.
- Location and details of the existing electrical services, electrical items and electrical panels in the boilerhouse.
- All other installations and the general layout of the plant and pipework in the boilerhouse.

Main Building:

Once appointed, the Contractor shall carry out a detailed survey of the following in the building:

- Before any radiators are ordered, the Contractor shall measure up on site and confirm to the Employer's Representative that all the new low water content radiators scheduled are suitable in all respects for the locations indicated. It is the Contractors responsibility to ensure that all radiators shall fit in the locations as indicated. Final locations of all radiators to be agreed on site. Radiators shall not be ordered until all locations and sizes have been agreed with the Employers Representative on site.
- Proposed routes of all new heating services pipework to the new radiators in the building. If the Contractor has any issues or wants to alter routes, this needs to be discussed and confirmed with the Engineer.
- Location, details and size of the existing heating services pipework throughout the existing old building.
- Location and details of the existing electrical boards in the building and the locations where the new electrical supplies will be taken from for the new electrical attendances to the new installation as indicated on the drawings.
- All other installations and the general layout of the building.

Photographic Survey:

Before any decommissioning works are carried out or any works in the boilerhouse or the main building, the Contractor shall carry out a detailed photographic survey of the existing installation in the boilerhouse and the main building.

This includes all rooms in the building and the existing installations in these rooms.

51.02 Decommissioning of the existing mechanical services and plant installed in the existing boilerhouse

The Contractor shall include for the decommissioning and removing from site all of the existing mechanical services and plant within the existing boilerhouse as part of the works to be completed on-site.

The following shall be decommissioned and removed from site as part of the works:

- Decommissioning and removal of the floor mounted oil boilers in the existing boilerhouse, all associated heating services pipework, controls, heating plant, etc.
- Decommission and removal of the existing flue for the existing oil boilers in the boilerhouse that is to be decommissioned and removed.
- Decommissioning and removal of all the existing heating flow pipework and heating return pipework in the boilerhouse including headers, pumps, controls, etc.
- Decommissioning and replacing of the existing MCC controls panel with a new MCC controls panel.
- Decommissioning, stripping out and removal from site of the existing radiator circuits, radiators and all associated heating services pipework for the heating services installation throughout the existing old building.
- Any other items associated with the existing installation.

51.03 Internal gas pipework in the boilerhouse

General:

The existing boilerhouse is served by a natural gas supply currently connected to the existing floor-mounted boiler. The existing incoming gas supply and serviceable internal gas pipework shall be retained and adapted to serve the new wall mounted boilers.

The Contractor shall allow for surveying the existing installation and verifying the condition, capacity, operating pressure and suitability of the existing gas supply, pipework and associated valves for the proposed boiler duty. Any deficiencies shall be reported to the Engineer before alteration works commence.

Refer to the drawings for the proposed boiler location, connection arrangements and extent of pipework alterations.

All gas installation works shall comply with I.S. 820:2019 – Non-Domestic Gas Installations, including applicable amendments, and the boiler manufacturer's instructions. Gas works shall be undertaken by an appropriately registered and competent gas installer.

Existing gas pipework in the boilerhouse:

The Contractor shall allow for the safe isolation and disconnection of the gas supply to the existing floor-mounted boiler before its removal.

Existing gas pipework shall be retained where suitable for reuse. Redundant branches shall be removed back to an appropriate retained connection point and

permanently capped or plugged using fittings suitable for natural gas. Closed valves alone shall not be used as permanent termination points.

Gas pipework alteration in the boilerhouse:

The Contractor shall supply, install and test all new pipework, fittings and valves required to adapt the existing natural gas installation and connect to the new condensing boilers.

New pipework shall be sized to meet the boiler's maximum gas input and required inlet pressure, taking account of the available supply pressure and any other connected gas loads. Existing pipe sizes shall not be assumed adequate without verification.

New internal pipework shall be black steel suitable for natural gas service, complying with I.S. EN 10255 or another applicable pipework standard accepted under I.S. 820.

Provide an accessible appliance isolation valve adjacent to the boiler and all connections required by the boiler manufacturer.

Pipework shall not be routed through unventilated voids. Where pipework passes through walls, floors or other building elements, provide suitable sleeves, seals and fire stopping as applicable. Pipework joints shall not be concealed within sleeves.

Welding:

All new internal gas pipework installed in the boilerhouse shall have all joints welded throughout its run.

All pipework welding shall be in accordance with the relevant BS specification or where BS does not apply shall be of the highest standard of workmanship and shall be subjected successfully to any test required by the Engineer.

All gas services pipework shall be welded in accordance with the requirements of BS 2640 and 2971, copies of which shall be retained on site during course of installation.

The Contractor shall ensure that all operatives engaged on welding are familiar with the requirements of this BS Specification and are normally capable of welding to the standards therein laid down.

Painting of gas pipework:

All new internal gas pipework in the boilerhouse shall be painted with two coats of yellow paint by the Contractor.

The Contractor shall allow to make good all surfaces before painting the gas pipework. The Contractor shall allow for the following to paint the gas pipework:

- Step 1: Thoroughly clean the pipework and prepare for painting.
- Step 2: Apply a good primer to the internal pipework.
- Step 3: Paint the internal gas pipework with two coats of Yellow Gas Paint (Ochre paint) to highlight that it is gas pipework.

Bracketing and supports for gas pipework:

The Contractor shall allow for brackets and supports on all internal gas pipework installed. Refer to 'Bracketing and supports for gas pipework' in 51.09 for information on the brackets and supports for the gas pipework as it will the same for external gas pipework as internal gas pipework.

Pressure testing of pipework:

The Contractor shall allow for carrying out a strength and soundness test on all the external gas pipework installed. Refer to 'Pressure testing of pipework' in 51.06 for information on pressure testing of the pipework.

Testing and commissioning:

Once the strength and soundness test has been successfully completed, the Contractor shall provide a declaration commissioning cert of successful completion of the test. Refer to 'Testing and Commissioning' in 51.06 for information on testing and commissioning required.

51.04 Gas isolation valves

The Contractor shall allow for the supply and installation of new gas isolation valves on the internal and external gas pipework. New gas valves in new pipe work up to and including 65mm nom. bore shall be full bore ball type lever valves without transition couplings.

Valves in pipe work over 65mm nom. bore shall be angle disc lugged butterfly type between steel flanges.



Certified gas lever valves shall be installed on all gas pipework. Valves shall be suitable for natural gas and LPG. Gas lever valves shall be EN331 approved valves. Valve shall have a lever handle, brass body with a nickel coated finish.

The level shall be a plated steel lever with yellow plastic coating. The isolation valve shall clearly indicated via permanent markings, stating its purpose and indicated its 'ON' and 'OFF' positions.

51.05 Gas detection system

New gas detection system for the boilerhouse:

A new gas detection system shall be supplied and installed by the Contractor in the boilerhouse for the new gas supply pipework in the boilerhouse. The Contractor shall allow for the supply and installation of a new gas detection system and gas solenoid valve on the new gas pipework in the boilerhouse as indicated on the drawings.

The gas detection system and associated gas solenoid valve shall be located as indicated on the drawings.

The solenoid valve shall be installed on the gas line entering the boilerhouse. The Contractor shall allow for the following with the gas detection system:

- Gas detection control panel.
- Gas solenoid valve
- All required gas detectors (Natural gas) and carbon monoxide detectors.
- All other accessories as required.



The gas detection system shall conform to the following parameters:

- Suitable gas detection system shall be as 'Medem 'AGDS-4 4' (or equivalent). The dimensions of the panel shall be 180mm wide by 130mm high by 70mm deep.
- Shall be a four-channel gas detection system.
- Panel shall have an OLED display for displaying system status during both installation and normal use, also for displaying diagnostics.
- The gas detection control panel shall be provided and shall conform to EN 50054 and shall be CE and BSI certified.
- The Contractor shall allow for the following detectors to be installed with the system:

    - Gas detector (LPG gas). Sensor shall be located at low level in the boilerhouse
    - Carbon monoxide detector. Sensor shall be located at high level on the ceiling (150mm below the ceiling)

- Panel to be wall mounted with emergency knock-off button, reset button, mute button and have LED indication for power on, gas-on and emergency stop. Detector LEDs will give clear indication as to the status of each detector i.e. 'high alarm', 'low alarm', 'gas isolated' and 'sensor alert'.
- Self-diagnosis of the panel. If the remote sensors are wired incorrectly or if they develop a fault during operation, the fault light shall activate.
- Panel to have an additional auxiliary relay. Functions can be selected as 'high alarm', 'Em-stop', 'detector alert' or 'low alarm'.
- The control panel housing shall be an ABS enclosure, rated IP65.
- The sensor(s) are to be wired to the control panel using a four core signal and low voltage cable and be powered up from this source. The detectors are typically daisy chain wired.

- If an alarm begins (at 5% LEL) then the pre-alarm light on the affected sensor/s will illuminate and the unit will emit a beep but the valve will remain open – if the gas levels continue to rise the panel will go to high alarm (at 10% LEL), a constant buzzer will sound and the valve will close – the affected sensor will be indicated on the panel and the light on the gas sensor concerned will turn from green to red confirming the location of the alarm.
- The solenoid valve shall be IP65 rated, shall be wired in series to the gas detection panel as per manufacturer's instructions. Slam shut valve as Banico, or equivalent.
- Panel to have terminals for the acceptance of a fire panel alarm signal in order to close the gas valve served by that panel during a fire alarm.
- The pressure sender unit and the gas solenoid valve to be supplied with a fixing kit for connection on site.
- The 230volt mains supply to panel should be from a 13amp fused switch.
- The solenoid valve is connected to the terminals marked "Valve" on the panel connections.
- System shall have a 10-year warranty.

Gas solenoid valve:

The Contractor shall allow for the supply and installation of a 50mm (2") gas solenoid valve on the incoming gas supply pipework into the boilerhouse that shall be installed in conjunction with the gas detection system.

Function:

- Gas detection for the devices in the boilerhouse.
- Carbon monoxide detection for the devices in the boilerhouse.
- Providing a means of isolating the gas during an emergency.
- OLED display for displaying system status during both installation and normal use, also for displaying diagnostics.In the event of a high alarm from one of the sensors, the system will isolate\close any connected valve. Low alarm indication is also given.

Operation:

- The gas supply to the building shall be linked to the gas safety panel by means of a solenoid valve.
- The system shall close on the activation of gas leak via the gas sensors.
- The system shall close on the activation of low pressure in the pipework.
- The system shall close on the activation carbon monoxide in the boilerhouse.

Ancillaries:

- Gas detection system as the 'Medem 'AGDS-4 4' panel.
- Gas solenoid valve (line sized to suit).
- Suitable gas detectors (natural gas). There 2no gas detector to be installed in total. Detectors shall be located at low level in the boilerhouse and at stairwell of boilerhouse.
- Suitable carbon monoxide detector. There is 1no carbon monoxide sensor to be installed in total. Detector shall be located at high level on the ceiling (150mm below the ceiling)
- All detectors shall be IP44 rated.

Commissioning:

- The Contractor shall include for a Medem Engineer to attend site for as long as is necessary to commission the system and to familiarise the Client's representative with the operation of the panel.
- The Contractor shall include for the testing and commissioning of the system by the equipment supplier.
- A commissioning certificate shall be issued on completion with full instructions on the operation of the system.

Interface to the fire alarm system:

The new gas detection system shall be connected and interfaced to the fire alarm system for the building. Refer to section 61.03 for further information on the interfacing of the gas detection system to the existing fire alarm system.

New gas detection system for the Sports Hall:

A new gas detection system shall be supplied and installed by the Contractor in the sports hall as shown on the drawing. The Contractor shall allow for the supply and installation of a new gas detection system and gas solenoid valve on the existing gas pipework in the sports hall as indicated on the drawings.

The gas detection system and associated gas solenoid valve shall be located as indicated on the drawings.

The solenoid valve shall be installed on the gas line entering the sports hall.
The Contractor shall allow for the following with the gas detection system:

- Gas detection control panel.
- Gas solenoid valve
- All required gas detectors (Natural gas) and carbon monoxide detectors.
- All other accessories as required.



The gas detection system shall conform to the following parameters:

- Suitable gas detection system shall be as 'Medem 'AGDS-4 4' (or equivalent). The dimensions of the panel shall be 180mm wide by 130mm high by 70mm deep.
- Shall be a four-channel gas detection system.
- Panel shall have an OLED display for displaying system status during both installation and normal use, also for displaying diagnostics.
- The gas detection control panel shall be provided and shall conform to EN 50054 and shall be CE and BSI certified.
- The Contractor shall allow for the following detectors to be installed with the system:

    - Gas detector (LPG gas). Sensor shall be located at low level in the boilerhouse
    - Carbon monoxide detector. Sensor shall be located at high level on the ceiling (150mm below the ceiling)

- Panel to be wall mounted with emergency knock-off button, reset button, mute button and have LED indication for power on, gas-on and emergency stop. Detector LEDs will give clear indication as to the status of each detector i.e. 'high alarm', 'low alarm', 'gas isolated' and 'sensor alert'.
- Self-diagnosis of the panel. If the remote sensors are wired incorrectly or if they develop a fault during operation, the fault light shall activate.
- Panel to have an additional auxiliary relay. Functions can be selected as 'high alarm', 'Em-stop', 'detector alert' or 'low alarm'.
- The control panel housing shall be an ABS enclosure, rated IP65.
- The sensor(s) are to be wired to the control panel using a four core signal and low voltage cable and be powered up from this source. The detectors are typically daisy chain wired.

- If an alarm begins (at 5% LEL) then the pre-alarm light on the affected sensor/s will illuminate and the unit will emit a beep but the valve will remain open – if the gas levels continue to rise the panel will go to high alarm (at 10% LEL), a constant buzzer will sound and the valve will close – the affected sensor will be indicated on the panel and the light on the gas sensor concerned will turn from green to red confirming the location of the alarm.
- The solenoid valve shall be IP65 rated, shall be wired in series to the gas detection panel as per manufacturer's instructions. Slam shut valve as Banico, or equivalent.
- Panel to have terminals for the acceptance of a fire panel alarm signal in order to close the gas valve served by that panel during a fire alarm.
- The pressure sender unit and the gas solenoid valve to be supplied with a fixing kit for connection on site.
- The 230volt mains supply to panel should be from a 13amp fused switch.
- The solenoid valve is connected to the terminals marked "Valve" on the panel connections.
- System shall have a 10-year warranty.

Gas solenoid valve:

The Contractor shall allow for the supply and installation of a 50mm (2") gas solenoid valve on the incoming gas supply pipework into the boilerhouse that shall be installed in conjunction with the gas detection system.

Function:

- Gas detection for the devices in the boilerhouse.
- Carbon monoxide detection for the devices in the boilerhouse.
- Providing a means of isolating the gas during an emergency.
- OLED display for displaying system status during both installation and normal use, also for displaying diagnostics.In the event of a high alarm from one of the sensors, the system will isolate\close any connected valve. Low alarm indication is also given.

Operation:

- The gas supply to the building shall be linked to the gas safety panel by means of a solenoid valve.
- The system shall close on the activation of gas leak via the gas sensors.
- The system shall close on the activation of low pressure in the pipework.
- The system shall close on the activation carbon monoxide in the boilerhouse.

Ancillaries:

- Gas detection system as the 'Medem 'AGDS-4 4' panel.
- Gas solenoid valve (line sized to suit).
- Suitable gas detectors (natural gas). There 2no gas detector to be installed in total. Detectors shall be located at low level in the boilerhouse and at stairwell of boilerhouse.
- Suitable carbon monoxide detector. There is 1no carbon monoxide sensor to be installed in total. Detector shall be located at high level on the ceiling (150mm below the ceiling)
- All detectors shall be IP44 rated.

Commissioning:

- The Contractor shall include for a Medem Engineer to attend site for as long as is necessary to commission the system and to familiarise the Client's representative with the operation of the panel.
- The Contractor shall include for the testing and commissioning of the system by the equipment supplier.
- A commissioning certificate shall be issued on completion with full instructions on the operation of the system.

Interface to the fire alarm system:

The new gas detection system shall be connected and interfaced to the fire alarm system for the building. Refer to section 61.03 for further information on the interfacing of the gas detection system to the existing fire alarm system.

51.06 New gas boilers and low loss header in the boilerhouse

General:

As highlighted in section 51.02 above, the existing oil boiler, associated flue, associated oil supply pipework, etc. that was in place for the building shall be decommissioned and removed.

The existing heating system for the school building shall be replaced with a new heating system. Six new wall mounted gas-fired condensing boilers shall be installed in the boilerhouse of the main building and these boilers shall cater for the heating load for both school building.

New boiler:

The Contractor shall allow for the supply, installation and testing 6no gas condensing boiler installed in the existing boilerhouse. The new boilers are to be installed on the wall.

The boilers shall be wall mounted gas fired, condensing and modulating unit with modulating pre-mix gas burner connected via a hydraulic low loss header. The boiler shall be complete with casings, circulation pumps, control and limit thermostats, pre-mix gas burners.

The boilers shall be used in conjunction with a heating system operating under weather compensation control, whereby the heating flow temperature is automatically adjusted in response to the outside air temperature in order to optimise system efficiency and maintain internal comfort conditions

This low loss header shall be wall or floor mounted and shall be suitable for the supplied boiler.

Boilers specification & construction:

The boiler specification and construction shall be as follows:

Specification:	There shall be 6no wall mounted gas-condensing boiler. The 6no gas-fired (Natural gas) condensing boilers shall have a rated output of 128 kW @ 80°C/60°C temperatures as Quinta Ace 135 (or equivalent).
Quantity:	6no wall mounted Quinta Ace 135 gas-condensing boiler
Configuration:	6no wall mounted Quinta Ace 135 gas boiler (LPG gas) shall be wall mounted and arranged in a pre assembled cascade system
Proposed Model:	6no Remeha Quinta Ace 135 (or equivalent)
Burner Type:	Fully modulating pre-mix burner that is suitable for use with the boiler
Pump:	Boilers to be supplied with individual shunt pumps
Control:	Self contained control panel on the boiler with output for link to heat pump controller
Type of boiler:	Condensing

Heat exchanger:	Cast aluminium heat exchanger
Fuel:	Natural gas
Casing:	Steel
Operation:	Boilers must be able to operate from 0.8-4.0 Bar and a maximum temperature of 90°C. Boilers must be able to operate on 20% Hydrogen
NOx Level:	Low NOx less than 24mg/kWh
SBEM Efficiency:	Minimal SMBE seasonal efficiency GCV of 95.90%
Warranty:	2no years on the boiler and 7no years on the heat exchanger.

Connection kit with pump:

The Contractor shall include a connection kit supplied with the boiler to connect it to the pre-assembled hydraulic low-loss header.

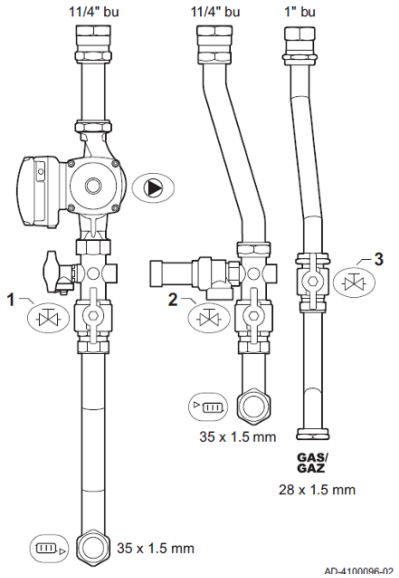
The boiler connection kit shall consist of service shut-off valves in the flow, return, and gas pipes and shall include the pipework between the boiler and the main header.

Each kit shall comprise the following:

- Flow connection: Pipe connection with isolation valve to the boiler and hydraulic low-loss header. Refer to drawings for sizes.
- Return connection: Pipe connection with isolation valve to the boiler and hydraulic low-loss header, speed-controlled high-efficiency circulation pump, overflow, non-return valve, expansion vessel connection, and drain cock. Refer to drawings for sizes.
- Gas connection: Pipe connection with isolation valve to the boiler and hydraulic low-loss header. Refer to drawings for sizes.
- Thermal insulation on each connection set.

Refer to image below for details on the connection kit for the boiler.

Fig.4 Connection kit with Quinta Ace pump



Connection kit with pump for the Quinta Ace

- Flow connection: (1¼" female thread to boiler and 35 x 1.5 mm to main pipe)
- Return connection: (1¼" female thread to boiler and 35 x 1.5 mm to main pipe)
- GAS/GAZ Gas connection: (1" female thread to boiler and 28 x 1.5 mm to main pipe)
- Boiler pump
- 1 Ball valve, non-return valve, expansion vessel connection (½" male thread) and filling/drain cock in return pipe
- 2 Ball valve in supply pipe as well as safety valve
- 3 Gas valve

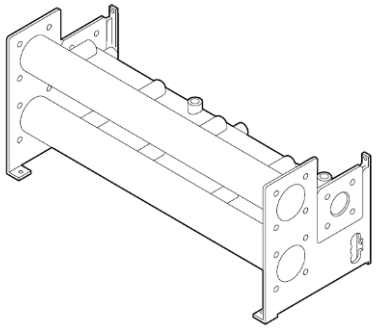
Pre-assembled header arrangement and free-standing frame:

The new wall-mounted gas condensing boilers shall be installed in the existing boilerhouse in the location indicated on the drawings. The boilers shall be mounted on a wall-mounted, pre-assembled hydraulic low-loss header arrangement designed specifically for the boiler.

The flow, return, and gas connections of the boiler shall be connected to the main header using the supplied fittings. These pipes shall be welded onto a frame that is fixed to the wall of the boilerhouse.

A common PVC condensate discharge pipe shall be installed sloping downwards from the boiler.

The Contractor shall discuss and confirm the arrangement of the header with the boiler supplier prior to ordering.



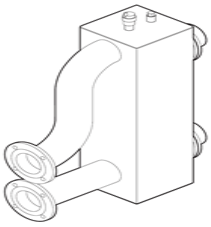
The pre-assembled header arrangement shall have the following specification and accessories:

- Hydraulic flow and return headers to suit a single boiler.
- DN125 hydraulic isolation flow and return headers
- Thermal insulation on the header arrangement.
- Boiler condensate collector pipe system:
- Condensate header with tee and brackets
- Drain hose to drainage system
- Connection hose for condensate from trap
- Connection hose for draining safety valve
- Boiler shall be supplied with individual circulation pump.
- All associated pipework and fittings, including safety valves (set at 3 bar unless stated otherwise).
- Boiler connection kit with flanged flow and return connections to the system.
- 1 no. drain valve from low-loss header.

Hydraulic low loss header:

The Contractor shall allow for the supply and installation of a of a DN125 hydraulic low loss header to suit the system. The hydraulic low loss header shall adhere to the following specification:

- Low loss header DN 125
- Shall have an integral sensor well
- Shall have thermal insulation
- Shall have quick-action air vent valve
- Shall have ball valve with hose nozzle for draining or blow-down
- Supplied with floor bracket



Accessories:

Due to the orientation and layout of the existing boilerhouse, the Contractor shall allow for the angled connections of either end of the pre-assembled headers.

Angled connections shall be installed of one side of the pre-assembled headers for connection to the new low loss header.
Angled connections shall be installed of the other side of the headers for connection of the heat pump to the heating installation.

Therefore, the Contractor shall allow for the following:

- 2no angled connections for flow and return pipework shall be installed of one side of the pre-assembled headers for connection to the new low loss header.
- 2no angled connections for flow and return pipework shall be installed of the other side of the pre-assembled headers for connection of the heat pump to the heating installation.
- Flanged blank plates shall be installed on the angled connections reserved for the future heat pump to allow for future integration without modifications to the header.

Safety release valve:

A safety release valve shall be supplied as part of the connection kit on each boiler and shall be installed don the return pipe.

Pipework shall be connected from the safety release valve to discharge 150mm above finished floor level. All pipework shall be installed in copper.

Control Notes:

The boiler shall be supplied with an integral controller capable of weather-compensated operation. It shall communicate directly with the heat pump controller to provide supplementary heat only when required.

- The boiler flow temperature shall be automatically adjusted depending on the external temperature as determined by the weather-compensation routine.

- The boiler must be capable of operating continuously at flow temperatures as low as 45 ºC to maximise system efficiency when controlled by the weather-compensation logic.

- The boiler shall respond to demand signals from the heat pump controller to provide backup heating whenever the heat pump alone cannot meet the required load.

Site visits by boiler supplier:

The boiler supplier shall allow for 3no site visits by their Commissioning Engineer as part of their tender cost and the Contractor shall ensure that the boiler supplier has included for this in his submitted cost to the Contractor.

The 3no site visits by the boiler suppliers Commissioning Engineer shall be as follows:

- Site Visit 1:

  Once the boilers are installed the Commissioning Engineer shall visit the site to ensure that the boilers are installed correctly as per manufacturers recommendations.

  This shall be completed before any connections are installed from or to the boilers i.e. before the flue is installed, before any gas is connected to the boilers, before any water connections is brought to the boilers, etc.

- Site Visit 2:

  This site visit is to commission the boiler once all electrical and mechanical connections are completed. It is essential that this visit is coordinated with the commissioning of the boiler and heat pump controllers to ensure seamless integration and operation.

  The Contractor shall ensure that the boiler supplier's commissioning engineer and the heat pump and boiler controllers' commissioning engineer are on site simultaneously. This coordination is critical to confirm that all connections between the boiler and the controllers are correctly installed and fully operational without any conflicts.

- Site Visit 3:

  The Contractor shall arrange with the boilers Commissioning Engineer to re-visit the site after one month of commissioning to ensure that all necessary adjustments are made to the plant to ensure satisfactory and efficient operation.

New flue from the new boiler:

Refer to section 51.07 below for further information.

Condensate from the boiler:

Refer to section 51.08 below for further information.

51.12 Flues for the new boilers

Existing flue:

As highlighted in sections 51.02, the existing flue from the existing boiler in the boilerhouse shall be decommissioned and removed.

The existing flue from the boiler is a steel flue. The existing flue from the existing boiler runs from the boiler into a masonry chimney.

The Contractor shall allow for the decommissioning and removal from site of the existing flue from the boiler.

Combined flue for the boilers:

Instead of 6no individual flues, the Mechanical Contractor shall allow for the supply and installation of 1no common flue for the 6no gas boilers.

The Mechanical Contractor shall therefore allow for a new flue from each new gas boiler (6no in total) to connect to a common flue at high level before exiting the building horizontally through the external wall of the boilerhouse as indicated on the drawings.

A flue from each boiler shall connect to the common flue before exiting horizontally through the external wall of the boilerhouse. It is the responsibility of the installer to install the flues and fluecades to comply with the current regulations and standards.

The flue for each boiler and the boiler cascade common flue shall be supplied by the boiler supplier and shall be compatible with the proposed boiler and the cascade system.

All flue terminals and CLV kits shall be supplied with a condensate drain/siphon, that must be connected within one metre of the boiler flue connection. Make sure that any flue gas outlet pipe towards the boiler has a sufficient gradient (at least 50mm per metre) and that there is a sufficient condensate collector.

Flue components are constructed from a white painted metal outer and plastic inner.

Plume kit external components are aluminium or plastic and are painted black.

All flue components shall be CE approved

Each boiler must have its each own flue system at a minimum of 530mm centres and never installed immediately above another.

The flue kit shall be as MG410082982, or equivalent. This flue kit includes the following:

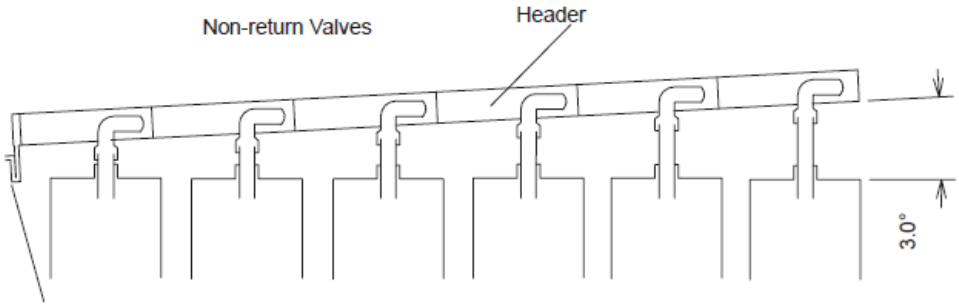
- 1no vertical terminal
- 1no boiler bend
- 1no external wall plate

The flue from each boiler shall be a 150mm diameter concentric flue that shall rise from each boiler to connect to a 200mm common flue that shall exit horizontally through the external wall of the boilerhouse as indicated on the drawings.

All changes of direction in the flue must be limited to a maximum angle of 45º. Each flue branch shall be fitted with explosion relief doors and shall be fitted with pocket test points to facilitate flue gas analysis testing and temperature reading.

Allow for a condensate drain from the bottom of the common flue to a drain outside the boilerhouse.

See detail below for the required flue installation and items required for the flue installation:



Cascade Boilers (Type B23)

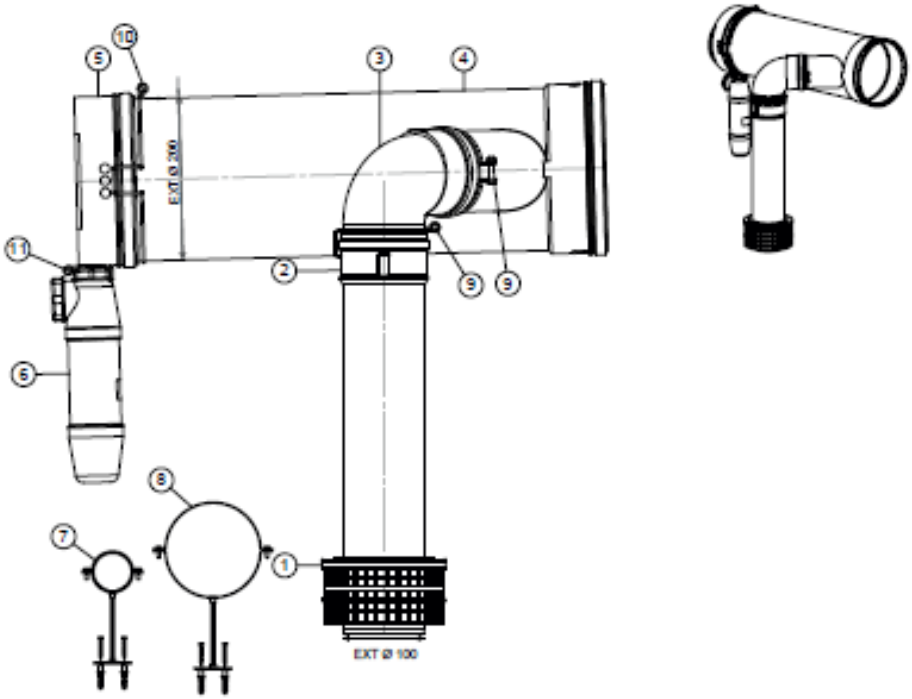
Allow for all necessary accessories for the flue installation for each boiler and the common flue. The flue supplied for each boiler shall be suitable to the boilers listed in section 51.06 above so consult the boiler supplier before ordering the flue for each boiler.

In particular, the Mechanical Contractor shall allow for the following components:

- All connection pieces for the individual flues from the boilers to the common header.
- Common flue header for the 6no flues from the gas boilers.
- Support bends for the necessary flue installation.
- Support rails for the necessary flue installation.
- Duct cover for the necessary flue installation.
- Flue gas non-return device on the flues from the boiler.
- Necessary lengths of flue pipe for the installation.
- Flue connections to the boiler.
- Necessary inspection pieces.
- Necessary flue inspection pieces (straight).
- Necessary flue bends for the common flue header (quantity and type to be confirmed by the Mechanical Contractor to the supplier).
- Necessary flue sliding couplings and fixing clamps (quantity and type to be confirmed by the Mechanical Contractor to the supplier).
- Necessary flue adaptors (quantity and type to be confirmed by the Mechanical Contractor to the supplier).

Starter Kit:

The start kit for the common flue will be supplied as part of the package in order for the common flue to exit the building. The Contractor shall discuss this with the boiler and flue supplier. See below for details on the start kit required.



1	179580	Air Inlet Grill
2	179583	Flue Extension
3	179591	Elbow Short
4	-	Collector
5	179588	Cover*
6	179581	Siphon
7	175457	Wall Bracket 100
8	-	Wall Bracket AL 200 + Wall Plate (x2)
9	179596 (x3)	Wire Retaining Clip 100 (x3)
10	179597	Wire Retaining Clip 200
11	179593	Wire Retaining Clip 32

*Ensure the cover does not block the inlet to the condense siphon

Soundness test:

A simple soundness test shall be carried out on each flue from each boiler and the common flue during the commissioning of the system.

For this it would be sufficient to check the CO2 concentration in the combustion air at the annular gap of the flue pipe. Each flue pipe is deemed to be sound if the CO2 concentration in the combustion air is no higher than 0.2% or the O2 concentration is at least 20.6%. If higher CO2 or lower O2 values are measured, check the flue system for soundness.

51.08 Condensate pipework from the new boilers and flues in the boilerhouse

The Contractor shall allow for a 32mm condensate drain from each of the new gas boilers and a 32mm condensate from each of the new new flues as indicated on the drawings. The condensate drain shall be connected to a 50mm condensate float pipe as indicated on the schematic. Refer to drawing for the routes and sizes of the condensate pipework required.

The main condensate flat pipe shall then be connected to a condense neutraliser before continuing to a local drain outside the boilerhouse. All condensate pipe shall be installed with a constant fall.

All condensate pipework shall be uPVC waste pipework and sizes shall be as indicated on the drawings.

The Contractor shall allow for installing a condensate neutraliser on the condensate from the boilers and the flues as indicated on the drawings. Refer to section 51.09 below on the condensate neutraliser.

51.09 Condensate neutraliser

The Contractor shall allow for installing a condensate neutraliser on the main condensate pipe from the boilers and the flues before it exits into drain outside the boilerhouse as indicated on the drawings.

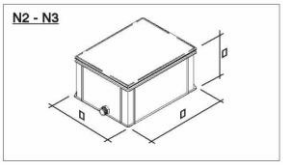
This neutraliser shall safely neutralise the acid waste from the items in question so that the condensate can be safely discharged to the drain.

The condensate neutraliser shall increase the PH level of the condensate captured from the boilers/water heater to a value of between 6.5 and 9. Once treated in this way, the condensate can be disposed off through the normal municipal drain/sewer network.

The condensate neutraliser shall be fitting in line with the condensate discharge pipe.

The Contractor shall allow for the supply and installation of a N2 condensate neutraliser kit as supplied by Davies Ltd, or equivalent. See details and sized of kit below.

Description	Type N2
L - Width	420
H - Height	240
P - Depth	300
Quantity of granulate	25



51.10 LPHW Pipework, fittings, valves and accessories in the boilerhouse

Existing LPHW heating services pipework in the boilerhouse:

Ad indicated in 51.02, the Contractor shall allow for decommissioning and removing all the existing Low Pressure Hot Water (LPHW) flow and LPHW return pipework throughout the boilerhouse.

New LPHW heating services pipework shall be installed throughout the boilerhouse as indicated on the drawings.

All existing LPHW flow and return pipework in the boilerhouse is gun barrel steel.

New LPHW flow and new LPHW return pipework:

The Contractor shall allow for the supply and installation of all new LPHW flow and LPHW return heating services throughout the boilerhouse as indicated on the drawings.

All new LPHW (Low Pressure Hot Water) flow and return heating services pipework in the plantroom/boilerhouse shall be installed in black mild steel tube piping.

All new LPHW (Low Pressure Hot Water) heating flow and return pipework to be installed in the boilerhouse shall be black steel pipe Class B seamless medium gauge, Blue band to BS EN 10255.

All mild steel pipe and tube shall be dual certified to BS EN 10217-1:2002, fully traceable back to the manufacturer and shall be supplied with 3.1 mill test certification. All of our BS EN 10255:2004 steel pipe shall be compliant with the European Pressure Equipment Directive (PED) 2014/68/EU.

All mild steel pipework in the boilerhouse shall have all joints welded. Butt steel welding to B.S. 1965 to match pipe.

Pipework arrangements as per the attached drawings. Pipework must be capable of being connected to for adjustment at a later date without the need for the

Client to employ a specialist Contractor with specialist tools to perform the works.

Welding:

All LPHW (Low Pressure Hot Water) flow and return heating services pipeline welding shall be in accordance with the relevant BS specification or where BS does not apply shall be of the highest standard of workmanship and shall be subjected successfully to any test required by the Engineer.

All LPHW (Low Pressure Hot Water) flow and return heating services pipework shall be welded in accordance with the requirements of BS 2640 and 2971, copies of which shall be retained on site during course of installation.

The Contractor shall ensure that all operatives engaged on welding are familiar with the requirements of this BS Specification and are normally capable of welding to the standards therein laid down.

Threading Fittings:

Where threaded fittings are specified they shall be in black malleable iron, banded type, individually tested to BS 143 and 1256: 1986 and screwed to BS 21: 1985. All bends used shall be of the long radius type, elbows will not be allowed.

Jointing of threaded fittings for water carrying pipework shall be by means of carefully stranded flax evenly covered in jointing compound and wound on to the male thread so as to bind around the thread during the screwing of the fitting.

Care should be taken to clean off all loose strands of flax after the joint is completed.

Painting of Heating Services Pipework:

All new LPHW (Low Pressure Hot Water) flow and return heating services heating distribution pipework in the boilerhouse shall be provided with one coat of red oxide paintwork prior to fitting insulation. Failure to provide this paintwork prior to insulation will result in the removal of insulation for painting.

The Contractor shall allow to make good all surfaces before painting the heating services flow and heating services return pipework.

The Contractor shall allow for the following to paint the LPHW heating services pipework in the boilerhouse:

- Step 1: Thoroughly clean the pipework and prepare for painting.
- Step 2: Prior to installing the insulation, paint the heating services pipework with one coat of red oxide paint.

Commissioning:

The Contractor shall allow for commissioning the entire system in the boilerhouse once installed.

The Contractor shall employ a suitable commissioning company carry out the commissioning of the heating system.

Automatic Air Vents

Fit automatic air vents at all high points on all heating pipes at high level in the boilerhouse as indicated on the drawings. Fit automatic air-vents on the highest point of the flow and return pipework in the boilerhouse as indicated on the drawings.

The Contractor shall ensure that pipes are laid with the correct gradient to eliminate air locks and to allow for adequate venting. Automatic air-vent shall be as Honeywell Vent EA122, or equivalent.



The valve shall have the following features:

- Integral stop valve. Enables seat to be cleaned without draining the system.
- Vacuum break ensures air collection.
- 3/8" BSP connections.
- Expanding disc under cap.
- 1/8" to 1/2" adaptor.

Circuit Valves:

Fit control valves on flow and return LPHW pipework to allow isolation of the heating flow and return pipework.

Valves shall be full-way pattern with gland surfacing boxes complete with iron hand wheels screwed or flanged as necessary with cast iron bodies, gunmetal wearing parts and bronze seatings.

Valves shall be as Crane D151 isolation valves for gate valves or Crane F611 for butterfly valves, or equivalent.





Regulating Valves:

The Contractor shall allow for the supply and installation of Flow measuring/Double Regulating Valves on all pipework and circuits as indicated on the drawings.

Commissioning Valves:

The Contractor shall include in his price for the supply and installation of fixed orifice double regulating valve commissioning sets on the heating circuits in the boilerhouse as indicated on the schematic.

The number and size of valves shall be as indicated on the drawings and where required for satisfactory commissioning, operation and maintenance.

Valves shall not be mounted with the test plugs pointing in a downward direction; otherwise they may act as dirt pockets. Measuring devices must provide flow measurement accuracy to within ± 5% under the design service conditions and must be suitable for the application such that the differential pressure produced is consistent with achieving measurement accuracy.

Valves shall be as Crane D931 fixed orifice double regulating valves, or equivalent.



Fixed orifice double regulating valves shall be as Crane D931/D933/D934 and shall adhere to the following:

- Fixed orifice performance.
- Hand wheel and pressure tappings oriented for maximum convenience.
- Insertion test points for quick connection.
- PN25 pressure rating.
- Adaptor kit for use with copper tube.

Strainers:

The Contractor shall allow for the supply and installation of all strainers as indicated on the drawings.

Strainers must be installed to protect to the heating circuits and heating equipment in the boilerhouse as indicated. Strainers shall be cast iron or bronze body, self cleaning 'Y' pattern full size, of connecting pipe, designed for 10 bars of water services and heating.

Strainers shall be 1/16" perforated SS on water services and 1/32" perforated SS on heating. Strainers 50mm and smaller shall be screwed; strainers larger than 50mm shall be flanged, with blow-down cocks. Strainers must be suitable for the pressures and service of the piping system in which they are to be installed. Strainer bodies for line sizes up to 50 mm must be of bronze to IS EN 1982: 1999. Strainer pressure ratings must be at least 150% of maximum service pressure in the application. See drawings for quantities required.

Size of strainers shall match the pipe size of the circuit where the strainer is to be installed.

Strainers shall be as Crane D297, Crane FM276, or equivalent.





Non-return valves:

The Contractor shall allow for the supply and installation of the non-return valves on the pipework as indicated on the drawings. The number and size of these valves shall be as indicated on the drawings. The non-return valves shall be bronze swing check valve with resilient disc. The valve shall permit flow in one direction only and close automatically if flow reverses. The valve shall be entirely automatic in action, depending upon pressure and velocity of flow within the line to perform their functions of opening and closing. Valves shall be as Crane D140, or equivalent.



Pressure Gauges:

The Contractor shall allow for the supply and installation of pressure gauges on the pipework as indicated on the drawings. In order to install the gauges on the pipework, the Contractor shall allow for the supply and installation of a 15mm socket for the installation of the gauges.

- 100mm face diameter
- 0 to 6 bar range.
- Bottom entry
- Bourdon tube copper alloy

- Black steel case
- Acrylic window
- Chrome plated bezel
- 3/8" BSP bottom entry male connection
- Direct mounting
- Dual scale bar and psi
- Accuracy class 1.6 to BS EN 837-1:1998



Temperature Gauges:

The Contractor shall allow for the supply and installation of temperature gauges on the pipework as indicated on the drawings. In order to install the gauges on the pipework, the Contractor shall allow for the supply and installation of a 15mm socket for the installation of the gauges.

The temperature gauges shall have the following features:

- 100mm face diameter
- 0° to 120° degree range.
- Bottom entry
- Black steel case
- Acrylic window
- Chrome plated bezel
- 50mm immersion length c/w BSP 1/2" pocket
- Pocket for 100mm dial - push fit
- Dual scale ºC and ºF
- Accuracy class 1 to BS EN 13190:2001



Systematic Valve Charts:

All valves supplied and fitted by the Contractor in the boilerhouse, excluding radiator valves, shall be fitted with circular plastic labels with black lettering on a white background, which shall be fixed between the wheel and the nut securing the wheel to the valve spindle.

Each valve shall be numbered in accordance with a corresponding valve chart schedule.

The valve chart shall indicate clearly the function of each valve so numbered. A valve chart shall be completed for the boilerhouse and which shall be laminated and displayed in a suitable location within the boilerhouse.

Labelling:

All new LPHW (Low Pressure Hot Water) flow and return heating services pipework installed in the boilerhouse shall be labelled with appropriate colour identification bands, flow indication arrows and zone numbers.

All labels must be neat, lined up with other labels, oriented for easy view, and securely fixed. Any labelling installed which does not fit this description shall be removed and replaced.

Labels on new LPHW (Low Pressure Hot Water) flow and return heating services pipework shall be provided at least once within the building compartment and every 10m on long runs within a single compartment such as a corridor.

All labels must be neat, lined up with other labels, oriented for easy view, and securely fixed. Any labelling installed which does not fit this description shall be removed and replaced.

Labels on new pipework shall be provided at least once within the building compartment and every 10m on long runs within a single compartment such as a corridor.

Bracketing and supports

All new LPHW flow and return pipework in the boilerhouse shall be adequately bracketed and supported.

Pipework shall be run on suitable unistrut brackets that are either supported off the floor or the wall.

Exceptional care shall be exercised when supporting and bracing pipework to ensure that no hammering or vibration takes place and that the complete system operates in a quiet manner even when valves are closed off quickly against full pressure.

Brackets shall allow for thermal expansion and ample clearance to be allowed when setting out brackets for large pipes. Supports shall be arranged to be as near as possible to changes in direction and joints.

All adjacent pipework following the same route shall be bracketed at the intervals specified for the smallest pipe in the run.

The following are the bracket intervals depending on the material of pipework:

BORE (mm)	HORIZONTAL (m)	VERTICAL (m)
15	1.5	1.8
20	1.5	2.1
25	1.8	3.0
32	1.8	3.0
40	2.4	3.0
50	2.4	3.5
65	2.7	4.0
80	3.0	4.0
100	3.0	4.6
125	3.7	5.5

Insulation:

All new LPHW (Low Pressure Hot Water) flow and return heating services pipework installed in the boilerhouse shall be thoroughly insulated.

Refer to section 51.11 below for further information.

51.11 Insulation on LPHW pipework and water services pipework in the building

General:

The Contractor shall allow for thoroughly insulated the following pipework in the building:

- All new LPHW flow and return pipework installed in the boilerhouse.
- All new LPHW flow and return pipework in the building that are installed in ceiling voids, box-outs, attic spaces, etc. Refer to drawings for the pipework in the main building that is to be insulated.
- All new water services pipework in the building that are installed in ceiling voids, box-outs, attic spaces, etc. Refer to drawings for the pipework in the main building that is to be insulated.

All new LPHW (Low Pressure Hot Water) heating services flow and return pipework shall installed be black mild steel tube piping.

All new water services pipework shall installed be copper tube.
All new LPHW pipework and new water services pipework installed in the building and in the boilerhouse shall be insulated as follows:

- *Pipes from 15mm to 20mm:* 30mm thick insulation
- *Pipes from 25mm to 80mm:* 40mm thick insulation
- *Pipes from 100mm to 300mm:* 50mm thick insulation

Generally, all insulation work shall be carried out by experienced established professional insulation contractors.

Generally, all insulation shall be accurately fitted and cut, accurately mitred, free from any damage or tears, fully bonded or otherwise secured and correctly terminated at flanges, pumps, heat exchanger, vessels or other plant items.

All unfitted insulation materials shall be stored on site in dry secure stores and all necessary measures shall be taken to ensure that no damage occurs to the insulation while unfitted in storage or fitted in situ prior to handover of the building.

The Contractor is responsible for ensuring that all insulation fitters are fully trained and for supervising the work of fitters.

Materials, adhesives, sealants and finishes shall be suitable in all respects for continuous use without degradation throughout the range of operating temperatures and within the environment indicated.

They shall be designed to provide proof against rotting, mould, fungal growth and attack by vermin and degradation through UV radiation when used externally. All materials shall be non-hygroscopic.

All insulating materials and associated products shall be applied in accordance with manufacturers recommendations and instructions.

Work failing to comply with these will not be accepted by the Engineer.
Where pipe work is to be laid in floor ducts, it shall be insulated as above and then wrapped in Oppanol (or equivalent).

Insulation:

The Contractor shall allow for thoroughly insulated the following pipework in the building:

- All new LPHW flow and return pipework installed in the boilerhouse.
- All new LPHW flow and return pipework in the building that are installed in ceiling voids, box-outs, attic spaces, etc. Refer to drawings for the pipework in the main building that is to be insulated.
- All new water services pipework in the building that are installed in ceiling voids, box-outs, attic spaces, etc. Refer to drawings for the pipework in the main building that is to be insulated.

All new LPHW (Low Pressure Hot Water) heating services flow and return pipework shall installed be black mild steel tube piping.

All new water services pipework shall installed be copper tube.

All new LPHW (Low Pressure Hot Water) heating supply pipework and all new LPHW heating services return pipework installed in the building and in the boilerhouse shall be insulated using Isover Climpipe, Rockwool Rocklap H&V, (or equivalent) foiled back mineral wool insulation, or equivalent.

Supports shall be so arranged as to prevent the ingress of moisture to the insulation.

The supports shall be insulated from the pipeline by lining the supports with insulation of sufficient density and thermal conductivity appropriate to the duty.

All insulation shall adhere to standards B.S. 5422:2009 and B.S. 5970:2012. The Contractor shall allow for the supply and installation of all insulation on the new LPHW (Low Pressure Hot Water) heating supply pipework, all new LPHW heating services return pipework and all new water services pipework installed in the building and in the boilerhouse.

The insulation shall be of preformed sections of rigid mineral wool incorporating an aluminium foil laminate cover and fitted in accordance with the manufacturer's instructions.

Clearances shall be sufficient between each pipe/service to allow for the thickness of insulation as indicated in this Specification.

The insulation shall also be applied to all connections, bends, tees and valves.



Insulation shall adhere to the following specifications:

- *Type:*

  Reinforced foiled back mineral wool insulation with a self-adhesive overlap to ensure a strong vapour barrier as Isover Climpipe, Rocklap H&V, or equivalent.

- *Thickness:*

  As highlighted above.

- *Thermal conductivity:*

  - 0.033 W/mk at mean temperature of 10°C.
  - 0.036 W/mk at mean temperature of 50°C.
  - 0.043 W/mk at mean temperature of 100°C.

- *Thermal performance:*

  To comply with B.S. 5422:2009.

- *Fire performance:*

  To comply with Euroclass A2L, S1, d0 fire rating when classified with BS EN 13501-1 Class O compliance. The factory applied aluminium foil facing shall meet the highest standards required by BS476: Part 6 'Fire propagation' and B.S. 476: Part 7 'Surface spread of flame'.

- *Service temperature:*

  The temperature on the aluminium facing should not exceed 80°C.

- *Smoke and toxicity:*

  Shall achieve the criteria for smoke generation and toxicity as given in the IMO Resolution MSC 61 (67). (Smoke and Toxicity Test to Part 2, Annex 1 and 2 of the Fire Test Procedures Code)

- *Certification:*

  CE Marked.
  B.S. 5422:2009.
  B.S. 476: Part 7
  B.S. 5970:2012
  CE 0402-CPD-SC0408-10.

Painting of new pipework prior to installing new insulation:

All new LPHW (Low Pressure Hot Water) flow and return heating services heating distribution pipework installed in the boilerhouse and all heating services pipework that is to be insulated in the main building shall be provided with one coat of red oxide paintwork prior to fitting insulation. Failure to provide this paintwork prior to insulation will result in the removal of insulation for painting.

The Contractor shall allow to make good all surfaces before painting the heating services flow and heating services return pipework and feed/expansion pipework.

51.12 Pressurisation unit and expansion vessels in the boilerhouse

New pressurisation unit:

As highlighted in sections 51.02, the existing pressurisation unit and expansion vessel in the boilerhouse shall be decommissioned and removed. The Contractor shall allow for the supply and installation of a new pressurisation unit in replacement of the existing pressurization unit. The new pressurisation unit shall be as follows:

Ref	System	Number of Pumps	Static Head (m)	Maximum working pressure (m)	Model
PU-01	LPHW	1	15	20	Grundfos PHT-A F125 (or equivalent).

The pressurisation unit shall have the following features:

- Single pump.
- 17.5 litre break tank.
- MODBUS communication output.
- Security coded user interface.
- Low water sensor and high level water sensor.
- Durable powder coated enclosure.
- Long life, gun metal pump casings.
- WRAS approved components.
- Pressurisation unit shall be a fully packaged single pump automatic pressurisation unit.
- Pressurisation units shall be suitable for an electricity supply of 230V / 1Ph / 50Hz.
- The unit must be capable of maintaining the required cold fill pressure in the heating water system.
- The cold fill pressure must be controlled by means of a pressure regulating valve or a system pressure switch, as indicated.
- The pressure regulating valve must be adjustable to maintain the required system pressure. The unit must have duplicate pumps.
- Unit shall have a 12-month warranty.
- Pressurisation units shall be provided with volt free contacts to monitor high and low level cut-outs to suit BMS requirements.

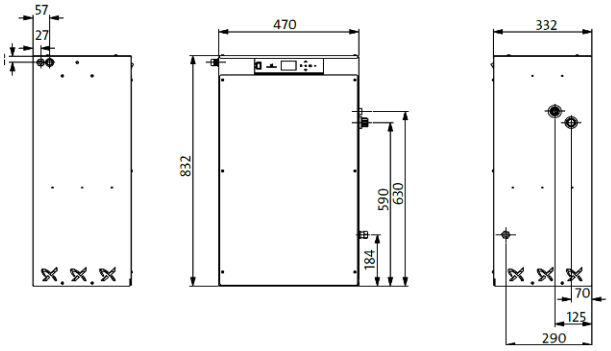
The maximum operation conditions of the unit shall be as follows:

- Maximum system temperature 85°C.
- Ambient temperature up to 40°C.
- Relative humidity 95% non-condensing.

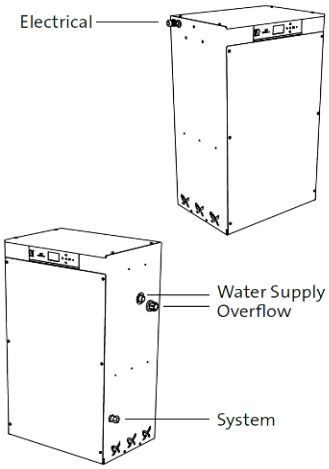


See below for dimensions and connections.

Dimensions



Connections



Break Tank Capacity	Dimensions (mm)			Connections		
	Width	Depth	Height	System	Mains Supply	Drain
17.5 Litre	470	332	832	½"	½"	¾"

Expansion vessel for the heating system:

A new expansion vessel shall be installed in the boilerhouse for the heating system as indicated on the drawings.

The Contractor shall supply and install the following expansion vessel for the heating system:

Ref	System	Volume (litres)	Maximum working pressure (bar)	Connection	Model
EV-01	LPHW	800 litres	10	50mm	GT-HR-800 PN6 R1V (or equivalent).

The vessel shall have the following features:

- Vessel comprises a high strength carbon steel shell.
- Vessel shall have a non- replaceable SBR rubber diaphragm and liquid compartment with a polypropylene liner (PP).
- Vessels fitted according to DIN EN 13831. Approval according to Pressure Equipment Directive 2014/68/EC.
- Dimensions shall be 740mm diameter by 1996mm high.
- Weight when empty 96kg.
- Durable epoxy resin coating
- Non-replaceable diaphragm according to DIN EN 13831
- For antifreeze additive of at least 25 – 50 %
- With threaded connections
- Max. permissible system temperature 120 °C
- Max. working pressure 6bar
- Max. operating temperature 70 °C
- CE compliant and WRAS approved.

Connecting the new mains water pipework to the new pressurisation unit:

A new mains water services pipework shall be brought to the to connect to the new pressurisation unit as indicated on the drawings. The Contractor shall allow for supplying and installing the new mains water pipework to connect to the new pressurisation unit. Refer to the drawings for locations. The Contractor shall allow for all works, materials, attendances, labour, etc. in connecting to the new mains water services pipework to the new pressurisation unit.

51.13 Circulating pumps in the boilerhouse

The Contractor shall allow for all works, labour, materials, etc. for the supply and installation of all new pumps as indicated. The Contractor shall allow for the supply, installation, fitting and commissioning of the following pumps in the boilerhouse:

Pump No.	Service	Qty	Pump Model	Line Dia (mm)	Flow (l/s)	Head (Mtr)	Elec Supply
P-01 to P-06	Primary Pump for Boiler 1 to 6	These variable speed pumps shall be supplied as part of the boilers heating connection set. Ensure that this pump is supplied with the boiler. See specification for boiler in section 51.06 for the specification on the pump.					
P-07	Heating Zone for the existing heating circuit 1	1no	Grundfos Magna3D 50/60F (twin head) (or equivalent)	50mm Dia	2.2 l/s Confirmation on-site	4	230-1-50
P-08	Heating Zone for the existing heating circuit 2	1no	Grundfos Magna3D 50/120 F (twin head) (or equivalent)	50mm Dia	1.6 l/s Confirmation on-site	8	230-1-50
P-09	Heating Zone for the existing heating circuit 3	1no	Grundfos Magna3D 50/120F (twin head) (or equivalent)	50mm Dia	1.35 l/s Confirmation on-site	9	230-1-50

P-10	Heating Zone for the existing heating circuit 2	1no	Grundfos Magna3D 65/120 F (twin head) (or equivalent)	65mm Dia	2.9 l/s Confirmation on on-site	8	230-1-50

Pumps shall fulfil the following criteria:

- All circulation pumps for heating zones shall be provided with build in pressure controlled variable speed drives. Variable speed pumps to have built in controls to maintain constant pressure drop (provide commissioning certificates proving the correct operation of the variable speed drives on handover of the building).
- All pumps shall be 'A' rated and the motors shall be 'IE2' energy efficiency class based on IEC standard.
- All pump mounted inverter drive shall be suitable for BMS/MCC connection.
- Graphical pump display with rotatable display horizontal and vertical module mounting, for display of operating status, control mode, rotation speed setpoint and fault/warning signals.
- Housing made of cast iron with cataphoretic coating, impeller made of glass-fibre reinforced plastic, stainless steel shaft with metal impregnated carbon plain bearings.
- Pumps must be installed in accordance with the manufacturer's recommendations and must comply with the requirements of IS/EN 60335-2-n51, BS 4082 : 1969 and BS 5257 : 1975 as applicable.
- Pumps must be 'type' tested in accordance with IS EN ISO 9906:2012 and BS EN 5198:1999. Pump curves must be submitted to indicate performance under all likely operating conditions.
- Flexible connections must be provided on the suction and discharge side of all pumps with end connections over 50mm and elsewhere as indicated. Each pump must be installed with isolating valves on the inlet and outlet connections.
- Provide test certs for all pumps. Nameplates shall be installed on the pumps to show test and working pressures of each pump.

51.14 Dosing pot in the boilerhouse

The Contractor shall allow for the supply and installation of a 6litre dosing pot on the heating services pipework in the boilerhouse as indicated on the drawings.

The dosing pot shall adhere to the following specification:

- 6litre capacity
- Mild steel welded construction.
- Exterior finishing: Epoxy powder coating – Red (RAL 3002).
- Supplied fully assembled.
- The unit shall be complete with a tundish, vessel, air vent, inlet, outlet and drain valves.
- Vessel with inlet (return) and outlet (flow) valves.
- Valve size 25mm BSP female.
- Welded to BS EN 287.
- Drain valve.
- Filling valve.
- Tundish.
- Air release valve.
- Wall mounting brackets.
- Max operating pressure is 16 bar.
- Min operating pressure is 0.5 bar.
- Max operating temperature is +82ºC.
- Min operating temperature is +1ºC.
- Designed to PD 5500:2009 category 3.
- CE marked.
- Dimensions of unit is 670mm high by 225mm wide by 225mm diameter.



51.15 Dirt separator with magnet on main flow header to the low loss header

General:

The Contractor shall allow for the supply and installation of a dirt separator with magnet on the new heating return pipework from the new low loss header to the new heating return header. The Contractor shall allow for all works for the supply and installation of the new dirt separator with magnet on the secondary side of the plate heat exchanger on the return pipework as indicated on the heating services schematic.

The pipework where the unit shall be installed is 125mm diameter pipework and the connections on the new dirt separator and magnet is also 125mm.

The Contractor shall allow for all works in installing the new dirt separator on the new 1250mm return pipework. The new dirt separator and magnet shall have all connections flanged so all allow for all necessary pipework, flanges, labour, materials, etc. in connecting the new dirt separator on the new return pipework.

The Contractor shall allow for the supply and installation of the following dirt separator with magnet on the return pipework as indicated on the drawings:

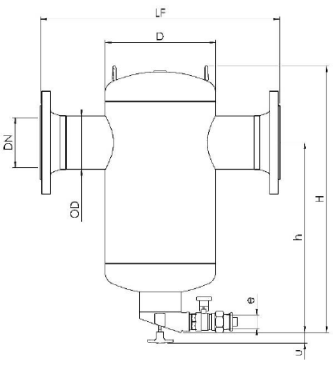
- Model: SpiroTrap Magnet BE125FM (or equivalent)
- Max. flow velocity: 1.5 m/s
- Nominal flow rate: 20 m^3/hr
- Pipework Size: 125mm diameter
- Connections: PN 16 Flange connections
- Temperature range: 0 to 110 ºC
- Max. operating pressure: 10 bar.
- Design standard: EN 13445
- Material of unit: Steel S235 JR G2 (St. 37)
- Colour: Yellow (RAL 1003)
- Paint: Standard
- Drain valve: Nickled brass
- Dry Pocket: Copper, brass
- Spirotube tube: Steel S235 JR G2 (St. 37)
- Spirotube wire: Copper
- Magnet: Neodymium
- Volume: 50litres
- Dry Weight: 58kg (empty)
- Dimensions: See below.
- Paint: Standard yellow paint (RAL 1003)

- Dimensions: See below.

Dimension of unit:



Drawing:



Dimensions:		
DN	125	mm
OD	139.7	mm
H	789	mm
h	598	mm
D	324	mm
LF	635	mm
e	1"	
u	44	mm

51.16 Frost heater in the main boilerhouse

Allow for a 2kW electric frost heater to be located near the auto fill unit/expansion vessel in the boilerhouse. It shall be controlled by a frost thermostat located near the boilerhouse doors.

Acceptable manufacturers are Honeywell or Dimplex, or equivalent. Hand over to the electrical for installation.

51.17 Flush out, pressure test and corrosion inhibitor in the boilerhouse

Flush out of new pipework:

Upon completion of the installation but before fitting any pumps; all new pipework in the boilerhouse shall be thoroughly flushed out with clean water until water flows clear from the system.

Once that is completed, all new pipework shall then be pressure tested as highlighted below.

Pressure testing of new pipework:

The Contractor shall hydraulic pressure test all new flow and return LPHW pipework in the unit to 7 bar and shall remain drop tight for a period of at least 12 hours.

If pressure has dropped at all from noted mark, the installation cannot be regarded as sound and shall not be commissioned until the escape is repaired and the installation re-tested. If pressure remains stable, then installation can be deemed sound.

Comply with procedures given in the HVCA Guide to Good Practice for Site Pressure Testing of Pipework. Ensure safety precautions detailed in HSE Guidance Note GS4 Safety in Pressure Testing are adopted.

Advise appropriate personnel, in advance, of the time pressure tests may be witnessed. Keep record of pressure tests and issue them to the Employer's Representative, and include them within the handover documentation.

Corrosion Inhibitor:

Once all new pipework has been adequately pressure tested, all new pipework in the boilerhouse and in the heating system shall be dosed with Fernox (or equivalent) corrosion inhibitor on commissioning. Exact dosage rates to be advised by the Employer's Representative prior to commissioning.

Allow for installing corrosion inhibitor in the heating system once all works have been completed.

Allow for 50litres for tendering purposes. A commissioning cert confirming that the correct treatment has been applied will be required prior to handover.

51.18 Fire extinguishers in the boilerhouse

New fire extinguishers:

The Contractor shall supply and fit the new fire extinguishers in the boilerhouse as indicated on the drawings. Exact locations to be decided on site in conjunction with the Employer's Representative. All fire extinguishers shall conform to the relevant standards.

Allow for supplying the suitable and relevant wall signage for each fire extinguisher which indicates what type of extinguisher it is.
Fire extinguishers shall be as follows (refer to drawings for quantities and locations):

- **Type A**: 6litre Foam
- **Type B:** 6kg Dry Powder

The Contractor shall also allow for the following:

- Providing wall brackets for all extinguishers and allow for mounting all extinguishers
- Providing and install wall mounted signage above all fire extinguishers identifying fire point, and extinguisher usage.
- Providing a fire assembly appoint sign and mount externally in the location indicated by the clients representative
- Agreeing exact locations and mounting heights with client's representative prior to mounting extinguishers.

51.19 Pressure test of all new pipework in the boilerhouse

The Contractor shall hydraulic pressure test all new heating services pipework and water services pipework that will be installed in the boilerhouse.

Pipework shall be tested prior to final connection to the any new plant or pumps. The pipework shall be pressure tested to 7 bar and shall remain drop tight for a period of at least 12 hours.

If pressure has dropped at all from noted mark, the installation cannot be regarded as sound and shall not be commissioned until the escape is repaired and the installation re-tested. If pressure remains stable, then installation can be deemed sound. Comply with procedures given in the HVCA Guide to Good Practice for Site Pressure Testing of Pipework. Ensure safety precautions detailed in HSE Guidance Note GS4 Safety in Pressure Testing are adopted.

Advise appropriate personnel, in advance, of the time pressure tests may be witnessed.

Keep record of pressure tests and issue them to the Employer's Representative, and include them within the handover documentation.

51.20 Drain down of existing heating system and re-fill

All the existing Low Pressure Hot Water (LPHW) flow and LPHW return pipework in the boilerhouse and building shall be decommissioned and removed.

New LPHW heating services pipework shall be installed throughout the boilerhouse and building as indicated on the drawings.
In order to decommission and remove the existing LPHW flow and return pipework in the boilerhouse and the building, the Contractor will need to drain down the existing heating system throughout the existing old building. Therefore, the Contractor shall allow for draining down the existing heating system throughout the existing old building.

Once all works in the boilerhouse and building is completed, the Contractor will need to re-fill the new system with water again. Therefore, the Contractor shall allow for all works in re-filling the new heating system. This shall be done through an existing mains water connection and fill to each heating zone.

When the new heating system is filled, some air may get into the new heating zones, radiators and pipework. Therefore, once the system is refilled, the Contractor shall allow for checking all the new radiators and new pipework throughout the existing old building is fully vented, working adequately, and that heat is getting to each radiator.

If there are some radiators that are not heating adequately, this shall be reported to the School and the Engineer.

The Contractor shall allow for the time and resources of a qualified plumber for one full day for this the venting of all radiators and checking of the new heating system throughout the school once all works in the boilerhouse and building is completed.

51.21 Testing of water

General:

The Contractor shall allow for carrying out two water test samples of the existing water in the building to analysis the condition of the existing mains water in the building and the existing LPHW water in the new heating system in the building.

The Contractor shall allow for carrying out a test of the following:

- Test on the mains water in the building that will be entering the new pressurisation unit.
- Test on the existing LPHW water in the existing flow and return headers in the boilerhouse.

A water sample must be taken for each of the two items above for detailed analysis. Each sample must be submitted to a water testing lab for detailed

testing of the water. Great care must be taken when obtaining samples for testing and only sterile containers should be used.

Please note that there is therefore two water samples that is to be taken in the building and each water sample must be submitted to a water testing lab for detailed testing of the water.

Water Test Sample:

The Contractor shall allow for taking a carrying out a detailed water test analysis for the two items listed above and submitting each water sample to a water testing lab for detailed testing of the water.

The Contractor shall allow for taking a reading of the following items as part of each water test for the two items listed above:

- pH level
- Phenolphthalein Alkalinity
- Methyl Orange Alkalinity
- Dissolved solids
- Nitrate
- Iron
- Clarity
- Aluminium
- Ecoli

51.22 Decommissioning of existing MCC controls panel in the boilerhouse

The Contractor shall allow for decommissioning and removing the existing controls that was in place for the existing boiler.

A new MCC controls panel shall be installed in its place. Refer to the specification below on the new MCC controls panel.

51.23 New MCC controls panel to be installed in the boilerhouse

Existing MCC controls panel:

Refer to 51.22 above.

New MCC controls panel:

A new MCC controls panel and controls installation shall be installed in lieu of the existing MCC controls panel in the boilerhouse. This new MCC controls panel shall control all the new heating plant and hot water heater in the building.

General information on the new MCC controls panel:

The Contractor shall be completely responsible for the supply, installation, testing and commissioning of a new independent MCC controls system for the heating centre in the boilerhouse which shall provide a means of controlling and indicating the performance of the heating system within set criteria.

The new MCC controls system shall consist of networked intelligent controllers, which shall control and monitor the mechanical plant within the plantroom.

A single system manufacturer shall supply the controls package for the plant installed.

The new building management and control system shall also comprise all necessary Motor Control Centres (MCCs), remote controllers and enclosures, sensors, actuators, valves, control and power wiring necessary to provide a complete and operational control system. The controllers shall execute, via software, all the necessary optimisation, time, temperature, humidity, interlocking and energy control requirements of the mechanical plant.

Each controller shall be capable of operating autonomously or via peer-to-peer communication as necessary to execute the control of the building's systems as required. The method of linking the controllers shall be via a data network that passes operational Information between the controllers. Each controller shall, via it's data network, be capable of being interrogated by a number of devices to provide a man machine interface. The man machine interface shall allow an operator to review and manipulate the system parameters, set points, etc.

The principal man machine interfaces are the central monitoring points, termed the operator's stations. The operator stations are explained in more detail below.

Interrogation of the building's controllers shall also be possible via a laptop computer allowing total access to all data held on the system at any location in the centre via access to the network.

Main plant controllers shall be provided with 25% additional input/output capacity and Supporting software and shall be networked.

The Contractor shall appoint a suitably qualified controls specialist and the controls specialist shall be fully responsible for instructing, monitoring, testing, and co-ordinating the new controls installation.

The provision of valves, actuators and any other components required for the controls system to function as described within the documents is the responsibility of the Contractor who may choose to have some or all of these items provided by the controls specialist.

The Contractor / MCC Controls Vendors summary scope shall include:

- MCC-01. Form 2B located in the plantroom.
- Provision of integrated differential pressure control valves.
- MCC controls hardware.
- The system shall be fully networked with server based graphic interface.
- Compliance with Open Process Control (OPC).
- Fully configured software.
- Instruments and Control Valves.
- Termination of control cables in the field.
- Termination of control cables at the MCC panel.
- Generation of Sequence of Operations (SOO) document.
- BMS & MCC Panels Factory Acceptance Test.
- Commissioning.
- Instrument calibration check on Site.
- 100% testing of installed system functionality.
- 100% demonstration of system functionality.
- Instrument calibration check on Site.
- Site Technician's time for comprehensive hand-over demonstrations to the Engineer and the Building Manager (separately).

Scope should also include:

- Provision of an out-of-hours heating override push buttons, complete with active-status indication, associated wiring and controls programming. The override shall enable heating for an adjustable period, initially set to two hours, subject to the normal temperature controls, plant interlocks and safety devices, before automatically reverting to the programmed schedule.

- Integration of the new boilerhouse BMS with the existing Delta Controls BMS controller in Building C, at the location indicated on the drawings. Allow for all necessary cabling, interfaces,

connections, software licences, programming and configuration to enable communication between the two systems. The Contractor shall liaise with Control Tech, the existing BMS installer, to confirm compatibility, interfacing requirements and the points to be exchanged. Include all testing, commissioning and demonstration required to verify correct communication and operation.

The complete controls installation shall be supplied, installed, tested and commissioned by suitably qualified controls specialist.

Labelling

Upon completion, the new panel shall be labelled with rigid engraved plastic labels for each and every separate item controlled. All labels must be neat, lined up with other labels, oriented for easy view, and securely fixed.

Any labelling installed that does not fit this description shall be removed and replaced as required.

The panel shall include a label stating, "All switches must normally be placed in the "Auto" position", Proposed labelling schemes, in addition to the full layout of any panel switches and lamps must be submitted to the Employer's Representative prior to order as incorrectly labelled or arranged displays shall be replaced if layouts have not been agreed, the panel may be rejected on arrival at site.

Equipment Connections

The controls schematic is given for indication purposes only. Prior to producing wiring diagrams for the controls system, the Contractor shall obtain full control and power wiring details for all equipment from the equipment suppliers and provide these to the controls specialist. Details of all mechanical equipment shall be supplied to the controls supplier to ensure that overloads specified provide adequate protection.

The Contractor shall be fully responsible for co-ordinating the interfaces between equipment and the controls system to ensure that the controls objectives are met. No additional payments will be made where controls interfaces are transferred between equipment and controls system packages.

Schematic:

See drawing 51(M001) for the proposed MCC controls schematic for the heating system.

Wiring

All electric wiring shall be carried out under this contract. The Contractor shall employ a suitably qualified electrical contractor (RECI qualified and a member of the ECSSA) to carry out all necessary electrical work including wiring the controls panel & all associated control items.

Any wiring diagrams or instructions as supplied by the specialist supplier shall be handed over to the electrical contractor. The Contractor shall ensure that the full price for this work is included in the tender price.

Most of the electrical work shall be confined to each boiler room however new control items will be required to be located throughout the existing old building within selected rooms as indicated. Control cabling shall be housed in steel conduits throughout including routes to temperature sensors throughout the existing old building. The Contractor shall provide certification from the supplier to the Employer's Representative certifying that commissioning has been carried out.

Commissioning and Handover

The controls specialist shall provide a checklist for the Electrical Contractor listing all terminations required. This checklist shall be in a format that can be checked off by the electrical contractor to confirm that all points are wired.

The controls specialist shall provide a checklist to the Employer's Representative showing each point connected to the system, confirming that it has been wired and that signals are received from the point in the correct format.

For temperature sensors or other equipment requiring calibration, the controls specialist is required to sign to say that each point has been commissioned against a calibrated device (that contains a valid calibration cert). Proof of the calibration cert must be provided to the Employer's Representative on request.

The Contractor shall ensure his tender figure includes fully for complete testing and commissioning by the controls specialist. The Contractor shall provide certification from the supplier to the Employer's Representative certifying that commissioning has been carried out. The Contractor shall also allow for a satisfactory demonstration and handover of the Building Management System to the Employers Representative.

Site Visits

The Contractor and Controls Specialist shall allow for returning to site on two occasions following substantial completion to carry our seasonal test and further commissioning to ensure that the controls system is working adequately.

The two number visits shall be carried out during the winter period and the summer period. During these visits, the control system shall be thoroughly checked and the Controls Specialist shall meet with the Client/End user to see that the system is working correctly and is understood by the Client.

Control functions of the new MCC Controls panel

The MCC controls for the building shall be controlled by 2no different interfaces which are as follows:

1. A digital touchscreen keypad shall be installed in the Principals Office offering the client full control over the building management system. This digital touchscreen panel shall be as Cylon SiteGuide V2.2, or equivalent. The touchscreen shall adhere to the following:

    - 7”(800mm x 450mm) colour screen
    - Touchscreen
    - 512 MB RAM
    - 256 MB ROM
    - USB host
    - USB Client.

2. The second form of user interface shall be a run-on push button for each heating zone which shall be located in the Principals Office in the building as indicated on the drawings. Each button shall allow the heating system to be instantly turned on for a fixed, timed period for that heating zone. See description of push button below for further information.

Heating:

The space heating installation shall be a low-pressure hot water, accelerated and sealed system. The system is designed for a flow temperature of 80 degrees Celsius and return temperature of 60 degrees Celsius. Control of heat emitter output shall be by weather compensation.

The boilers shall be weather compensated to reduce the overall system temperature. Once the optimum start routine period is complete, Weather compensation shall be provided by modulation of the boilers flow water temperature in proportion to the external air temperature.

Other features include two-stage frost protection and heat dissipation after timed shut down. Spare tappings shall be provided on the main flow and return low loss header to serve any possible future expansion.

The boilers shall be provided with the following control functions:

- Time control:

  Seven day time schedule control for each of the pumped circuits that calls on the boiler when a circuit requires heat under the time schedule.

- Weather compensation:

  Weather compensation shall be achieved through the modulation of the boilers firing rate. The controls system must send a signal in an appropriate format to the boilers in order to instruct the boilers to change its temperature as the external temperature changes.

  Consult with the boilers manufacturer/supplier before designing the control system.

  The boilers supplier and MCC Controls specialist shall meet on site at the time of commissioning to ensure that all works are completed for the boilers so that the boilers can be directly modulated by the MCC controls panel. This is to ensure that all connections from the boilers to the MCC controls are completed to the satisfaction of the boiler Commissioning Engineer and the MCC Controls Commissioning Engineer.

  The Contractor shall ensure that both parties are on site at the same time for commissioning so that there are no conflicting issues with the boilers and MCC controls.

  The Contractor shall be responsible for ensuring that the boilers proposed by the Contractor are provided with the appropriate control modules to allow the boilers to allow its temperature set-point to be altered by the MCC controls system.

- Zone Control:

  Time schedule shall be provided for each LPHW circuit with the optimum start controller being activated relative to the first of the heating circuit's schedules that calls on the heating system.

  In total there are two LPHW heating circuits for the building.

- Heat Dissipation:

  When any of the boilers are not in use, its associated pump shall turn off after a five minute run on period.

- Frost Protection:

  Two-stage frost protection shall be provided for the system. External and immersion frost protection shall be provided to sequence pumps and boilers as required to protect the system and building.

  Two-stage frost protection shall be set-up as follows:

  - The circulating pumps shall operate if the external frost stat detects a temperature of less than 5°C and the boiler shall be enabled. In the event that the frost protection is enabled, the heating circuits shall also be enabled.
  - If the submerged frost stat detects a temperature of less than 2°C in the pipework. In the event that the frost protection is enabled, the heating circuits shall also be enabled.

- Optimum start control:

  The controls system shall operate the boilers at full output in order to bring the building up to temperature in the shortest possible period to the first set on time in the time schedule. Once the building is up to the temperature, the boiler shall be controlled by the modulating burner being capable of receiving a temperature set-point from the control system. As the external temperature increases, the boiler flow set-point shall reduce.

- Energy Saving Features:

  If the external temperature rises above 18°C then the heating system and all pumps shall revert to an off state to prevent pump circulation losses.

Zone Control

Separate time schedules shall be provided for each heating zone with the optimum start controller being activated relative to the first of the heating zone schedules that calls on the heating system.

In total there are two heating zones for the building.

Control Display Keypad

A digital touchscreen control display screen for the MCC controls system shall be located in the Principal's Office. This panel shall therefore be installed remotely from the MCC controls panel and the boilerhouse.

This wall mounted touchscreen will allow the controller to view and change all items relating to the MCC control system i.e. time schedules, temperature set points, energy usage etc. Laminated instructions on how to operate the touchscreen shall be positioned beside the panel.

This touchscreen shall be mounted in the Admin Office and shall be a digital touchscreen panel as Cylon SiteGuide V2.2, or equivalent. The touchscreen shall adhere to the following:

- 7" (800mm x 450mm) colour screen
- Touchscreen
- 512 MB RAM
- 256 MB ROM
- USB host
- USB Client.

Remote Out-Off-Hours Push Button

A run-on timer (out-off-hours push button) shall be installed for each heating zone in the building that will give the Client control over the timing of each heating zone for the Building. The button shall be clearly labelled.

There are four heating zones so there will be four push buttons required.

Each run-on controller/push button for the heating zones shall allow the End User to turn on the heating in the requested zone for a period ranging from 0 to 4 hours.

Each button shall be clearly labelled of the function and operation of the run on controller.

Each button installed must allow the operator to cancel the decision made, forcing the system to return to its automatic control mode. When the heating circuit is called on by this method then the boiler, pump, and associated zone valve shall be enabled for the prescribed period.

The main seven day timers shall be located within the main plant room and shall not be included within the remote panel.

MCC Outstation Panel

The main MCC outstation panel shall be located in the boilerhouse. Panel size shall be as required to include all of the control elements below and shall include 50% spare capacity. The MCC Controls Panel shall be complete with all accessories as required, such as:

- Sheet Metal Enclosure to Form 2B.

Door interlocked panel isolator

- Power MCB's as required
- Contactors with overload trips as required
- Time clock for plant with 7 day and minimum 30-hour spring reserve.
- Switches for plant items and holiday over ride (All plant to be disabled unless frost protection system calls for heat). All plant to have hand-off-auto switches, including run and trip indication.
- Interface to the remote run-on push buttons.
- Interface to the remote touchscreen for the control of the heating system.

See drawing 51(M001) for the controls schematic which highlights what items are required.

Electrical sockets on the side of the MCC controls panel:

For electrical supply in the boilerhouse, the MCC Controls specialist shall allow for the supply of electrical sockets on the side of the MCC controls panel. The MCC Controls Specialist shall allow for the following sockets to be installed on the side of the MCC controls panel:

- 1no standard double socket. Double socket shall be a surface mounted 2-gang electrical socket. Include for a mounting box for the socket. The socket shall be metal and finished in brushed stainless steel.
- 1no IP67 rated 25amp 3-pin single phase socket. Socket shall be a surface mounted electrical socket and shall be plastic. Include for a mounting box for the socket.

See images below of the proposed sockets.





All valves, stats, sensors, detectors, meters shall be supplied by the controls specialist.

The Contractor shall allow for expansion within the controls panel for future building and therefore the size of the expanded control panel should be compensated for. See Controls Schematic Drawing for further information.

51.24 Decommissioning of the existing space heating installation throughout the building

General:

The Contractor shall allow for thoroughly decommissioning and removing the existing space heating installation throughout the building as indicated on the drawings. A new space heating installation shall be installed throughout the building in replacement of the existing space heating installation that will be decommissioned and removed.

The Contractor shall allow for all works in decommissioning and removal from site of the existing space heating installation throughout the building which includes all existing exposed Low Pressure Hot Water (LPHW) flow and LPHW return heating services pipework and all existing radiators.

All existing LPHW flow and LPHW return pipework throughout the building is gun barrel steel.

The main runs of the existing LPHW flow and LPHW return pipework throughout the main building is installed at either high level on the wall/ceiling or is installed at low level on the wall. The Contractor shall allow for cutting and removing all the existing LPHW heating services flow and return pipework throughout the building.

The contractor is to allow for inspecting the existing services within the suspended timber ceilings prior to commencing works to confirm available space and coordinate the proposed pipework routes.

Any exposed or surface mounted existing LPHW flow and LPHW return pipework in the building shall be decommissioned and removed. This includes any of the existing heating services pipework in the ceiling void.

Some LPHW flow and LPHW return heating services is also installed in the floor. Any existing LPHW flow and LPHW return pipework in the floor shall be decommissioned and drained but shall be left in place. Refer to section 51.33 below for further information.

All the existing radiators throughout the building shall be decommissioned and removed.

Skips:

The Contractor shall allow for the provision of the necessary skips during the construction period for the removal from site of decommissioned items and rubbish. The Contractor shall adhere to current Health and Safety requirements in order to dispose of the materials. On the Contractors site visit during the tendering period (as highlighted above), the Contractor shall assess the necessary works required in order to dispose of the decommissioned materials.

The Contractor shall ensure that any other attendances or modifications required to the existing installation in order to leave the whole of the completed installation in a satisfactory condition are included in his tender.

51.25 Decommisioning and removal of the existing pipework serving the existing radiators

The Contractor shall allow for the isolation, draining, decommissioning and removal of all redundant LPHW flow and return pipework throughout the school, including associated valves, brackets, supports and insulation.

Disconnect and permanently cap redundant connections to any retained services. Remove all redundant materials from site and make good surfaces disturbed by the works to match the existing finishes.

51.26 Low water content radiators

Existing radiators in the building:

As indicated in 51.24, all the existing radiators throughout the building shall be decommissioned and removed. New low water content radiators shall be installed throughout the building as indicated on the drawings.

New radiators to be installed in the building:

The Contractor shall allow for supplying and installing all new radiators as indicated on the drawings. All new radiators shall be Low-H20 technology (low-water content) radiators.

The Contractor shall allow for the supply, installation and commissioning of all the low-water content radiators throughout the building as indicated on the drawings.

Radiators are as specified in the schedule below.

The Contractor shall also allow for all necessary LPHW (Low Pressure Hot Water) flow and return pipework to all radiators from the boilerhouse as indicated.

Before ordering radiators and measuring up:

Before any radiators are ordered, the Contractor shall measure up on site and confirm to the Employer's Representative that the radiators scheduled are suitable in all respects for the locations indicated.

It is the Contractors responsibility to ensure that all radiators shall fit in the locations as indicated. Final locations of all radiators to be agreed on site.

Radiators shall not be ordered until all locations and sizes have been agreed with the Employers Representative on site.

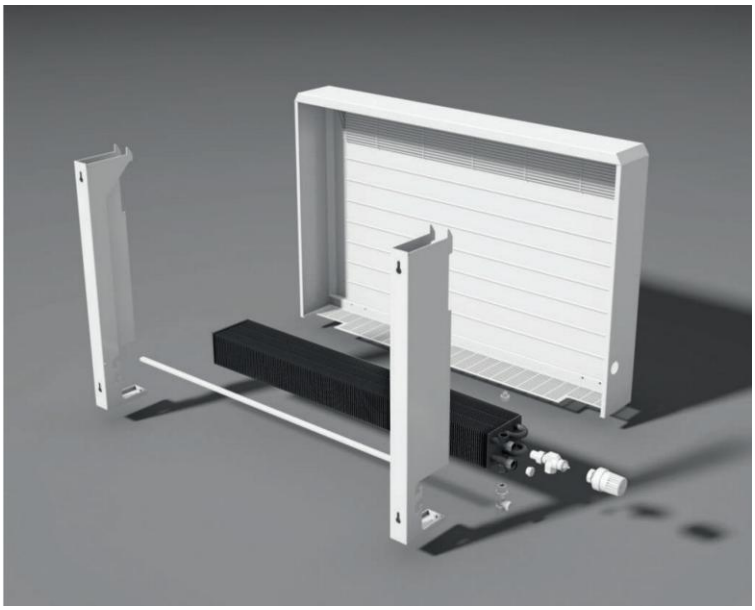
The Contractor shall allow for one full day on site for measuring up and confirming all radiator sizes and locations. No radiators shall be ordered by the Contractor until the Contractor is fully satisfied that all new radiators can be installed in their proposed locations.

Radiator Specification:

All new radiators shall be Low-H20 technology (low-water content) radiators. New radiators shall adhere to the following:









General:

In general the radiators shall be as follows:

- Radiator shall be low surface temperature (Low-H20 technology)
- Outputs of radiators tested and manufactured in accordance with BS EN442 independently by BSRIA.
- Conforms to NHS DN4 which confirms to an average of 43°C.
- Radiators shall be as manufactured by Merriott (or equivalent).
- Surface temperatures independently tested by BSRIA.

Casing:

The casing shall adhere to the following:

- Scratch resistant epoxy polyester powder coat finish in satin white to RAL9016.
- High UV resistance to ASTM G53.
- Anti-bacterial coating standard on brackets and casing.
- Unit to come with rounder corners to avoid injury.
- Low surface temperature NHS DN4 compliant at 50 ΔT, maximum flow temperature 80°C. Surface temperatures independently tested by BSRIA.
- Strong single piece profiled casing in 1.6mm steel with 3mm deep rib detail.
- Easy wipe clean, soft bevelled design to prevent accidental injury.
- No joints in the casing to gather dirt, dust and potential bacteria .
- Pencil proof bar grilles maximum aperture 7.1mm

- Integral bottom grille on wall mounted casings to prevent emitter access.
- Security screw locking system to prevent unauthorised access.
- CE marked to BS EN442 and manufactured under a BS EN ISO 9001: 2008 quality system accepted by BSI.
- Ten year warranty.

The Low-H2O emitter specification:

The emitter shall adhere to the following:

- Low H2O, high output fin coil heat exchanger.
- Low water content from 0.75 litres per metre.
- Non-corrosive 0.2mm aluminium fins & 15mm diameter copper tubes.
- Corrugated aluminium fins to maximise convective surface area.
- Single pipe reverse flow heat exchanger, continuous mass flow for optimum output efficiency.
- Same end connections, reversible heat exchanger can be connected left or right with standard valve, TRV or remote sensor.
- Dual quick-fit bracket system for emitter & casing, supplied with bracket spacing bar.
- Standard connections of 4 x 1/2" with 1/2" blank plug and vent.
- Dirt and dust repellent epoxy polyester powder coat finish in matt graphite grey to RAL7024.
- Working pressure 10 bar, test pressure 13 bar
- Maximum operating temperature 120 °C.
- Thirty year warranty.
- Outputs tested in accordance with BS EN442 independently by BSRIA.

Radiator Schedule:

There are 119no new low water content radiators to be supplied and installed in the building.
The radiator schedule is as below:

Radiator Schedule									
Radiator	Qty	Location	Design Output (Watts)	Output Per Rad (Watts) at Delta 30	Output Per Rad (Watts) at Delta 50	Casing Length (mm)	Casing Height (mm)	Radiator Type	How heating of rads are controlled
R-01 to R-03	3 no	Staffroom	3846	611	1299	1400	500	Runtal RHL490	Two-port-valve
R-04 to R-09	6 no	Assembly Hall	21759	1773	3773	2400	500	Runtal RHLLH490	Two-port-valve
R-10 to R-12	3 no	Stage, Store 1,2	9956	1773	3773	2400	500	Runtal RHLLH490	Two-port-valve
R-013	1 no	TY Office S-45	984	524	1114	1200	500	Runtal RHL490	Two-port-valve
R-14 to R-15	2 no	Entrance Lobby	4146	1034	2201	1400	500	Runtal RHLLH490	Two-port-valve
R-16 to R-17	2 no	Reception Area	7550	1773	3773	2400	500	Runtal RHLLH490	Two-port-valve
R-18	1 no	Office 1	943	443	943	600	500	Runtal RHLLH490	Two-port-valve
R-19	1 no	Office 2	1762	872	1856	2000	500	Runtal RHL490	Two-port-valve
R-20	1 no	Office 3	2759	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-21	1 no	Gents Toilet Room Hall	1642	785	1670	1800	500	Runtal RHL490	Two-port-valve
R-22	1 no	Gents Toilet Room	2272	1182	2515	1600	500	Runtal RHLLH490	Two-port-valve
R-23	1 no	Accessible Toilet	424	262	557	600	500	Runtal RHL490	Two-port-valve
R-24	1 no	Ladies Toilet Room	1973	1034	2201	1400	500	Runtal RHLLH490	Two-port-valve
R-25	1 no	Office S-29	1445	698	1485	1600	500	Runtal RHL490	Two-port-valve
R-26 to R-27	2 no	Male Student Toilet Room S-10	5118	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-28 to R-30	3 no	Library	8010	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-31	1 no	Office-Library	2272	1182	2515	1600	500	Runtal RHLLH490	Two-port-valve
R-32	1 no	Office S-12 & Entryway	1309	698	1485	1600	500	Runtal RHL490	Two-port-valve
R-33 to R-34	2 no	Class S-13	5724	1478	3144	2000	500	Runtal RHLLH490	Two-port-valve
R-35 to R-36	2 no	Class S-14	5649	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-37 to R-38	2 no	Class S-15	6318	1773	3773	2400	500	Runtal RHLLH490	Two-port-valve
R-39 to R-43	5 no	S-16 Corridor , Residence Corridor, S-09	13444	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-44	1 no	Office S-20	2479	1182	2515	1600	500	Runtal RHLLH490	Two-port-valve
R-45 to R-46	2 no	Class S-17	5188	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-47 to R-48	2 no	Class S-22 (Stage)	6410	1773	3773	2400	500	Runtal RHLLH490	Two-port-valve
R-49 to R-50	2 no	Class S-21	5188	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-51 to R-52	2 no	Class S-18	6065	1478	3144	2000	500	Runtal RHLLH490	Two-port-valve
R-70 to R-71	2 no	Class S-22	5245	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-55 to R-56	2 no	Class S-19	6113	1478	3144	2000	500	Runtal RHLLH490	Two-port-valve
R-57 to R-61	5 no	S-27 Corridor & S-33	17450	1773	3773	2400	500	Runtal RHLLH490	Two-port-valve
R-62 to R-63	2 no	Class S-23	5119	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-64 to R-65	2 no	Class S-24	5903	1478	3144	2000	500	Runtal RHLLH490	Two-port-valve
R-66 to R-67	2 no	Class S-25	4424	1182	2515	1600	500	Runtal RHLLH490	Two-port-valve
R-68 to R-69	2 no	Class S-26	4285	1034	2201	1400	500	Runtal RHLLH490	Two-port-valve
R-70 to R-71	2 no	Class S-30	5316	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-72 to R-74	3 no	Art S-31	11747	1773	3773	2400	500	Runtal RHLLH490	Two-port-valve
R-75 to R-76	2 no	Male Student Toilet Room S-32	2736	698	1485	1600	500	Runtal RHL490	Two-port-valve
R-77 to R-80	4 no	S41 Hallway& S-34	15351	1773	3773	2400	500	Runtal RHLLH490	Two-port-valve
R-81 to R-82	2 no	Class S-35	4272	1034	2201	1400	500	Runtal RHLLH490	Two-port-valve
R-83 to R-84	2 no	Class S-36	5401	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-85 to R-86	2 no	Class S-37	6112	1478	3144	2000	500	Runtal RHLLH490	Two-port-valve
R-87 to R-88	2 no	Class S-38	3907	1034	2201	1400	500	Runtal RHLLH490	Two-port-valve
R-89	1 no	S-50 Office & Store 3	1624	785	1670	1800	500	Runtal RHL490	Two-port-valve
R-90	1 no	S-49 Office	1184	591	1258	800	500	Runtal RHLLH490	Two-port-valve
R-91 to R-95	5 no	Metal Work S-39	15715	1478	3144	2000	500	Runtal RHLLH490	Two-port-valve
R-96 to R-100	5 no	Wood Work S-40	17597	1773	3773	2400	500	Runtal RHLLH490	Two-port-valve
R-101 to R-104	4 no	S-43 Hall, S-57, S-42	13938	1773	3773	2400	500	Runtal RHLLH490	Two-port-valve
R-105 to R-106	2 no	Class S-44	5724	1478	3144	2000	500	Runtal RHLLH490	Two-port-valve
R-107 to R-109	3 no	Physics Lab	7699	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-110 to R-112	3 no	Chemistry Lab	7040	1182	2515	1600	500	Runtal RHLLH490	Two-port-valve
R-113 to R-115	3 no	Biology Lab	7078	1182	2515	1600	500	Runtal RHLLH490	Two-port-valve
R-116 to R-117	2 no	Lab Backroom	5295	1330	2830	1800	500	Runtal RHLLH490	Two-port-valve
R-118 to R-119	2 no	Existing School Building	6219	1478	3144	2000	500	Runtal RHLLH490	Two-port-valve

51.27 LPHW Pipework and pipework supports for space heating in the building

<u>Existing LPHW heating services pipework in the building:</u>

As indicated in 51.24, all the existing exposed LPHW flow and return heating services pipework and radiators throughout the existing old building shall be completely decommissioned, removed and replaced with a new installation.
All existing space heating services pipework in the old existing building is installed in mild steel tube piping.

New LPHW flow and new LPHW return pipework:

New LPHW (Low Pressure Hot Water) heating flow and return pipework shall be installed throughout the existing old building from the boilerhouse to all the new radiators in the building as indicated on the drawings.

All new LPHW (Low Pressure Hot Water) flow and return heating services pipework to be installed throughout the existing old building shall be installed in black mild steel tube piping. All new LPHW (Low Pressure Hot Water) heating flow and return pipework to be installed throughout the existing old building shall be black steel pipe Class B seamless medium gauge, Blue band to BS EN 10255.

Refer to the drawings for location, routes and sizes.

All mild steel pipe and tube shall be dual certified to BS EN 10217-1:2002, fully traceable back to the manufacturer and shall be supplied with 3.1 mill test certification. All of our BS EN 10255:2004 steel pipe shall be compliant with the European Pressure Equipment Directive (PED) 2014/68/EU.

New LPHW flow and return pipework shall be supplied throughout the existing old building from the boilerhouse to all the new heat emitters throughout the existing old building. Pipework shall be as specified above.

Where possible, the main runs of heating pipework shall be installed at high level on the wall or ceiling.

All LPHW flow and return heating services pipework shall be supplied, installed, tested and commissioned by the Contractor.

Piping to valves and equipment shall be connected with either flanges or unions to facilitate the removal of the equipment.

Stab-in branch welds or swagged reducers and or branches shall not be accepted.

All branches shall be by a tee piece. All reducers shall be eccentric where the pipework is on the horizontal and concentric on the vertical.

LPHW pipework installed above the ceiling:

All new mild steel LPHW flow and return pipework installed above the ceiling shall be jointed as highlighted below.

- Pipework in ceiling voids up to & including 50 mm ID: ***Threaded joints***
- Pipework 65 mm dia and above: ***Welded joints***

Steel butt welding to B.S. 1965 to match pipe. Specification of pipework as highlighted above.

LPHW pipework installed below the ceiling:

All new mild steel LPHW flow and return pipework installed below the ceiling shall be jointed as highlighted below.

- Pipework in ceiling voids up to & including 50 mm ID: ***Threaded joints***
- Pipework 65 mm dia and above: ***Welded joints***

Steel butt welding to B.S. 1965 to match pipe. Specification of pipework as highlighted above.

Welding:

All pipeline welding shall be in accordance with the relevant BS specification or where BS does not apply shall be of the highest standard of workmanship and shall be subjected successfully to any test required by the Engineer.

All pipework shall be welded in accordance with the requirements of BS 2640 and 2971, copies of which shall be retained on site during course of installation. The Contractor shall ensure that all operatives engaged on welding are familiar with the requirements of this BS Specification and are normally capable of welding to the standards therein laid down.

Threading Fittings:

Where threaded fittings are specified they shall be in black malleable iron, banded type, individually tested to BS 143 and 1256: 1986 and screwed to BS 21: 1985. All bends used shall be of the long radius type, elbows will not be allowed.

Jointing of threaded fittings for water carrying pipework shall be by means of carefully stranded flax evenly covered in jointing compound and wound on to the male thread so as to bind around the thread during the screwing of the fitting.

Care should be taken to clean off all loose strands of flax after the joint is completed.

Painting of LPHW Flow and LPHW Return Heating Services Pipework:

Insulation is only to be installed on heating services pipework installed in the ceiling void or in box-outs.
Any exposed heating services pipework installed internally is not to be insulated.
All pipework that is to be insulated in the building is highlighted on the drawings.

All new LPHW (Low Pressure Hot Water) flow and return heating services heating distribution pipework that is to be insulated in the building shall be provided with one coat of red oxide paintwork prior to fitting insulation. Failure to provide this paintwork prior to insulation will result in the removal of insulation for painting.

The Contractor shall allow to make good all surfaces before painting the heating services flow and heating services return pipework. The Contactor shall allow for the following to paint the heating services pipework:

- *Step 1:* Thoroughly clean the pipework and prepare for painting.
- *Step 2:* Prior to installing the insulation, paint the heating services pipework with one coat of red oxide paint.

All tubing fittings and supports shall be coated with application of lacquer or rust-inhibiting priming paint. Pipe-work which penetrates fire walls or floors shall be painted with one coat of rush inhibiting priming paint before fire stopping is applied.

The Contractor shall ensure that fire stopping will not proceed prior to the piping being treated.

Bracketing and supports

All new LPHW flow and return pipework in the building shall be adequately bracketed and supported.

Exposed pipework in rooms shall be supported on allowable iron or brass split pattern screw-to-wall school board type brackets, depending on the service. The Contractor shall allow for lining up the brackets, fixing the brackets and drilling and plugging the walls. Brass screws to be used with brass brackets and screws to have a minimum length of 50mm. Plastic type wall plugs to suit the screw size shall be used.

Pipework run above suspended ceiling shall be fixed by adjustable hanger or brackets as BOSS Flamco or similar approved.

Pipework run below the ceiling at high level shall be run on suitable unistrut brackets that are either supported off the wall or off the ceiling.

Exceptional care shall be exercised when supporting and bracing pipework to ensure that no hammering or vibration takes place and that the complete system operates in a quiet manner even when valves are closed off quickly against full pressure.

Where pipework is installed, brackets shall be dimensioned and mounted so as to accommodate the insulation 15mm clear of the surface wall. Brackets shall allow for thermal expansion and ample clearance to be allowed when setting out brackets for large pipes. Supports shall be arranged to be as near as possible to changes in direction and joints.

Where pipework is exposed the Employers Representative approval shall be obtained as to the location and method of fixing of pipe supports before putting the work in hand, to ensure the required standard of neatness is achieved.

Where floor level pipes are likely to be subjected to abuse additional floor type brackets shall be used in locations to be decided by the Employers Representative. They shall comprise a split pipe ring, pipe nipple and backplate secured to the floor.

All adjacent pipework following the same route shall be bracketed at the intervals specified for the smallest pipe in the run.

The following are the bracket intervals depending on the material of pipework:

BORE (mm)	HORIZONTAL (m)	VERTICAL (m)
15	1.5	1.8
20	1.5	2.1
25	1.8	3.0
32	1.8	3.0
40	2.4	3.0
50	2.4	3.5
65	2.7	4.0
80	3.0	4.0
100	3.0	4.6
125	3.7	5.5
150	4.5	5.5

Pipework sleeves

Pipe sleeves of appropriate diameter and of the same material as the pipe shall be fitted where pipes are installed through walls, duct covers, ceilings and floors. Sleeves shall be round out and free from burrs and project 5mm on either side of finished wall surfaces.
Adequate allowance shall be made for thermal expansion. Pipes passing through sleeves shall be positioned to allow for this movement. The sleeves shall be arranged to finish flush with the plaster or other wall finish and be of one length. The following table shall be used as a guide for the size of sleeves.

PIPE BORE (mm)	BORE OF SLEEVE (mm)
15	25
22	32
28	38
35	51
42	51
54	63

Supply and commissioning:

The Contractor shall allow for supplying and commissioning the entire LPHW system throughout the existing old building. The Contractor shall employ a suitable commissioning company carry out the commissioning of the heating system.

Automatic Air Vents

The Contractor shall allow for the supply and installation of automatic air vents at all high points on the new heating pipes at high level in the building as indicated on the drawings. Fit automatic air-vents on the highest point of the flow and return pipework in the building as indicated on the drawings. The Contractor shall ensure that pipes are laid with the correct gradient to eliminate air locks and to allow for adequate venting. Automatic air-vent shall be as Honeywell Vent EA122, or equivalent.



The valve shall have the following features:

- Integral stop valve. Enables seat to be cleaned without draining the system
- Vacuum break ensures air collection
- 3/8" BSP connections
- Expanding disc under cap.
- 1/8" to 1/2" adaptor

Isolation Valves:

The Contractor shall allow for the supply and installation of isolation valves on the new flow and return LPHW pipework to allow isolation of the LPHW heating flow and LPHW heating return pipework in the building.

Valves shall be full-way pattern with gland surfacing boxes complete with iron hand wheels screwed or flanged as necessary with cast iron bodies, gunmetal wearing parts and bronze seatings.

Valves shall be as Crane D151 isolation valves for gate valves or Crane F611 for butterfly valves, or equivalent.





Commissioning Valves:

The Contractor shall allow for the supply and installation of fixed orifice double regulating valve commissioning sets on the new heating circuit pipework to each 2-port valve arrangement.

The number and size of valves shall be as indicated on the drawings and where required for satisfactory commissioning, operation and maintenance.

The Contractor shall ensure that the valves are installed as indicated on the drawings. Valves shall not be mounted with the test plugs pointing in a downward direction; otherwise they may act as dirt pockets.

Measuring devices must provide flow measurement accuracy to within ± 5% under the design service conditions and must be suitable for the application such

that the differential pressure produced is consistent with achieving measurement accuracy.

Fixed orifice double regulating valves shall be as Crane D931/D933/D934 and shall adhere to the following:

- Fixed orifice performance.
- Hand wheel and pressure tappings oriented for maximum convenience.
- Insertion test points for quick connection.
- PN25 pressure rating.
- Adaptor kit for use with copper tube.



Labelling:

All new LPHW flow and return heating services pipework installed at high level (either above the ceiling or at high level on the ceiling) throughout the existing old building shall be labelled with appropriate colour identification bands, flow indication arrows and zone numbers.

All labels must be neat, lined up with other labels, oriented for easy view, and securely fixed. Any labelling installed which does not fit this description shall be removed and replaced.

Labels on new pipework shall be provided at least once within the building compartment and every 10m on long runs within a single compartment such as a corridor.

All labels must be neat, lined up with other labels, oriented for easy view, and securely fixed. Any labelling installed which does not fit this description shall be removed and replaced. Labels on pipework shall be provided at least once within the building compartment and every 10m on long runs within a single compartment such as a corridor.

Expansion and Contraction

Arrange supports and fixings to accommodate pipe movement caused by the thermal changes. Generally allow the flexure at changes in direction. Allow for movement at branch connections. Select pipe rings and clips appropriately to allow axial movement due to expansion.

Provide expansion loops in all straight heating pipework runs with a length of greater than 20m. Use expansion bellows where the installation of loops is not possible due to space constraints. Expansion devices shall only be employed where it is found to be impossible to take up expansion within the system.

51.28 Radiator valves

The contractor shall allow for all necessary radiator control valves for all radiators. Radiator valves shall be supplied by the radiator supplier in conjunction with the radiators to suit the radiator. Control valves for radiators shall be of the easy clean pattern chromium plated with grey grip moulded hand wheels on the flow and lock shield chromium plated valves on the return.

Radiator lockshield valves shall be as Herz type 3723/3724 or equal and approved.



51.29 Two-port valves & associated thermostat

General:

Radiators serving the rooms indicated on the drawings shall be provided with individual room temperature control via two-port motorised valves, each controlled by a dedicated wall-mounted digital room thermostat. Refer to the drawings and radiator schedule for locations and quantities.

Zone 4 shall be divided into two independently controlled subzones, Zone 4A and Zone 4B. Each subzone shall be provided with a separate two-port motorised valve and a dedicated wall-mounted digital room thermostat as shown on the drawings.

Where applicable, the two-port valve shall be installed at high level in the ceiling void or at high level on the ceiling as indicated on the drawings.

See specific detail on the heating services drawing for the specific piping arrangement for each two-port valve installation.

See drawings for number of two-port valve and thermostat to be installed. See drawings to confirm quantities, locations and pipe sizes.

Digital Room Stats:

All rooms stats as indicated that are to be installed in conjunction with the two-port valve to control the heating within the specified rooms shall be digital stats as specified and indicated below. See drawing for quantities and locations.

These digital room stats shall provide the following functions

1. Clearly display the room temperature.
2. Clearly display the room set point temperature.
3. Allow the user to easily adjust the set point temperature.
4. Operate on a 230V mains power supply (battery stats are not acceptable)
5. Provide a 230V power control to a two-port motorized valve.
6. If alternative makes are proposed, they must run on mains power and be as robust as the above. It an alternative is proposed, provide a sample.

The stats shall adhere to the following specifications:

- *Temperature range:* 5°C - 35°C
- *Mounting type:* Surface
- *Digital display:* Yes
- *Keypad lock:* Yes
- *Backlight:* White
- *Built-in sensor:* Yes (NTC 100K)
- *Accuracy:* +/- 1.0°C
- *Electrical supply:* 230VAC
- *Electrical rating:* 3amp
- *Contacts:* Volt free
- *Power consumption:* 1.1watt
- *IP rating:* IP20
- *Dimensions (approx.):* 91mm high x 91mm wide x 26mm deep.
- *Guarantee:* 2years



The Contractor shall hand over all necessary items to his Electrician for wiring complete with any wiring diagrams or instructions as supplied by the specialist supplier.

Wall mounted digital/electronic room thermostats shall be as EPH CDT2, or equivalent. The Contractor shall include for the supply and fitting of these valves and thermostats.

Two-port Valves:

Two-port valves shall be installed on the pipework into classrooms/offices to control the heating within the room.

See drawing for quantities, locations and piping arrangements.

Two-port valves shall have the following specifications:

- Motor Supply Voltage: 230 V AC
- Frequency: 50 Hz
- Power Consumption: 6 W
- Motor Insulation Rating: Class 'F'
- Maximum Working Pressure: 10 Bar
- Maximum Water Temperature: 95° C
- Maximum Ambient Temperature: 52° C
- KV value: 7.3
- Switch Rating: 3(0.5) A
- High Temperature Silicon Cable: 1100mm
- Actuator head: Yes. Supplied with valve.
- Valve Body: Brass with spring loaded Mica filled PTFE shoes
- Actuator: Power to Open Spring to Close
- Approvals: Valve to be VDE approved, ISO 9002 compliant.

Two-port valves shall be as Myson, Honeywell, EPH, (or equivalent). Valve shall be 15mm/22mm Zone Valve and shall be supplied with and actuator head. The

Contractor shall include for the supply and fitting of these valves as indicated on the drawings.



51.30 Flush out and pressure test all new pipework installed in the building

Flush out of new pipework:

Before any radiators are installed, all new pipework heating services pipework and water services pipework that was installed in the building shall be thoroughly flushed out with clean water until water flows clear from the system.

Once that is completed, all new pipework shall then be pressure tested as highlighted below.

Pressure testing of new pipework in the building:

The Contractor shall hydraulic pressure test all new flow and return LPHW pipework that is to be installed the building. All new pipework shall be pressure tested to 7 bar and shall remain drop tight for a period of at least 12 hours.
If pressure has dropped at all from noted mark, the installation cannot be regarded as sound and shall not be commissioned until the escape is repaired and the installation re-tested. If pressure remains stable, then installation can be deemed sound.

Comply with procedures given in the HVCA Guide to Good Practice for Site Pressure Testing of Pipework. Ensure safety precautions detailed in HSE Guidance Note GS4 Safety in Pressure Testing are adopted.

Advise appropriate personnel, in advance, of the time pressure tests may be witnessed. Keep record of pressure tests and issue them to the Employer's Representative, and include them within the handover documentation.

51.31 Commissioning of new heating system in the boilerhouse and the building

The Contractor shall allow for commissioning the entire new flow and return pipework throughout the boilerhouse and building once all works are completed within the boilerhouse and building. The Contractor shall employ a suitably qualified company to carry out the commissioning in the boilerhouse and in the building.

51.32 Gas fired radiant heaters

he Contractor shall allow for the safe isolation, disconnection, decommissioning and removal of the 4 No. existing gas-fired radiant heaters in the sports hall, including redundant fittings, supports and associated components.

Supply, install, test and commission 4 No. new natural gas-fired radiant tube heaters at the locations indicated on the drawings. Heater duties, dimensions and mounting arrangements shall be verified against the sports hall heating requirements and submitted to the Engineer for approval before ordering.

The existing gas distribution pipework shall be retained where suitable. Verify its condition, capacity and operating pressure and allow for all local alterations, appliance isolation valves and connections required for the new heaters.

Provide suitable supports and maintain the manufacturer's required mounting heights and clearances. Allow for compatible flues, combustion air ducts and roof terminals. Existing flue and air inlet components shall only be reused following verification of their condition and compatibility with the selected heaters. Make good disturbed roof penetrations and finishes.

Provide 4 No. new natural gas detectors, one associated with each heater, complete with a compatible gas detection control panel, audible and visual alarm indication, and automatic gas shut-off arrangements. Detector locations and coverage shall be determined by the gas detection specialist, taking account of the roof geometry, ventilation and manufacturer's instructions. Agree the alarm, shutdown and manual-reset sequence with the Engineer.

Allow for all associated heating controls, safety interlocks and coordination of electrical supplies and wiring with the Electrical Contractor.

All gas works shall comply with I.S. 820:2019, as amended, and the equipment manufacturers' instructions, and shall be undertaken by an appropriately registered gas installer. Include gas installation testing, purging, combustion commissioning, testing of the gas detection and shutdown functions, certification, operating manuals and demonstration to the Client.

(61) ELECTRICAL WORKS

61.01 General electrical specification

The Contractor shall be responsible for all electrical works as identified on the drawings.

Electric wiring shall be carried out under this contract. The Contractor shall employ a suitably qualified electrical contractor (RECI qualified and a member of the ECSSA) to carry out all necessary electrical work.

The Contractor shall ensure that the full price for this work is included in the tender price. Wiring to devices shall be housed in steel conduits throughout the existing old building. The Contractor shall provide certification from the supplier to the Employers Representative certifying that commissioning has been carried out.

This section of the specification outlines the electrical services installation and describes the particular requirements of the services to be installed and the works carried out. This section is intended to be read in conjunction with all other technical and non-technical sections of the specification and with the tender drawings. Where this section is at variance with any other sections of the tender documents, the tenderer shall obtain clarification from the Employers Representative before tendering. Failure to do so will be deemed to imply that the most onerous requirements have been included for.

61.02 Cable carrier

General:

The Contractor shall allow for supplying and installing any new cable containment and cable carrier system for the new electrical services throughout the boilerhouse and building.

New cable containment to be installed in the boilerhouse:

The Contractor shall allow for installing galvanised steel tray and trunking for all the power and low voltage cabling to be installed to all the plant, control devices, etc. throughout the boilerhouse.

If possible, the Contractor shall re-use the existing trunking that was in place in the boilerhouse for the existing control cabling. However, some new trunking will be required in the boilerhouse for some new cabling.

These items are not indicated on the drawings but the Contractor shall allow for the following cable containment in the boilerhouse:

- A new 100mm x 100mm galvanised steel trunking shall be installed around the perimeter of the room for all new power cabling for the plant and equipment in the main boilerhouse from the new MCC controls panel. The dimensions of the existing boilerhouse are 3700mm long by 2700mm wide. The new trunking shall be installed on the wall at 2800mm high.

- A new 100mm galvanised steel tray shall be installed around the perimeter of the room for all new control cabling for the plant and equipment in the boilerhouse from the new MCC controls panel. The dimensions of the existing boilerhouse are 3700mm long by 2700mm wide. The new tray shall be installed on the wall at 2800mm high.

- All drops to plant, control items, equipment, etc. from the new trunking and tray to be installed in steel conduit. All conduits shall be surface mounted. Allow for a conduit drop of 2500mm for each item.

For all power and control wiring in the boilerhouse, the electrical distribution system shall be installed in a steel conduit/trunking system throughout boilerhouse. All conduits and cable containment in the boilerhouse and the building shall be surface mounted.

New cable containment to be installed in the main building for the electrical attendances to the two-port valves in the rooms:

The Contractor shall allow for installing galvanised steel conduit for all the power supplies to be installed to the new two-port valves to be installed in the rooms.

Refer to drawing 61(E001) for the electrical attendances required in the building. Also refer to these drawings for the location of the existing electrical boards in the building.

For all the new power and control wiring required to the new motorised two-port valves and thermostats in the relevant rooms, the Contractor shall allow for installing all power and control cabling in galvanised steel metal conduit throughout. All new conduits in the building shall be surface mounted.

The Contractor shall allow for using the existing tray and trunking in the building for the new cabling to the new two-port valves and thermostat arrangement in the classrooms.

The Contractor shall allow for taking power supplies from the existing electrical installation in the rooms for the power supply to the new two-port valve in each room.

New cable containment for sub-mains cabling to the existing building:

A new sub-mains cable shall be required from the existing main distribution electrical board in the building to the new MCC controls panel in the boilerhouse. As a result, the Contractor shall allow for the supply and installation of 100mm galvanised steel tray between the existing main distribution electrical board in the building and the new MCC controls panel in the boilerhouse. The new tray shall be installed at high level in the corridor and shall be exposed.

For tendering purposes, allow for 50metres of 100mm galvanised steel tray between the existing main distribution electrical board in the building and the new MCC controls panel in the boilerhouse.

Allow for all necessary bracing, supports, unistrut, threaded rod, etc. for the installation of all new tray throughout the existing old building.

The Contractor shall allow for all necessary bends, offsets, crossovers, additional labour, etc. in installing the new cable containment in the building. The Contractor shall allow for visiting the site during the tendering period to review all necessary works that are involved in supplying and installing the necessary cable containment for the new electrical services in the building.

This new cable containment is to be installed for the new sub-mains cable from the existing main distribution electrical board in the building to the new MCC controls panel in the boilerhouse.

Refer to drawing 61(E001) for the location of the existing main distribution electrical board in the building and the boilerhouse.

For all power and control wiring in the building, the electrical distribution system shall be installed in a steel conduit/tray system throughout. All conduits and cable containment in the boilerhouse and the building shall be surface mounted.

Trunking and Tray:

As highlighted above, new galvanised steel trunking and galvanised steel cable tray shall be installed throughout the boilerhouse for the distribution of electrical cabling throughout the boilerhouse.

As highlighted above, new tray shall also be installed in the main building from the new MCC controls panel in the boilerhouse for control devices to the Principals Office and also for the sub-mains cabling from the existing main distribution electrical board to the new MCC controls panel in the boilerhouse.

All power, circuit wiring, control cabling, etc. in the boilerhouse and in the building shall be installed in metal conduit, trunking, as described below.

All tray and trunking to be installed in the building shall be manufactured from mild steel pre-galvinised. Trunking shall meet the requirements of BS EN 50085-1:2005 and BS EN 50085-2-1:2006. Tray systems shall meet the requirements of BS EN 61537:2007.





All new sub-mains cabling shall be installed on suitably sized tray as described below.

The Contractor shall allow for all necessary bends, offsets, crossovers, additional labour, etc. in installing the new cable containment in the boilerhouse and in the building. The Contractor shall allow for visiting the site during the tendering period to review all necessary works that are involved in supplying and installing the necessary cable containment for the new electrical services throughout the existing old building.

The Contractor shall allow for all necessary brackets, unistrut, threaded rod, etc. in hanging the cable containment. Cable containment shall be properly aligned and securely fixed at regular intervals at 1000mm on straight runs.

Where bends, angles or offsets occur, additional fixings shall be supplied at a distance not exceeding 150mm on each side of the accessory.

Cable capacities of conduit and trunking systems shall not exceed the requirements of the ETCI Specifications. It is the responsibility of the Electrical

Contractor to verify that the trunking system as designed satisfies these regulations.
If cables exceed the trunking capacities, the Electrical Contractor must bring this to the attention of the Engineer prior to order or installation of the trunking system.

Trunking and cable tray systems shall be free of sharp corners, edges or burrs, where cable insulation could be damaged. Cables shall be installed in a manner that will not damage or put undue physical strain on them.

Metal conduits:

All of the electrical installation in the boilerhouse and in the building shall be surface mounted and as a result, all conduits shall be surface mounted. All surface mounted conduits shall be installed in metal conduit.

All metal conduits shall be galvanised welded steel to BSS 31 Class E for heavy gauge tubing as manufactured by ASCM or approved equal. 16mm outside diameter is the minimum size to be used. All inlet boxes, conduits shall be plugged or capped whilst waiting for further items to be attached.

The ends of every fitting, tube length or nipple are to be reamed and all threads to be coated with aluminium paint after assembly.

All fittings shall be installed so as to facilitate easy re-wiring. Inspection fittings shall be fitted at all bends, tees and elbows. Back entry elbows or tees shall be used, if necessary, to enable easy of accessibility without disturbing any plasterwork.





Inspection fittings shall be flush with the plasterwork and floorboards over conduit fittings shall be screwed in position. The complete conduit installation shall be finished before any wiring is pulled through.

Allow for all junction boxes for jointing of conduits.

The minimum spacing of conduit supports shall be as follows:

Nominal Conduit Size	Spacing of Supports
25 mm. and less	1.75 metres
25 mm. to 40 mm.	2.00 metres
Exceeding 40 mm.	2.50 metres

Metal Conduit Fixing and Fittings

Surface conduit, where used, shall be run parallel to building elements and shall be fixed to the structure by means of galvanised spacing saddles affording a clearance of 3mm min. and spaced at 100mm min. Saddles shall be fixed with wooden plugs or rawl plugs as the surface permits. Where conduit is to be concealed in plasterwork, it shall be fitted using galvanised pipe hooks. Conduit boxes shall be fitted using brass round head screws.

Where conduits are fixed under flooring, which is supported on joists, cutting away shall be kept to an absolute minimum. The approval of the Employer's Representative must be sought prior to any notching.

61.03 Sub-mains cable to the new MCC controls panel for the boilerhouse

General:

The Contractor shall allow for the supply and installation of a new sub-mains cable from the existing main distribution electrical board in the main building to the new MCC controls panel in the boilerhouse.

Refer to drawing 61(E001) for the location of the existing main distribution electrical board in the main building and the boilerhouse.

Refer to 61.02 for further information on the cable tray to be installed for the new sub-mains cabling between the existing main distribution electrical board and the new MCC controls panel in the boilerhouse.

Allow for the connection of the new sub-mains cable to the existing main distribution electrical board and also the new MCC controls panel.

Sub-mains cable specification:

For reference, the Contractor shall allow for the supply and installation of a 4core 25mm^2 sub-mains cable and 25mm^2 earth (sub-mains cable as specified below) between the existing main distribution electrical board and the new MCC controls panel in the boilerhouse. For tendering purposes, allow for a cable length of 50metres.

The sub-mains cable shall be laid on a cable tray over the entire length of the cable run. The Contractor shall provide all cable supports and cable glands necessary for correct installation and termination of the cables.

Sub-mains cable shall adhere to the following specifications:

- Composition: Manufactured to BS 6724 Table 6 (2 Core) Table 8 (3 Core) Table 10 (4 Core) Table 13 (5 Core)
- Type: Plain Annealed Copper Conductor / XLPE Insulated / LSNH Bedded / Galvanised Steel Wire Armour / LSNH Sheathed. 600/1000V
- Conductor: Plain Annealed Copper Class 2 Stranded to BS EN 60228
- Insulation: Thermosetting XLPE Type GP8 to BS 7655-1.3
- Bedding: Compatible LSNH Polymeric Material (LSNH)
- Steel Wire Armour: Galvanised Steel Wire
- Sheathing: LSNH Type LTS1 to BS 7655-6.1
- Current Ratings: For current ratings refer to table 4E4A of BS7671 IEE Wiring Regulations Seventeenth Edition.

Sub-mains cables and sub-distribution cables shall be 4 Core CU/XLPE/LSHN/SWA/LSNH with separate CPC's for cables over 16.0 sq.mm, and 5 Core CU/XLPE/LSHN/SWA/LSNH for cables of 16.0sq.mm or less. Cables shall be sized as scheduled on the electrical drawings.

Internal sub-mains cables and sub-distribution cables shall be fixed to cable tray. Cable tray shall be perforated type, galvanised medium gauge sheet steel. Sub-mains cables and sub-distribution cables shall be installed on cable trays at a spacing of twice the diameter of the larger adjoining cable with nylon cable ties. Sub-mains cable distribution within the building shall be XLPE insulated, steel wire armoured, LSNH sheathed cable that shall be installed directly on steel cable tray.

A separate CPC shall be installed with every sub-mains feed and should be of the size detailed in the distribution drawings. The amour of the cable should also be

bonded at both ends to the distribution equipment by means of a nut and bolt through a tab linked to the earth bar.

The objective of the system is to provide an efficient and effective system for the distribution and support of small power requirements.

The design parameters are defined within the ETCI National Rules for Electrical Installations.

All cables shall have stranded or flexible copper conductors and LSF or heat resisting insulation to suit the particular application.

Cable carriers for incoming mains cables must be complete with lid. Under no circumstances will exposed cables be acceptable in any location throughout the existing old building.

Information and communication technology cables shall be run on a separate cable tray system generally following the same service routes and they shall be separated from power distribution cables. Where crossovers are required, they shall be at 90° to the power cable route.

Segregation, Concealment and Re-Wiring:

The Electrical Contractor shall comply with ET101 when wiring installations. Circuits shall be segregated as indicated. Draw wires shall be left within empty conduits for use of specialist installers. Draw wires comprising nylon tapes with fitted eyelets shall be used by the Electrical Contractor.

For concealed conduit the Electrical Contractor shall ensure that the system is installed to enable re-wiring to be carried out from boxes for fittings or accessories only. Draw-in boxes will only be permitted with prior permission in writing. The Electrical Contractor shall not use tallow or any other substances to facilitate drawing-in of cables.

Cable containment:

Suitable cable tray shall be supplied and installed for all new sub-mains cabling in the building. Refer to section 61.02 above for further information.

61.04 Attendances to the MCC controls panel in the main boilerhouse

Existing MCC controls panel in the boilerhouse to be decommissioned and removed:

The existing MCC controls panel in the boilerhouse and all associated cabling, control cabling, power cabling, etc. shall be decommissioned and removed.

A new MCC controls panel shall be installed for the new heating plant and installation in the boilerhouse as highlighted below.

New MCC controls panel to be installed in the boilerhouse:

A new Motor Control Centre (MCC) shall be installed in the boilerhouse as indicated on the drawings for the control of the heating system.

The Contractor shall supply, install, connect, test and commission all power and control wiring associated with the mechanical installation in accordance with the detailed wiring diagrams for the MCC controls panel.

Allow for BMS communications cabling between the new boilerhouse controls system and the existing Delta Controls BMS in Building C, including all necessary interfaces, connections, programming, testing and commissioning. Cable type and interfacing requirements shall be confirmed with Control Tech, the existing BMS installer. Allow for associated trenching, underground ducting and reinstatement as detailed in the Builder's Works section.

Refer to drawing 51(M001) for specific details of the new MCC controls panel and drawing 61(E001) for the location of the new MCC controls panel in the boilerhouse.

Electrical attendances:

The Contractor shall allow for the wiring of the controls package and control devices.

The Contractor shall supply, install, connect, test and commission all power and control wiring associated with the MCC controls installation in accordance with the detailed wiring diagrams supplied by the MCC controls specialist. Refer to the schematic on drawing 51(M001) for further information.

New wiring to the heating plant in the boilerhouse shall be in LSZH cable in steel conduit. Refer to Section 61.06 for details on cabling required.

Refer to drawing 51(M001) for information on wiring and connecting up all the relevant mechanical items and control items. The majority of the items are located within the boilerhouse. All new and existing control items shall be wired back to the new MCC controls panel located in the boilerhouse.

The Contractor shall include for wiring and connecting up all the new relevant mechanical items and control items as indicated on drawing 51(M001) and any other items described in this specification or shown on the drawings.

The Contractor shall supply and install all isolators and switched fuse spur outlets as necessary for the correct completion of the installation. The Contractor shall include for wiring and connecting up all new items.

All new plant items in the boilerhouse shall be provided with local and dedicated labelled isolation at each plant item. Final connections to the boiler, burner and pumps shall be via local IP54 isolators and flexible conduit connection.

Refer to drawing 51(M001) for information on wiring and connecting up all the relevant mechanical items and control items.

All new plant items shall be provided with local and **dedicated labelled isolation at each plant item.** Final connection to all plant items in IP54 isolators and flexible conduit connectors.

The Contractor shall refer to the drawings and specifications to ascertain the location of the mechanical plant control devices and equipment, which require electrical services.

The Contractor shall supply and install all isolators and switched fuse spur outlets as necessary for the correct completion of the installation.

Power Wiring:

Refer to drawing 51(M001) for information on all power wiring and for the location of the new MCC controls panel and all plant and equipment in the boilerhouse. Refer to Section 61.06 for details on cabling required.

Schematic:

Refer to drawing 51(M001) for the MCC controls schematic.

Control Wiring:

Refer to drawing 51(M001) for information on all control wiring.

Control Wiring:

Refer to drawing 51(M001) for information on all control wiring.

There will be some control items from the MCC controls panel to be installed in the Principals Office in the building. The Contractor shall allow for all necessary control cabling from the new MCC controls panel in the boilerhouse to the control items in the Principals Office.

The following items shall be installed in the Principals Office from the new MCC controls panel in the boilerhouse:

- A digital touchscreen keypad shall be installed in the Principals Office offering the client full control over the building management system. For tendering purposes, allow for a control cable length of 60metres. Refer to drawing 51(M001) for information on the control wiring required for this item.
- Out-off-hours push button for Heating Zone 1 shall be installed in the Principals Office offering the time control over each heating zone. For tendering purposes, allow for a control cable length of 60metres. Refer to drawing 51(M001) for information on the control wiring required for this item.
- Out-off-hours push button for Heating Zone 2 shall be installed in the Principals Office offering the time control over each heating zone. For tendering purposes, allow for a control cable length of 60metres. Refer to drawing 51(M001) for information on the control wiring required for this item.
- Out-off-hours push button for Heating Zone 3 shall be installed in the Principals Office offering the time control over each heating zone. For tendering purposes, allow for a control cable length of 60metres. Refer to drawing 51(M001) for information on the control wiring required for this item.
- Out-off-hours push button for Heating Zone 4 shall be installed in the Principals Office offering the time control over each heating zone. For tendering purposes, allow for a control cable length of 60metres. Refer to drawing 51(M001) for information on the control wiring required for this item.

61.05 Testing and commissioning

The Contractor shall test all items of equipment individually and shall commission the full installation as a unified system. All testing and commissioning shall be carried out in the presence of and to the satisfaction of the Employer's Representative.

The Contractor shall give to the Employer's Representative seven days notice in writing before testing or commissioning is carried out. All tests shall be carried out in accordance with IEE Recommendations, relevant British and Irish Standards or IEC Publication.

61.06 Cabling, wiring and cable sizes

General installation:

All final sub-circuit cables for lighting, power, etc., shall adhere to the following specifications:

1. All cabling shall be run in metal cable containment and shall be run in steel conduit, trunking, tray etc.

2. All final sub-circuit cables for lighting, power, etc., shall be single core low smoke and zero halogen (LSZH) insulated type, flame retardant to BS 4066, with stranded copper conductors, thermosetting insulation type E1.5 to BS 7655 all complying with BS 7211. All cabling shall be LSZH sheathed cable.

3. All cables to be class Cca-s1, d2, a1. All cables to be CPR 2017 compliant.

4. Multicore unscreened cables for control and signalling requirements shall be of the unarmoured type with copper conductors, PVC insulation and PVC sheath to BS 7655 all in accordance with BS 6004/BS 6346 (as appropriate).
5. All cables shall be 450/750 volt rated and no cable less than 1.5 sq. mm in cross section shall be used without the permission in writing of the Engineer.

6. Only insulated cables shall be installed in conduit and/or trunking and cabling for different services shall not be installed in the same conduit without the permission in writing of the Engineer.

7. Joints on cables in trunking shall not be permitted. The cables of different circuits run in trunking shall be taped together at not greater than 3 metre centres.

8. Cables in excess of 10 sq. mm cross sectional area shall not be installed in trunking with smaller cables. In addition MICS LSF or armoured cables shall not be installed in trunking with other cables.

LSZH Cabling:

All final sub-circuit cables for lighting, power, etc., shall be single core low smoke and zero halogen (LSZH) insulated type, flame retardant to BS 4066, with stranded copper conductors, thermosetting insulation type E1.5 to BS 7655 all complying with BS 7211.

All cabling shall be LSZH sheathed cable. All LSZH or LSOH cabling shall adhere to the following specifications:

Product features:

- Flame-retardant according to IEC 60332-1-2 (flame spread on a single cable)
- No flame-propagation according to IEC 60332-3-22 and IEC 60332-3-24 respectively IEC 60332-3-25 (Flame spread on vertical cable or wire bundle)
- Halogen-free according to IEC 60754-1 (amount of halogen acid gas) Corrosiveness of combustion gases according to IEC 60754-2 (degree of acidity)
- Low smoke density according to IEC 61034-2
- UL Cable Flame Test.
- All cables to be class Cca-s1, d2, a1. All cables to be CPR 2017 compliant.

References/Approvals:

- UL AWM style 21089
- Based on EN 50525-3-11

Product Make-up:

- Fine-wire strand made of bare copper wires
- Core insulation: Halogen-free
- Cores twisted in layers
- Outer sheath: Special halogen-free compound, grey (similar to RAL 7001).
- All cables to be class Cca-s1, d2, a1. All cables to be CPR 2017 compliant.

Cable Sizes

All conductors carried in conduits shall be single core LSZH cabling as specified in 'point 2' above. All cable sizes are to be a minimum of 2.5mm^2.

Conduit capacities as set down in Appendix 12 of the I.E.E. regulations latest edition are not to be exceeded. Joints in conductors between terminating points will not be permitted.

Cable sizes shall be as follows:

- *Lighting final circuits (1kW max load):* 2.5mm^2/2.5mm^2 CPC
- *Emergency light fittings:* 2.5mm^2/2.5mm^2 CPC
- *20amp radial circuits (6no sockets max):* 4.0mm^2/4.0mm^2 CPC
- *20amp radial circuits (general power):* 4.0mm^2/4.0mm^2 CPC
- *32amp radial circuits (non-cooker):* 6.0mm^2/6.0mm^2 CPC

Trunking & Tray:

Refer to Section 61.02 above.

61.07 Attendances to the gas detection system in the boilerhouse

New gas detection system in the boilerhouse and sports hall:

A new gas detection system shall be installed in the boilerhouse and sports hall and the Contractor shall allow for the wiring and electrical attendances to this new gas detection system in the boilerhouse.

The gas detection system shall consist of a solenoid valve within the boiler house, control boxes for the system, gas slam shut (1no), gas detectors (2no), carbon monoxide detector (2no) and control cabling as indicated on the drawings.

The gas detection system shall consist of a solenoid valve within sports hall, control boxes for the system, gas slam shut (1no), gas detectors (4no), and control cabling as indicated on the drawings.

A gas detection panel shall be located within the boilerhouse and sports hall and the gas slam shut valves and detectors shall be wired directly to these gas detection panels.

The Contractor shall include for the following electrical attendances to the gas detection system which shall be as follows:

- 13amp single phase fused spur outlet to the gas detection panel. Location as indicated on the drawings. Power wiring as indicated below. Refer to section 61.06 in the tender specification for the cabling. Power wiring to the spur from the existing electrical board shall be carried out in 3-core 4.0mm^2 LSZH cables. Allow for a cable length of 40metres.
- Power cabling from the gas detection panel to the gas solenoid valve. Location as indicated on the drawings. Power wiring as indicated below. Refer to section 61.06 in the tender specification for the cabling. Power wiring to the gas valve from the new gas detection panel shall be carried out in 3-core 2.5mm^2 LSZH cables.
- Control cabling between the gas solenoid valve and the gas detection panel. Location as indicated on the drawings. Control cabling shall be 4-core 1mm screened Belden type security cable.
- Control cabling between the gas detector (1no in total) at low level on the wall in the boilerhouse and the gas detection panel. Location as indicated on the drawings. Control cabling shall be 4-core 1mm screened Belden type security cable.
- Control cabling between the carbon monoxide detector (1no in total) at low level on the wall in the boilerhouse and the gas detection panel. Location as indicated on the drawings. Control cabling shall be 4-core 1mm screened Belden type security cable.
- All control and power wiring shall be installed in steel conduit. Include for all necessary cable containment.
- Wiring shall be taken from the new electrical boards in the building which are indicated on the drawings.

All items shall be located in the boilerhouse and similar in the sportshall.

Power Wiring:

Electrical power supplies to the panel and the valve shall be 230VAC 50 Hz c/w 13amp spur and shall be supplied as part of this contract. Refer to section 61.06 in the tender for information on cabling.

Control Cabling:

Control wiring shall be 4-core 1mm screened Belden type security cable from the control panel to the valve and the detectors. The equipment and wiring details shall be provided by others. See drawings for the quantities and locations of all equipment.

Fire Alarm Wiring:

The new gas detection system in the boilerhouse shall be connected and interfaced to the fire alarm system in the building as highlighted in section 61.08 below.

Allow for all necessary conduit, tray etc. and all other accessories to carry out this work.

61.08 Fire alarm works to the boilerhouse

Existing fire alarm installation in the boilerhouse:

The Contractor shall allow for retaining the existing fire alarm installation in the existing boilerhouse i.e. existing manual call point, wall mounted sounder, smoke detector, etc.

New fire alarm interface to the MCC controls panel:

The new MCC controls panel in the boilerhouse shall be connected to the existing fire alarm system for the building.

The Contractor shall allow for the supply and installation of a new fire alarm interface unit (Input/Output model) at the new MCC controls panel in the boilerhouse. The Contractor shall allow for connecting this new fire alarm interface to the new MCC controls panel.

The Contractor shall allow for the following for the supply and installation of the fire alarm interface for the new MCC controls panel:

- Supply and installation of a firetuff cable from the MCC controls panel to the nearest fire alarm loop. Allow for a cable length of 30metres.
- Supply and installation for a new fire alarm interface (I/O unit) in the boilerhouse for the MCC Controls panel.
- Allow for all necessary conduit, tray etc and all other accessories to carry out this work. Wiring shall be carried out using 2 x 2.5 sq. mm firetuff cable with red PVC covering. Refer to specification below on the fire alarm cabling.
- Allow for connecting and interfacing the I/O unit to the MCC controls panel.

Fire alarm interface to the gas detection system in the boilerhouse:

The new gas detection panel in the boilerhouse shall be connected to the existing fire alarm system for the building.

The Contractor shall allow for the supply and installation of a new fire alarm interface unit (Input/Output model) at the new gas detection panel in the boilerhouse.

The Contractor shall allow for connecting this new fire alarm interface to the new gas detection panel.

The Contractor shall allow for the following for the supply and installation of the fire alarm interface for the new gas detection panel:

- Supply and installation of a firetuff cable from the BMS controls panel to the nearest fire alarm loop. Allow for a cable length of 30metres.
- Supply and installation for a new fire alarm interface (I/O unit) in the boilerhouse for the gas detection panel.
- Allow for all necessary conduit, tray etc and all other accessories to carry out this work. Wiring shall be carried out using 2 x 2.5 sq. mm firetuff cable with red PVC covering. Refer to specification below on the fire alarm cabling.
- Allow for connecting and interfacing the I/O unit to the gas detection panel.

Fire alarm cabling:

All new cabling used for the new fire alarm devices in the boilerhouse shall meet classification 'PH120 Enhanced'.

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.

All new fire cabling shall be 2 x 2.5mm^2 'Prysmian FP Plus' fire alarm cabling (or equivalent) as specified below. Cabling shall be 2core and earth type.

The fire alarm cable shall be rated at 120mins in compliance with BS 8432-2 (flame, shock and water spray). The fire-resisting cable shall have 2-hour fire rating according to IEC 331.

All cabling shall be manufactured by a BASEC approved manufacturer. Cables shall be installed strictly in accordance with the manufacturer's requirements.

The enhanced PH120 fire alarm cabling shall satisfy the following requirements for integrated water spray and mechanical shock:

Conductor:

Plain annealed copper. Solid 2 x 2.5mm^2 to meet the requirements of BS EN 60228 class 1 or class 2.

Insulation:

High performance, damage resistant enhanced insulation to meet BS EN 50363-5, Type EI5.

Overall metallic screen and CPC:

Polyester backed laminated aluminium or copper tape bonded to outer sheath to provide overall screen. In contact with full sized, tinned annealed copper circuit protective conductor and laid-up with the cores to provide automatic screen earthing

Sheath:

Robust thermoplastic low smoke, zero halogen and reduced flame propagation outer sheath. Suitable for outdoor installation with exposure to normal daylight UV.

Sheath shall be coloured 'Red' for Fire Alarm System wiring indication.

Standards, Tests & Approvals:

- I.S. 3218:2014
- BS 8432-2 (120 minutes)
- BS EN 50200 (PH 120)
- BS 7629-1 Enhanced 120
- BS 60332-1-2
- BS EN 60754-1
- BS EN 61034-2
- BS EN 50200 PH30, PH60, PH120
- BS 8434-2 Flame, impact & water test for 'enhanced' cable
- BS 5839-1, 6, 8 & 9 'enhanced' fire resisting cable
- BS 5266-1 'enhanced' fire resisting cable
- BS 8519 'Catagory 2' control cable
- BASEC approved
- LPCB approved (specific products & fire tests only)



61.09 Decommissioning of the existing electrical installation in the boilerhouse

The Contractor shall allow for decommissioning and removing the existing controls panel and existing electrical installation to the existing plant that is to be decommissioned in the boilerhouse.

This includes decommissioning and removing the power supplies, cable containment, control cabling, etc. to the following items:

- the existing oil burner
- existing pumps
- existing pressurisation unit
- existing control valves on the pipework at the back of the boilers,

61.10 Attendances to the two-port valves and local room stats

General:

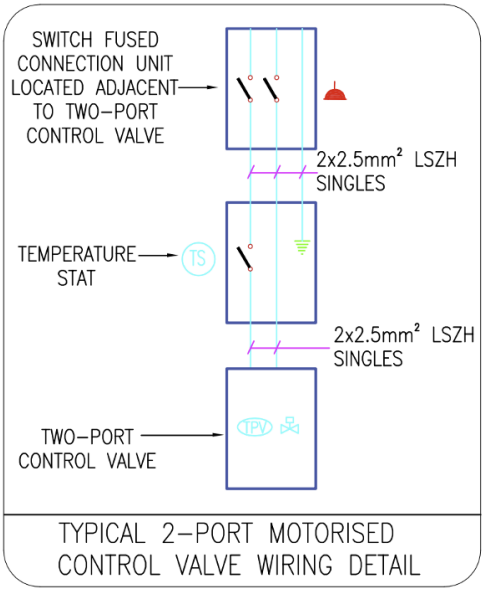
As indicated on the drawings, a number of localised two-port valves and associated temperature room stat shall be installed throughout the existing old building.

In the rooms where a two-port valve and associated temperature room stat is to be installed, these shall be installed for local room temperature control only and are not required to be wired back to the new MCC Controls panel in the boilerhouse.

The Contractor shall allow for the wiring of all two-port valves and associated wall stats in the rooms as indicated on the drawings.

The Contractor shall allow for the power supplies to all valves/thermostats and control wiring between all valves/thermostat. See drawings for the quantities and locations of all two-port valves and thermostats.

Please not that there are 5no rooms where two-port valves and thermostat arrangements shall be installed. Refer to drawings for quantities and locations.



The Contractor shall allow for taking power supplies from the existing electrical installation in the rooms for the power supply to the new two-port valve in each room. See detail for the necessary electrical attendances required to the two-port valve and thermostat in each room.

The Contractor shall include for the following electrical attendances to each two-port valve and thermostat arrangement in the 18no rooms as indicated.

- A 230V power supply via a new 13amp switched spur to be installed adjacent to the new two-port valve at high level in the room. The new spur shall be installed at approximately 3000mm high. Final location of spur to be confirmed with the installer. Refer to below for information on spur required.
- The 230volt power supply to the new 13amp switched spur shall be taken from an existing spur or socket in the room where the new spur is to be installed. Allow for a 3-core 2.5mm² LSZH cable from the new 13amp switched spur to the nearest socket or spur in the room. For tendering purposes, allow for a cable length of 15metres in each room for power supplies to the new 13amp spur.
- A 3-core 2.5mm² LSZH cable from the new 13amp switched spur to the new two-port valve at high level. For tendering purposes, allow for a cable length of 2metres in each room for cabling from the new 13amp spur to the new two-port valve. Refer to the drawings for the location of the two-port valve and thermostat in each room.
- A 3-core 2.5mm² LSZH cable from the new wall mounted thermostat to the new two-port valve at high level. The thermostat shall be located at

1350mm above finished floor level. Refer to the drawings for the location of the thermostat and the length of cabling required. For tendering purposes, allow for a cable length of 15metres in each room for the cabling from the new thermostat to the new two-port valve.

- All wiring installed from the new spur to the new two-port valve and from the new two-port valve to the new thermostat shall be installed in galvanised steel metal conduit. Include for all necessary cable containment. For tendering purposes, allow for the supply and installation of 30metres of galvanised steel metal conduit in each room. Refer to 61.02 for information on the metal conduits.
- Any other items deemed necessary for the supply and installation of the two-port valves and thermostats throughout the existing old building.

Wiring shall be by the Contractor and shall be exactly to supplier's instructions.

The Contractor shall liaise with the supplier regarding installation of equipment.

Cable containment for control items in the building:

For all the new power and control wiring required to the new motorised two-port valves, thermostats and spurs in the relevant rooms, the Contractor shall allow for installing all power and control cabling in galvanised steel metal conduit throughout. All new conduits in the building shall be surface mounted.

Refer to 61.02 for information on the cable containment required.

Power supplies to the new motorised valves:

In each of the rooms that require a new two-port valve and new thermostat installation, the Contractor shall supply and install a new 230V power supply via a new 13amp switched spur adjacent to the two-port valve at high level in the room.

The spur shall be installed at approximately 3000mm high. Final location of spur to be confirmed with the installer. Refer to below for information on spur required.

The 230volt power supply to the 13amp switched spur shall be taken from an existing spur or socket in the room where the new spur is to be installed. Allow for a 3-core 2.5mm^2 LSZH cable from the 13amp switched spur to the nearest socket or spur in the room. Refer to 61.06 for information on the cabling required.

Switched fused spur outlets:

As highlighted above, in each of the rooms that require a new two-port valve and new thermostat installation, the Contractor shall supply and install a new 230V power supply via a new 13amp switched spur adjacent to the two-port valve at high level in the room.

The Contractor shall allow for installing all power cabling for the spur in galvanised steel metal conduit throughout. All new conduits in the building shall be surface mounted. Refer to 61.02 for information on the metal conduits.

All new spur outlets shall be as manufactured by MK Albany Plus and finished in brushed stainless steel, or equivalent. All spur outlets shall adhere to the following:

- Spur outlet shall be as K961 BSS, or equivalent. All outlets shall be of brushed stainless steel finish.
- Supplied with 13amp fuse with fuse holder.
- Isolation switch shall have a neon indicator in the switch rocker to indicate that they are on.
- Surface mounting box for single switch shall be as K829 ALM, or equivalent. Mounting box to be supplied without knockouts.



Connection to all equipment shall be by fixed spur outlet, mounted in line with the equipment on the drawings. Wiring to the fused spurs shall be as highlighted below.

As per ETCI National Rules for Electrical Installations, the 230v thermostat must have a means of isolation which shall be a switched fused spur at high level above the thermostat.

Conduits:

Refer to 61.02 above.

Cabling:

Refer to section 61.06 got details on cabling required to the fused spur.



The digital meter shall have the following functions and capabilities:

- Three phases, neutral and ground to be monitored simultaneously.
- Power quality measurements.
- Data recording.
- Graphical display, menus.
- Text in 8 selectable languages.
- Highly accurate devices with global billing certifications.