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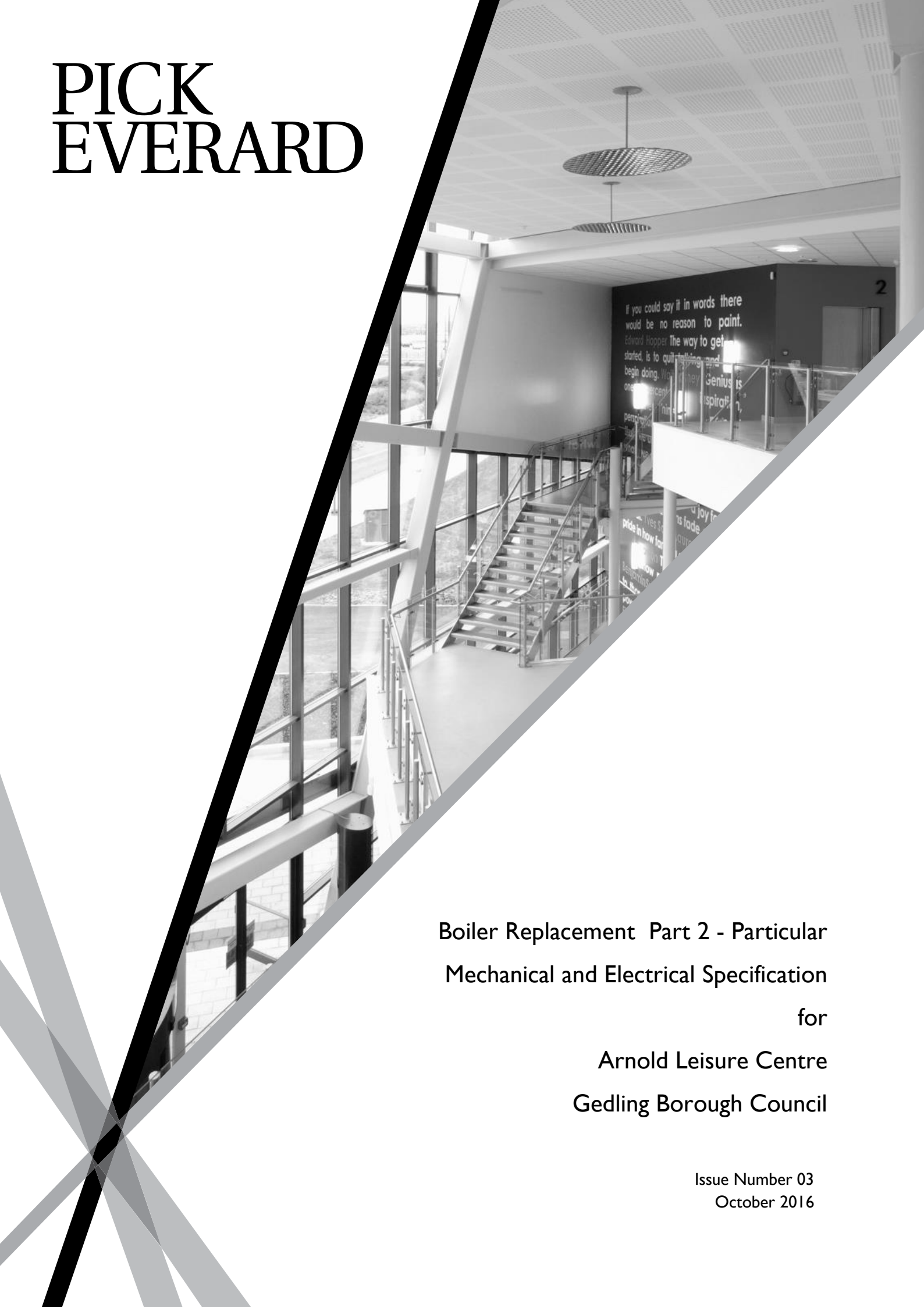

Boiler Replacement Part 2 - Particular Mechanical and Electrical Specification for Arnold Leisure Centre Gedling Borough Council

Issue Number 03
October 2016

Document History

Issue	Date	Comment	Author	Chk'd
01	30/06/2016	For Information	SR/SA	SA
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Contents

1.0 Introduction

This document contains the Particular Clauses and general information for the works and describes the mechanical and electrical services alterations required to facilitate the removal and replacement of gas fired boilers at Arnold Leisure Centre for Gedling Borough Council

1.1 Project Particulars

The project works are to supply and install new boiler plant in an existing boiler room at;

Arnold Leisure Centre
161 Front Street
Gedling
Nottinghamshire
NG5 7EE

for Gedling Borough Council. The works will require careful planning and phasing as the centre will be in use throughout the contract and heat to the building and swimming pools is to be maintained at all times.

1.2 General Scope

The scope of works envisaged will include the following but not be limited to;

- Decommissioning and draining down the existing boiler systems.
- Removal of existing boilers, CHP Unit, pumps and ancillary connections.
- Strip back heating and gas pipework connections.
- Provide new Hamworthy or equal gas fired boilers.
- Provide new pumps
- Provide new connections to heating and gas pipework.
- Provide new heat detection and gas solenoid shut off controls.
- Replace existing control links with new to existing control panel.
- Electrical works in connection.
- Builders work in connection
- Provide new gas supply pipework from meter.
- Re-fill and test new boiler and circuits.
- Provide certification and staff training.
- Provide operating manuals as part of overall health and safety file.

Unless otherwise indicated, the works shall include the preparation of installation / shop drawings, installation , setting to work, commissioning, demonstration, full client training, making good of defects during Defects Liability Period, and provision of "As installed" Drawings.

Any dimensions provided on the tender drawings or within the specification are for indication only. It shall be the Service Contractors' responsibility to provide a full set of builderswork drawings, showing all required dimensions and setting out.

The Services Contractor shall ensure that all necessary liaisons take place to ensure that locations of all services are fully coordinated.

2.0 Tender documentation

2.1 Specification

This document contains the Particular Mechanical and Electrical Services Specification for the boiler replacement and other general information associated with the Works. The complete Specification document consists of;

987-PE-XX-00-ME-0001 - Part 1 Preliminaries.
987-PE-XX-00-ME-0002 - Part 2 Particular Mechanical & Electrical Services Specification.
987-PE-XX-00-ME-0003 - Part 3 Materials & Workmanship Specification
987-PE-XX-00-ME-0004 - Part 4 Form of Tender & Tender Summary

Notwithstanding the above, this document should be read in conjunction with all other Tender documents issued by the Design team as set out in the Particulars.

The specification depending on the clauses contained within may refer either to 'Contractor', 'Services Contractor' or 'Main Contractor', in all instances relating to these works this will refer to the Mechanical and Electrical Services Contractor appointed to undertake the works.

2.2 Drawings

The drawings listed below show the works to be undertaken and form part of the contract documents;

987-PE-XX-00-DR-M-0010	- Proposed Boiler Room Strip Out
987-PE-XX-00-DR-M-0500	- Proposed Boiler Room layout
987-PE-XX-00-DR-M-0600	- Proposed Boiler Room Schematic
987-PE-XX-00-DR-ME-0800	- Existing CHP Unit Electrical Disconnection & DHWS Pump Alteration

3.0 Builders Work

The contractor shall include in his tender for undertaking all builderswork associated with the boiler replacement works including making good decoration on completion. The Contractor shall be responsible for providing all craneage, scaffolding, mobile platforms etc. necessary for the completion of the works. The builders work shall include but not be limited to the following;

- Removal of 1no 90mmH x 3685mmL x 1210mmW base under existing CHP Unit
- Removal of 2no 90mmH x 2370mmL x 1210mm bases under existing boilers
- Removal of 1no 90mmH x 1850mmL x 910mmW base under existing pressurisation unit
- Removal of 1no 90mmH x 1220mmL x 800mmW base (disused, former Library Heating Pumps)
- Installation of new concrete base 100mmH x 2000mm l x 1800mmW for new boilers
- Installation of new concrete base 100mmH x 2200mmL x 1200mmW for pressurisation unit and expansion tanks
- Making good holes through roof including roof finish

- Form new openings through roof including weather proofing as necessary to suit new installation

4.0 Asbestos

Asbestos containing materials are known to exist within the building in which the boiler plant is to be replaced. An asbestos refurbishment survey report for the boiler plantroom has been prepared by M & G Services Ltd. for Gedling Borough Council and is included as part of the tender documents. The contractor shall include in his tender for appointing an asbestos removal contractor to remove/encapsulate all asbestos containing materials likely to be disturbed as a result of these works.

The Contractor appointed to undertake the boiler replacement works shall acquaint himself with the report and shall consult with M & G Services Ltd. prior to disturbing any asbestos containing materials.

5.0 Maintaining Heat to The Building

The swimming pool will be in operation throughout the works to replace the boilers and as a result will require heat and hot water to be maintained at all times. The contractor will be required to phase the work in order that one boiler and one DHWS calorifier is kept operational at all times.

As part of his tender submission the Contractor shall submit an outline programme for the works indicating the phased changeover of the boilers and calorifiers highlighting any periods when maintaining heat could be a problem.

6.0 Removal of Existing Boiler(s), CHP Unit & Ancillary Equipment

6.1 LTHW Boiler Installation

Drain down the heating system locally to the plantroom, following sample checks on the water treatment to establish a safe method of drainage and disposal.

The Contractor shall then carefully decommission the existing 2no Hamworthy Wessex County 400 boilers, disconnect the flue spigots, carefully isolate and remove the gas pipework connection and cut back flow and return connections to a suitable point with new isolation valves and capped ends. The boilers shall then be stripped out and removed from site including all ancillary connections.

6.2 CHP Unit

An existing CHP unit is located within the plantroom and was decommissioned in 2012. The contractor shall allow in his tender for the disconnection and removal from site for all components associated with the CHP unit. This shall include but not be limited to the following:

- Power cable - isolate, disconnect and strip out cable back to suitable location for re-use
- Dedicated phone line - disconnect and strip out back to suitable position
- Gas supply - isolate, disconnect and strip out to suitable location the existing 50mm gas supply

- Secondary heating pipework - disconnect and strip out back to suitable position on site and make good pipework to remain
- Exhaust Pipe - disconnect and remove exhaust pipe including primary and secondary attenuators
- Ductwork - disconnect and remove enclosure ventilation ductwork including attenuators
- Decommissioned CHP unit to be disposed of from site

6.3 Pumps

Isolate power supplies to 2no HWS primary pumps, and 2 no Pool heating pumps and strip out wiring back to wall mounted isolators. Disconnect pipework, remove pumps and dispose of from site. Strip out to be phased in order to maintain hot water services and pool heating at all times.

6.4 Gas Supply

The Contractor shall purge and carefully decommission the existing gas supply feeds to the boilers and CHP Unit. The existing 65mm gas shall be stripped out back to the meter as the meter is no longer required will be disconnected and removed by the Utility supplier. The 100mm gas shall be stripped back to a suitable location at high level for re-connection to the new boilers as detailed elsewhere in this specification.

Prior to disturbing any existing gas installation the Contractor shall undertake strength and tightness testing on the Gedling Borough Council owned natural gas distribution pipe work from the outlet of the meter in accordance with National Grid requirements as well as IGE/UP/1A.

As part of this work the Contractor shall determine the gas pressure available at the discharge from the meter in each instance. Any meter having a discharge pressure less than 21mbar shall be referred to the Engineer who will refer the matter to the client's utility supplier for rectification.

If the tightness test fails the Contractor shall refer the matter to the Engineer for instruction and shall not proceed any further with the gas works until repairs have been undertaken and a satisfactory tightness test achieved.

6.5 Flue Removal

The Contractor shall allow for stripping out the boiler flue connections, and flue pipes rising though the plantroom roof, and remove from site, providing temporary weathering to any openings in the building fabric.

All existing bracketry and supports associated with the flues shall also be stripped out and removed.

6.6 LTHW Pipework

The existing flow and return pipework, currently installed at the rear of the existing boilers, shall be removed along with the insulation and bracketry to a suitable point as generally indicated on the tender drawings.

New isolation valves shall be provided at this point and the pipework shall be temporarily capped/plugged to protect the system from ingress of foreign contaminants.

6.7 Pressurisation Unit and Expansion Vessels

Isolate and disconnect the power supply, mains water and fill pipework to the existing pressurisation unit and expansion vessels and remove back to a suitable point as generally indicated on the tender drawings. Dispose of the pressurisation unit and expansion vessels from site.

6.8 Power & Controls

The existing control panel and BMS outstation were installed in 2015 and are to be retained and modified to serve the new boiler installation. Existing controls and power wiring, including containment, shall be retained as far as is practicable to serve the new installation.

Where existing control and power wiring is not suitable for the new installation or where additional equipment is being installed and new supplies are required the Contractor shall include in his tender for installing new power and control wiring including suitably rated isolators and containment.

The existing CHP unit feeds into the existing main LV panel located in the basement Electrical room via a 200A isolator unit. The existing main LV panel supplies the leisure Centre and the boiler room. Although the main LV panel is old it is still in working order and it is intended to retain the main LV panel.

As part of the de-commissioning and removal of the existing CHP unit the Contractor shall isolate and make safe any electrical connections associated. All cables should be clearly identified as live etc. and appropriate Risk assessments and method statements completed for the works.

7.0 New Boiler Installation

7.1 Boilers

The Contractor shall supply and install 2 No Hamworthy Wessex ModuMax Mk3 condensing boilers model 196/392V or equal each rated at 383.2kW nominal output and having the following features;

- Seasonal efficiency up to 95% in compliance with Building Regulations Part L 2013 and ErP 2015
- Working pressure up to 10bar
- Low NO_x performance (European Class 5 <40mg/kWh)
- Stainless steel heat exchanger
- BMS compatible
- Full modulation control with 0-10volt analogue signal
- 10 year manufacturer's warranty

Boilers are to be complete with manufacturers 2 high pipe kits with 150mm diameter headers suitable for shunt pump installation comprising;

- Isolating butterfly valves for water flow and return connections on each boiler module, with locking plates to prevent accidental isolation.
- Flow and return flexible connectors and tees.
- Drain Valves.
- Flow and return header pipe assembly
- Gas manifold (supplied loose).
- Blanking flanges, gaskets and bolts for header ends.
- Adjustable levelling feet.

Install in the return connection on each boiler module a dedicated boiler module shunt pump as detailed elsewhere to isolate flow through the module when the module is not firing. Each pump is to be wired to and controlled from the respective boiler module and is to be provided with a 5 minute overrun period. A suitable pump contactor is to be fitted between the individual boiler module and its pump.

The boilers shall be installed on a new concrete base as generally indicated on the tender drawings. The Contractor shall allow for removing the existing boiler bases and forming a new single base to suit the new boiler requirement.

Supply and fit safety relive valves to each boiler module set at 3.5bar.

Supply and fit safety relive valve to the system set at 3.5bar.

The gas boilers shall be connected to the existing constant temperature heating circuits via a new boiler primary circuit complete with low loss header.

The boilers will be arranged in a modular arrangement providing 'unison' controlled set up as described elsewhere to allow full modulation of each unit via a 0-10 volt signal from the Building Management System installed as part of the controls.

The internal time clock and remote enable circuit functions will require to be disabled when controlled from a 0-10 volt analogue signal from a BMS system.

The boiler shall be installed in accordance with the manufacturer's recommendations.

7.2 Pumps

7.2.1 Boiler Shunt Pumps Reference P1, P2, P3, & P4

Supply and install in the return to each boiler module (4no) a new shunt pump complete with isolation valves, non-return valve and pressure gauge which shall be located generally as indicated on the tender drawings.

The pumps shall be as Messrs. Grundfos or equal MAGNA3 50-180 F canned rotor pumps each having a duty of 4.3l/s @ 100kPa system resistance, and suitable for 230v/1ph/50Hz power supply.

Pumps shall be set up to give a constant flow rate with pump body incorporating inlet and outlet connections in line, to allow pump to be mounted in pipework.

Each pump shall be complete with the following;

- Full throat ball valve on the inlet and outlet
- Non return valve on the outlet side of the pump
- Suitable supports to ensure that the weight of the pump is not carried by the pipework and valves.
- A pair of suitably graduated 100mm diameter altitude gauges with isolating cocks and siphons shall be provided on the inlet and outlet of each pump.

Valves and non-return valves shall be of the pipeline size and not the pump connection size.

Pumps with connection sizes of 50mm diameter or larger shall be fitted with reinforced rubber vibration isolating connection to the suction and discharge side of the pumps. All pumps shall be provided with anti-vibration transmission mountings between the base plate inertia base and the concrete plinth / or suspension drop rods / bracketry

All adjacent pipework is to be adequately supported to prevent undue distortion of the compensators.

General Requirements for all circulators;

- Flanged to BS 4504, PN to suit system working pressure.
- Flanged to BS EN 1092-2, PN to suit system working pressure.
- Threaded to BS EN 10226.
- EUP Directive for Pumps and circulators
- Manufacturer - Grundfos Magna3 or equal and approved.

Comply with manufacturer's recommendations regarding application and installation of pumps.

- Locate pump with adequate space around it for service and maintenance.

- All circulators to be identified

7.2.2 Swimming Pool Heating Pumps P5 & P6

Supply and install 2no Pool Heating Pumps arranged for run and standby operation with auto-changeover and complete with flexible connections, isolation valves, non-return valves and pressure gauges upstream and downstream, which shall be located as generally indicated on the tender layouts. The Contractor shall allow for differential pressure fault indication to the new control panel.

The pumps shall be as Messrs. Grundfos or equivalent single stage inverter driven units set at constant speed, type TPE3 50-180S each having a duty of 7.5l/s @ 75.0kPa system resistance and suitable for 400v/3ph/50Hz power supply. Pumps shall be installed in full accordance with the manufacturer's recommendations.

The Contractor shall allow for the pumps to be installed on a purpose built concrete base complete with anti-vibration mat.

Pumps shall be standard units with pump body incorporating inlet and outlet connections in line, to allow pump to be mounted in pipework.

Each pump shall be complete with the following;

- Full throat ball valve on the inlet and outlet
- Non return valve on the outlet side of the pump
- BMS differential pressure sensor to monitor developed actual pressure in relation to BMS input signal.
- Strainer on the inlet side of the pump
- Suitable supports to ensure that the weight of the pump is not carried by the pipework and valves.
- A pair of suitably graduated 100mm diameter altitude gauges with isolating cocks and siphons shall be provided on the inlet and outlet of each pump set.

Valves and non-return valves shall be of the pipeline size and not the pump connection size.

Pumps with connection sizes of 50mm diameter or larger shall be fitted with reinforced rubber vibration isolating connection to the suction and discharge side of the pumps. All pumps shall be provided with anti-vibration transmission mountings between the base plate inertia base and the concrete plinth / or suspension drop rods / bracketry

All adjacent pipework is to be adequately supported to prevent undue distortion of the compensators.

General Requirements for all circulators;

- Flanged to BS 4504, PN to suit system working pressure.
- Flanged to BS EN 1092-2, PN to suit system working pressure.
- Threaded to BS EN 10226.
- EUP Directive for Pumps and circulators
- Manufacturer:- Grundfos TP pumps or equal and approved.

Comply with manufacturer's recommendations regarding application and installation of pumps.

- Locate pump with adequate space around it for service and maintenance.
- All circulator set to be complete with auto-air vents.
- All circulators to be identified

7.2.3 Pool Hall and Building Heating Pumps P7 & P8

Supply and install 2no Building Heating Pumps arranged for run and standby operation with auto-changeover and complete with flexible connections, isolation valves, non-return valves and pressure gauges upstream and downstream, which shall be located as generally indicated on the tender layouts. The Contractor shall allow for differential pressure fault indication to the new control panel.

The pumps shall be as Messrs. Grundfos or equivalent inverter driven units, type TPE3 50-240-S each having a duty of 9.6l/s @ 100.0kPa system resistance and suitable for 400v/3ph/50Hz power supply. Pumps shall be installed in full accordance with the manufacturer's recommendations.

Pumps shall be standard units with pump body incorporating inlet and outlet connections in line, to allow pump to be mounted in pipework.

Each pump shall be complete with the following;

- Full throat ball valve on the inlet and outlet
- Non return valve on the outlet side of the pump
- BMS differential pressure sensor to monitor developed actual pressure in relation to BMS input signal.
- Strainer on the inlet side of the pump
- Suitable supports to ensure that the weight of the pump is not carried by the pipework and valves.
- A pair of suitably graduated 100mm diameter altitude gauges with isolating cocks and siphons shall be provided on the inlet and outlet of each pump set.

Valves and non-return valves shall be of the pipeline size and not the pump connection size.

Pumps with connection sizes of 50mm diameter or larger shall be fitted with reinforced rubber vibration isolating connection to the suction and discharge side of the pumps. All pumps shall be provided with anti-vibration transmission mountings between the base plate inertia base and the concrete plinth / or suspension drop rods / bracketry

All adjacent pipework is to be adequately supported to prevent undue distortion of the compensators.

General Requirements for all circulators;

- Flanged to BS 4504, PN to suit system working pressure.
- Flanged to BS EN 1092-2, PN to suit system working pressure.
- Threaded to BS EN 10226.
- EUP Directive for Pumps and circulators
- Manufacturer:- Grundfos TP pumps or equal and approved.

Comply with manufacturer's recommendations regarding application and installation of pumps.

- Locate pump with adequate space around it for service and maintenance.
- All circulator set to be complete with auto-air vents.
- All circulators to be identified

7.2.4 HWS Primary Pumps P9 & P10

Supply and install 2no HWS Heating Primary Pumps arranged for run and standby operation with auto-changeover and complete with flexible connections, isolation valves, non-return valves and pressure gauges upstream and downstream, which shall be located as generally indicated on the tender layouts. The Contractor shall allow for differential pressure fault indication to the new control panel.

The pumps shall be as Messrs. Grundfos or equivalent constant volume units, type TP 65-90/4 series 300 each having a duty of 5.2l/s @ 52.0kPa system resistance and shall be installed in full accordance with the manufacturer's recommendations.

The Contractor shall allow for the pumps to be installed on a purpose built concrete base complete with anti-vibration mat.

Pumps shall uncontrolled standard units with pump body incorporating inlet and outlet connections in line, to allow pump to be mounted in pipework.

Each pump shall be complete with the following;

- Strainer
- Full throat ball valve on the inlet and outlet
- Non return valve on the outlet side of the pump
- BMS differential pressure sensor to monitor developed actual pressure in relation to BMS input signal.
- Strainer on the inlet side of the pump
- Suitable supports to ensure that the weight of the pump is not carried by the pipework and valves.
- A pair of suitably graduated 100mm diameter altitude gauges with isolating cocks and siphons shall be provided on the inlet and outlet of each pump set.

Valves and non-return valves shall be of the pipeline size and not the pump connection size.

Pumps with connection sizes of 50mm diameter or larger shall be fitted with reinforced rubber vibration isolating connection to the suction and discharge side of the pumps. All pumps shall be provided with anti-vibration transmission mountings between the base plate inertia base and the concrete plinth / or suspension drop rods / bracketry

All adjacent pipework is to be adequately supported to prevent undue distortion of the compensators.

General Requirements for all circulators;

- Flanged to BS 4504, PN to suit system working pressure.

- Flanged to BS EN 1092-2, PN to suit system working pressure.
- Threaded to BS EN 10226.
- EUP Directive for Pumps and circulators
- Manufacturer:- Grundfos TP pumps or equal and approved.

Comply with manufacturer's recommendations regarding application and installation of pumps.

- Locate pump with adequate space around it for service and maintenance.
- All circulator set to be complete with auto-air vents.
- All circulators to be identified

7.3 Gas

Two gas supplies currently serve the boilers. These supplies shall be altered/removed as necessary on site and connected to the new boilers.

Supply 1 is 65mm diameter and is to be removed in its entirety back to the meter and the connection to the meter blanked off. The meter is to be removed by the utility supplier.

Supply 2 is 100mm diameter and is to be altered as necessary on site to connect to both of the new boilers in the positions shown on the drawings. A new solenoid valve is to be installed in the position shown on the tender drawings complete with isolating valves for maintenance purposes. Connect to 50mm gas manifold on each boiler incorporating isolation and purge points with reduction to 32mm connection on each boiler module.

Strength and tightness testing shall be undertaken on the Arnold Leisure Centre owned natural gas distribution pipe work from the outlet of the meters to the boiler room in accordance with National Grid requirements as well as IGE/UP/1A.

The system shall be provided with sufficient test points for purging the system safely and efficiently.

Gas pipework shall be identified via the basic identification colour painted on the pipe over its whole length with marker identification tape installed in accordance with the requirements of NJUG.

An identification notice complying with Gas Safety (Installation and Use) Regulations 1998 requirements shall be displayed to provide a mimic diagram of the complete gas pipe work distribution system and isolation points. The diagram shall be encapsulated in a plastic composite material in a frame securely screwed to the wall within the meter room.

All gas systems distribution pipework shall be installed and ventilated in accordance with gas regulations and IGE documents.

Gas distribution shall be medium grade steel fully welded. Valves etc shall be screwed / flanged as appropriate. Any deviation shall be agreed with the Client's representative. Crimped fittings will generally not be accepted.

Gas pipe work shall be colour identified in accordance with the gas regulations over its full length. This shall be BS 08 C 35 for all low pressure gas pipework systems.

Sectional isolation shall be provided throughout the gas distribution network so as to allow the removal, replacement and testing of the gas network.

Isolation valves shall be of the butterfly low hysteresis type. Either side of each isolation valve gas purge points shall be installed.

General isolation valves for natural gas services shall generally be quarter turn butterfly valves (> 50mm) and ball type (<50mm) with the exception of the main site isolation valve and any other emergency isolation type valve, which shall be of the position indicator type.

7.3.1 Safety Control Requirements

Each boiler module shall be complete with a manual gas isolation valve and pressure tapping.

Purge valves and manual isolation valves shall be installed throughout the installation.

A Gas knock-off button shall be provided to the plant room adjacent to the main entrance doors together with an electro-thermal fusible links located above each boiler. An activation of either of these shall close the gas solenoid valves and shut down the boiler plant. A Safety Circuit failed and alarm lamps should be indicated on the control panel.

Encapsulated wall mounted gas schematics for the entire installation shall be installed at the gas entry point to the building, in the meter house and the entry point to the plant room.

Fire mode and manual knock-off buttons shall be hard wired and not dependent upon the function of the BMS.

Activation of the Fire alarm shall activate the gas control solenoid to shut down. Weekly testing of the fire alarms shall not activate the system.

Following a mains power failure, the plant shall start in a sequenced manner with time delays incorporated so as to limit the total surge on demand and prevent systems 'locking out'.

7.3.2 Commissioning and Testing

The gas installation shall be commissioned and tested in accordance with this specification, Gas Safe, ACOPS, IGE, BCGA Code of Practice CP4, general principles of IGEM/UP/11 Edition 2.

Commission in accordance with the General Specification section of this specification

Test and purge gas pipelines in accordance with BS 6891 and the requirements of the Gas Regulations.

The Services Contractor shall provide gas soundness documentation for the entire gas installation when complete, (and any part completion events). Handover or partial handover events shall be conditional upon provision of test documentation for gas soundness.

7.4 Boiler Flues

The Contractor shall employ the design services of a specialist flue company such as Midtherm Engineering Ltd. Staffordshire House, New Road, Netherton, Dudley, West Midlands DY2 8TA, telephone 01384 455811or equal to design, supply and install the boiler flue(s) including provision of design and working layout drawings, generally as their quotation reference 160223-H-RH dated 18th February 2016

New flues, connecting from each boiler shall be in accordance with the manufacturers recommendations and must comply with the Clean Air Act Chimney Heights Memorandum for the fuel type specified (e.g. location, height).

The Contractor shall allow for a single flue header and penetration through the roof of the plantroom, incorporating a weathering plate and shall liaise with the Engineer to ensure the weathering and flue installation is in full accordance with the requirements of the tender document and manufacturers recommendations.

The flues are to be resistant to corrosion and be compatible with the boiler manufacturer's recommendations. Concentric flues shall be considered. Flues shall terminate above roof level with a suitable cowl to prevent water penetration. Minimum flue specification to be grade 316 stainless steel liners, grade 304 stainless steel outer casing, and 25mm nominal void packed with dense mineral wool fibre. All joints are to include proprietary seals where necessary and cover/locking bands as applicable.

All flue components shall be supported independently of the boiler from masonry or other fire resistant structure, with hangers arranged to take up expansion. Provide a 15mm minimum air gap between the flue and structure and a stainless steel flashing collar where the flue passes through the structure to maintain the penetration weatherproof.

Boiler and flue shall be provided with condensate drains. Flue condensate drains shall be at flue base. Drain materials shall be suitable for acidic environment. Under no circumstances shall copper be used for the condensing boiler condensate drain.

All drains shall be trapped to prevent gases escaping and shall be discharged to a tundish in a readily visible position. All condensate drain pipes shall have a fall of at least 3° to the horizontal.

Where condensate pH values nominated by the boiler manufacturer exceed those permitted by waste water Authorities, provide a condensate neutralisation unit to adjust discharge water to Statutory Authorities requirements, with each drain pipe.

The contractor shall include in his tender for pressure testing the positive pressure flue system in accordance with IGEM/UP/10 Edition 4.

7.5 Pipework

The primary heating flow and return pipework shall be modified to enable connections to be made to the new boiler headers as generally indicated on the tender layouts.

Heating shall be distributed in heavy grade steel pipework to BS EN 10255 for pipe sizes 50mm and above with welded & flange joints and below 50mm diameter with screwed pipework and fittings, connecting to and in the same material as the existing primary circuits.

All pipework will be insulated to reduce heat losses. Foil faced phenolic foam insulation shall be included in the tender including correct labelling to BS 1710 - refer to prelims section and Materials and Workmanship sections of the tender documents.

The distribution shall follow the routes as generally indicated on the tender drawings.

The Contractor shall allow for new pipework supports including load bearing sleeves to all brackets, and shall insulate the entire new works with minimum thickness phenolic foam Kingspan Cooltherm insulation in accordance with BS5422, and labelling in accordance with BS 1710.

The Contractor shall allow for draining down and refilling, and testing and balancing of the new circuit up to and including the existing secondary circuits.

7.5.1 Air Separator

Supply and install in the primary flow from the boilers an air separator suitable for a flow rate of 17.2l/s (63.72m³/hr). Unit to have a vertical welded carbon steel body, PN16 flanged connections, internal stainless steel concentrator, and a high capacity AAV (Automatic Air Vent) with isolation valve for maintenance. Unit to be suitable for;

- Operating temperature range +110°C to -10°C
- Maximum working pressure 10 bar, tested to 16 bar minimum
- Maximum static head for optimum performance = 30m (3 bar)
- Dirt removal down to 10 microns
- Bi-directional flow

7.5.2 Air and Dirt Separator

Supply and install in the return to the boilers an air and dirt separator suitable for a flow rate of 17.2l/s (63.72m³/hr). Unit to have a vertical welded carbon steel body, PN16 flanged connections, internal stainless steel concentrator, high capacity AAV (Automatic Air Vent) with isolation valve for maintenance and a full bore flushing valve fitted to the dirt collection reservoir. Unit to be suitable for;

- Operating temperature range +110°C to -10°C
- Maximum working pressure 10 bar, tested to 16 bar minimum
- Maximum static head for optimum performance = 30m (3 bar)
- Dirt removal down to 10 microns
- Bi-directional flow
- Dirt removal without system drain down

7.5.3 Chemical Dosing Pot

Supply and install between the boiler primary flow and return pipework a chemical dosing pot suitable for an installed boiler output of 800kW and a system volume of 5000 - 9999litres. Unit to have a vertical welded carbon steel pipe body and tundish and complete with the following;

- Non-return valve to prevent backflow through the tundish
- Air bleed valve to release air as dosing pot is filled
- 1" brass ball valves for fill, drain and system isolation
- Maximum temperature +110°C
- Maximum working pressure 10 bar, tested to 16 bar minimum

7.6 Pressurisation Unit and Expansion Vessels

The Contractor shall supply and install in the position shown on the tender drawings 1no Hamworthy Chesil or equal FTE floor standing twin pump pressurisation unit with electronic controls suitable for 230v/1ph/50Hz power supply. Unit shall be preassembled within a robust powder coated steel enclosure and complete with the following features;

- 7.6 litre capacity break tank with float valve, class AF air gap and overflow
- Twin pumps
- Pump non return valves
- Plant interlock circuit
- Low water level switch in break tank
- Volt free contacts for low and high pressure alarms
- Intelligent control unit
- 16 character back-lit LCD display
- Pressure transducer
- Volt free contacts for general fault with LCD interrogation

Pressurisation unit to be complete with 2no Burstock or equal expansion vessels type PV500W, each having a capacity of 500litres and dimensions of 740mm diameter x 1475 overall height. Vessels to be suitable for a system operating pressure of 3.52 bar. Connect 1 1/4" system connection from each vessel to 1 1/2" anti-gravity loop connected to the 150mm return.

7.7 Controls

7.7.1 Controls Specialist

The existing controls and BMS installation were installed in 2015 and allowance for future alterations were included at the time. The Contractor shall include in his tender for appointing;

Schneider Electric
Smisby Road
Ashby de la Zouch
Leicestershire
LE65 2UG

Bob Rees- Account Manager

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as a specialist controls contractor to undertake the design and installation of the control modifications necessary for the boiler replacement works to be completed. The works shall be generally as their quotation QLK-1602-2714272 rev 3 dated 03/10/2016 comprising;

7.7.2 Point Schedule

Description	Panel Equipment	Field Equipment	AI	DI	AO	DO	Comments
Software Reset	Push Button						Re-use spare boiler fault I/O Channel
Fire Alarm	Fire Alarm I/L						Existing
Gas Safety Circuit	Safety Equipment	TL x 4, EM Stop, GSV					100mm
Outside Air Temp							Existing
Boiler1 Enable	1ph Supply/On &						Re-use I/O channel

	Fault						
Boiler 1 Control		0-10vdc Signal					Existing Spare I/O Channel
Boiler 1 Shunt Pump Enable		Contactor – VFC				1	New I/O Channel
Boiler 2 Enable	1ph Supply/On & Fault						Re-use I/O channel
Boiler 2 Control		0-10vdc Signal					Existing Spare I/O Channel
Boiler 2 Shunt Pump Enable		Contactor – VFC				1	New I/O Channel
Boiler 3 Enable	1ph Supply/On & Fault						Re-use I/O channel
Boiler 3 Control		0-10vdc Signal					Existing Spare I/O Channel
Boiler 3 Shunt Pump Enable		Contactor – VFC				1	New I/O Channel
Boiler 4 Enable	1ph Supply/On & Fault						Re-use I/O channel
Boiler 4 Control		0-10vdc Signal					Existing Spare I/O Channel
Boiler 4 Shunt Pump Enable		Contactor – VFC				1	New I/O Channel
Boiler Common Fault		VFC					Re-use I/O channel
Boiler Common Flow Temp		T-Immersion (SS)					Re-use I/O channel
Boiler Common Return Temp		T-Immersion (SS)					Re-use I/O channel
Pressurisation Unit Fault	1ph Supply/On & Fault						Re-use I/O channel
Pool Hall Heating Pump 1 Enable	3ph Inverter/HOA switch, On & Fault Lamps	Int. VSD					Re-use I/O channel, Remove DOL Contactor – TPE3 50-240S
Pool Hall Heating Pump 2 Enable	3ph Inverter/HOA switch, On & Fault Lamps	Int. VSD					Re-use I/O channel, Remove DOL Contactor – TPE3 50-240S
Pool Hall Heating Pump Flow Status							Re-use I/O channel via existing CT in panel
Main Pool Space Temp							Existing
Main Pool Valve							Existing
Learner Pool Space Temp							Existing
Learner Pool Valve							Existing
DHWS Calorifiers Primary Heating Pump 1 Enable	3ph Inverter/HOA switch, On & Fault Lamps	3ph Inverter (IP54)					Re-use I/O channel. Remove DOL Contactor – TP 65-90/40 300
DHWS Calorifiers Primary Heating Pump 2 Enable	3ph Inverter/HOA switch, On & Fault Lamps	3ph Inverter (IP54)					Re-use I/O channel. Remove DOL Contactor – TP 65-90/40 300
DHWS Calorifiers Pump Flow Status							Re-use I/O channel via existing CT in panel
DHWS Calorifier 1 Flow Temp							Existing
DHWS Calorifier 2 Flow Temp							Existing
DHWS Return Temp							Existing
DHWS Calorifier 1 valve							Existing
DHWS Calorifier 2 valve							Existing
DHWS Secondary Pump							Existing
Pool Pump 1 Enable	3ph Inverter/HOA switch, On & Fault Lamps	Int. VSD				1	New I/O channel – TPE3 50-180S
Pool Pump 2 Enable	3ph Inverter/HOA switch, On & Fault Lamps	Int. VSD				1	New I/O channel – TPE3 50-180S
Pool Pump Flow Status		CT Switch					Re-use Spare boiler fault I/O channel
Backwash Unit Status							Existing
	New I/O Modules						
	DO8						

7.7.3 Equipment Schedule

Equipment Description	Model Number	Quantity
Immersion Temperature Sensor	STP500-150	2
Current Transducer	3240103000	1
Fusible Thermal Links	TFL72	2
100mm Gas Solenoid Valve	GVAF100	1
Digital Output module	SXWDOC8HX10001	1

7.7.4 Inclusions

The controls contractor shall include for the following;

- Power to the boilers and shunt pumps
- Thermal fusible links above the boilers
- Modification of the control panel facia to include new Hand/Off/Auto switches for the new pool pump set
- Isolation and strip out of redundant controls wiring
- Software engineering and graphics
- Point to point commissioning of control points
- Demonstration to and training of client's staff upon practical completion
- Provision of Operation and maintenance manuals

All electrical wiring shall be installed in accordance with the 17th Edition IEE Wiring Regulations BS7671latest edition.

The Contractor shall allow for the supply and installation of additional controls and control panel which shall be interfaced with the existing controls panel.

The controls shall be designed, arranged and labelled for ease of use by non-technical staff. In order to extend a time schedule (on-off), modify time schedules or set-points or correct time setting it should not be necessary to use any tools or require any specialist knowledge.

The Services Contractor shall employ the BEMS specialist sub-contractor to;

- Provide all necessary control panels
- Provide all necessary power wiring and isolators to boilers, pumps etc.
- Provide all wiring to sensors, stats, control valves etc.
- Provide fully detailed control panel drawings.
- Provide fully detailed control sequence drawings.
- Test and commission the entire controls installation
- Provide operator training and operating and maintenance manuals.
- Provide attendances on commissioning engineers
- Provide fault/status monitoring of all plant

The existing systems are controlled via a Schneider SmartStruxure building management system. The new software, strategy and site specific graphics shall be loaded onto the BMS web based server to enable access by the client's staff from various locations.

All power and controls wiring associated with the works will be provided by the controls specialist as necessary to give a fully functional controls installation.

The controls specialist will be responsible for liaising with the contractor to determine the extent of the power wiring as necessary in order to achieve this. Due allowance should be made for this.

New power supplies shall be provided where necessary for the pumps, boilers and other ancillary equipment, which shall emanate from the control panel, and shall be wired in suitably rated fire resistant, low smoke and fume cable, mounted and securely fixed on cable tray. All cables shall be supported at regular intervals in accordance with best practice guidance.

Power supplies for the pumps, boilers and ancillary equipment shall terminate in new suitably rated rotary isolators, which are lockable in the 0 (off) position. The isolators shall be labelled with fixed traffolyte labels with the item of equipment that they are serving.

The controls specialist will be responsible for providing all cable containment required within the plant areas.

7.7.5 Safety Circuit / Fire Shutdown

A safety circuit shall be provided comprising of 1 No emergency stop push button (located in the boiler room) and 2 thermal cut outs, one over each boiler. A fire shutdown interlock will shut down all plant immediately and close the gas shut-off solenoid valves (located in the boiler room) when any one of the aforementioned is activated, in addition to the building fire alarm system. A Safety Circuit failed and alarm lamps should be indicated on the control panel.

Following a mains power failure, the plant shall start in a sequenced manner with time delays incorporated so as to limit the total surge on demand and prevent systems 'locking out'.

7.7.6 Control Strategy

Each boiler module is to be provided with a shunt pump installed in the return to the module to isolate flow when the boiler module is not firing. Individual pumps are to be wired to and controlled from their respective boiler module and shall be provided with a 5 minute pump overrun period to dissipate heat from the module after the module has ceased firing. A suitable contactor shall be fitted between the individual boiler module and its pump.

The BMS system is to provide a 0 -10 volt analogue systems to control the boilers in 'Unison' control whereby the boiler modules are brought on at their lowest rate until all modules are firing and then the modules are modulated simultaneously to higher rates to match the system load. Sequencing the boilers in this mode offers higher operating efficiencies by taking advantage of the higher part load efficiency of the boiler at lower firing rates.

7.7.7 Discrimination

Controls selected and installed shall provide the necessary discrimination and total control function, without conflict with any integral safety and/or operating controls of the system plant and equipment.

7.7.8 Safety of Equipment

All data communications equipment shall be designed, installed and commissioned in accordance with, BS EN 60950.

7.7.9 Approvals

All equipment connected to a service providers system shall meet the requirements of the service provider and BABT.

7.7.10 Electromagnetic Compatibility

All monitoring system equipment shall be compatible, and shall not adversely affect any other equipment installed in the same location. Ensure all monitoring system equipment meets the requirements of;

- BS EN 60950.
- BS EN 55022.
- BS 6667 Part 1 and BS EN 60801-2.
- BS 7671 (IEE Wiring Regulations).
- BS EN 55014

7.8 Electrical Works

The existing CHP unit feeds into the existing main LV panel located in the basement Electrical room via a 200A isolator unit. The existing main LV panel supplies the leisure Centre and the boiler room. Although the main LV panel is old it is still in working order and it is intended to retain the main LV panel. The existing 200A isolator CHP feed is in good working order and it to be retained along with the associated cabling and Capacitor.

The Contractor shall disconnect the existing power cable at both ends, make good the ends of the cable, leave the cable in situ and fix loose/hanging sections of cable out of reach in an agreed location.

7.9 Fire Alarm

The contractor shall allow in his tender for appointing a specialist fire alarm contractor to undertake the works associated with linking the boiler fire safety circuit comprising;

- 1no gas solenoid valves
- 1no emergency stop button
- 2no heat detectors mounted over the boilers

with the fire alarm system via the control panel. In the event of operation of any heat detector or the stop button the system shall shut down the control panel, close the gas solenoid valve and activate the fire alarm system.

8.0 Domestic Hot Water Service Calorifiers

8.1 Existing to be Removed

Isolate DHWS flow and return, cold feed and heating flow and return pipework, drain down and remove from site 2no existing Hoval Farrar Ltd. free standing module calorifiers Type F31 each having a rated secondary output of 2273 litres (500 gallons) at 60°C in one hour when supplied with primary heating water at 82°C flow/71°C return.

8.2 New Calorifiers

Supply and install 2no Hoval Ltd. or equal and approved free standing modul-plus calorifiers type F31each with a rated secondary output of 2400litres at 60°C in one hour when supplied with primary heating water at 80°C. Each unit is to be complete with a control panel comprising a thermometer, control thermostat and secondary limit thermostat less all electrical wiring.

Primary heating side	operating pressure - 5.0bar	test pressure - 7.5bar
Secondary HWS side	operating pressure - 6.0bar	test pressure - 12.0bar
Secondary DHWS flow	2" BSP Male	
Secondary DHWS return	1" BSP Male	
Cold feed	2" BSP Male	
Primary heating flow	50mm	
Primary heating return	50mm	

Modify existing DHWS flow and return, cold feed and heating flow and return pipework as necessary on site and connect to new calorifiers. Include in tender for wiring control thermostat and secondary limit thermostat to control system to control the domestic hot water service.

Sterilise calorifiers, test, commission and return to service. Make good thermal insulation to pipework.

8.3 DHWS Secondary Pump(s)

Carefully isolate, disconnect and remove 2no Grundos secondary hot water pumps together with all isolating valves and non-return valve from the existing 54mm DHWS flow at high level in the plantroom and retain pumps for re-use. Remove pipework reducers 54 - 28mm, valves, 28mm pipework and make good 54mm DHWS pipework including thermal insulation. The large non-return valve (54mm) removed from the DHWS flow is to be disposed of from site.

Install 1no existing secondary return pump at high level into the existing 28mm DHWS secondary return complete with new isolating valves. Alter electrical wiring as necessary on site and reconnect to pump. Test and commission the pump and return to use. Make good thermal insulation to pipework.

8.4 Pressure Reducing Valve

An existing pressure regulating valve is located at high level in the 54mm mains water service pipe feeding the existing DHWS calorifiers and is set to control the outlet pressure

to the system at 0.65bar. The contractor shall allow in his costs to reset the valve to increase the outlet pressure to 1.5bar. Install up stream of the pressure reducing valve a pressure relief safety valve set at 3bar.