



Galileo Energy Services

Unit A6, Celbridge M4 Business Park,
Maynooth Road, Celbridge, Co. Kildare.

Tel: 01-6274103
www.galileoenergy.ie

**NUNS CROSS NATIONAL SCHOOL,
ASHFORD,
CO. WICKLOW.**

ROLL NUMBER: 11649S

MECHANICAL SERVICES SPECIFICATION

VOLUME A.2.3

PARTICULAR SPECIFICATION FOR THE MECHANICAL INSTALLATION

TENDER ISSUE (T1)

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GENERAL ITEMS

Introduction

The intention of this specification and the drawings 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.

The works entails a new ASD Extension for Nuns Cross NS. The works includes for the supply and installation of new mechanical services in the new ASD Extension. Refer to the drawings for further information, layout of the building and services/works required. All works shall be in compliance with all relevant Building Regulations, Irish Standards, British Standards, CIBSE Guidelines and Good Engineering Practices.

The Mechanical Contractor shall be deemed to have carried out a site visit of the site prior to the completion of his tender and ensure that all factors, site conditions, and items are taken account and what items are necessary in order to complete the installation and to leave same in a complete working condition to the satisfaction of the Employer's Representative. No extras or variations shall be allowed for additional work that could have been ascertained by visiting the site. The Contractor shall contact the Main Contractor to arrange an appropriate appointment to visit the site during the tender period.

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 the Main Contractor 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.

The Contractor shall also review all Architects and Structural Engineers drawings to familiarise themselves with the proposed development and scope of works involved. It is the Contractor's responsibility to raise any concerns over the proposed works with the Engineer prior to commencement of works. Failure to inform the Engineer of any such concerns will be deemed that the contractor has accepted the design and scope of works to be fault free.



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This specification will set out in general terms the design drawings and data to be used by the Contractor in order to submit a tender bid for the mechanical services installation and the works associated with the installation. 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 drawings and 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, 1989.
- 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 and European Standards and Codes of Practice.

Please note that 'The Contractor' in this specification refers to the Mechanical Contractor.

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

For any queries relating to this specification or related drawings, the Contractor shall contact the following:

*Mr. Robert Whyte,
Galileo Energy Services,
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Standard and code of practice

Unless specifically stated otherwise, or approved by the Engineer, installation, materials and equipment shall be in accordance with the relevant Irish, European International and British Standards and Codes of Practice and CIBSE Guidelines, whether indicated in this Specification or not.

Where stated in this document the British Standard Reference numbers shall be compatible with the I.E.C. reference numbers or vice versa.

Acts and regulations

The installation(s) shall comply with all Acts, relevant Statutory Instruments and Regulations including any special Regulations issued by the electricity, gas and/or water authorities. The tender shall be based on the Acts and Regulations current on the date for return of tenders. If these Acts and/or Regulations are amended or new Acts and/or Regulations are enacted after that date the Mechanical Contractor shall inform the Engineer immediately.

Specified equipment

The Contractor shall refer to the rear of this document for a schedule of the specified equipment on which The Company's price is based. The Tenderer may offer an alternative manufacturer, providing the equipment offered is equal in all aspects, i.e. aesthetic appearance, classification and performance.

Alternative equipment proposed to that specified shall only be accepted/installed with the expressed approval of the Engineers in writing prior to the completion of the tender documents.

Plant warranties

Where a manufacturer's warranty applies, the warranties on plant and equipment shall commence from the date of commissioning and acceptance of plant by the Engineers.

Form of tender

The Contractor will pay particular attention to the proper completion of the Form of Tender. Completion of the Form of Tender must be as per the item numbers listed and should note that any section heading may apply to one or more of the items listed in the Summary of Prices.

The Contractor shall include in his tender under additional headings if necessary, and irrespective of the items indicated for all work specified or implied by the drawings or specification.



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The tenderer shall be deemed to have full knowledge of the Specification and Drawings supplied to him and to have made himself fully acquainted with all requirements and to have obtained clarification on any matter or detail, which may be obscure to him.

Should any matter arise which in the opinion of the tenderer is obscure, he shall submit the details for clarification in writing to the Employer's Representative Engineer within 7 days of expiration of the tender period. The Employer's Representative shall circulate a reply to all Tenderers before the tender period expires.

The tender price is to be based on the works being carried out at rates of pay during working hours and under conditions of labour not less favourable than those established for the trade or industry in the district where the works are to be carried out. Any non-productive time associated with the recruitment of additional staff by the Contractor during the execution of the contract shall be deemed to be included in the tender price.

Installation and setting out of works

The Contractor shall set out the whole of the works and be responsible for the correctness of the positions, levels and dimensions of the several works. All openings, plinths, bases and holes to be cut in the structure shall be positioned and marked by the Contractor.

The tender drawings are diagrammatic only and the Contractor shall allow for a practical installation allowing for the setting around obstructions and other minor modifications which may or may not be apparent from the Architectural, Engineering, Structural, or services drawings.

The exact courses and positions of all pipes, ducts, flues, cabling, conduit, trunking etc. and other items of equipment shall be duly laid out and marked on the job by the Contractor and approved before execution as the best possible course and position, having regard to all considerations including temperature and the proximity to other services plant.

The Contractor shall make good any incorrectly set out works and shall be liable for costs of making good any work incorrectly carried out. The Contractor shall furnish all materials, labour and instruments necessary to enable the setting out to be checked.

Conflict between drawings and specifications

In the event of there being a conflict between drawings and specification, the tenderer shall obtain clarification before submitting his tender.



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Failure to do so will be deemed to imply that the most onerous requirements have been included for.

Materials and workmanship

All materials used in the works shall be fit for the use for which they are intended and for the conditions in which they are to be used in and includes materials which:

- a) Bear a CE mark in accordance with the provisions of the Construction Products Directive (89/106/EEC)
- b) Comply with an appropriate harmonized standard, European technical approval or national technical specification as defined in article 4(2) of the Construction Products Directive (89/106/EEC)
- c) Comply with an appropriate Irish Standard or Irish Agreement Board Certificate or with an alternative national technical specification of any member state of the European community, which provides in use an equivalent level of safety and suitability.

The installation shall be carried out and maintained in the best and most substantial and workmanlike manner. Workmanship shall comply with British or Irish Standards and the relevant codes of practice.

Only fully qualified and competent tradesman and helpers shall be employed on the works. Work shall not be sub-let or done by any other Contractors without the Employer's Representative permission.

No work shall be covered up prior to inspection by the Employer's Representative.

Wherever a proprietary name is used to specify a material or process it shall be deemed to have the term '**or equivalent**' appended to it.

Where a material or process is described by reference to its propriety name the name is used to indicate the standard of construction, appearance, ease of maintenance and durability acceptable to the Employer's Representative. The Employer's Representative will approve the use of alternatives where such alternatives are shown to equal or surpass the qualities of the product or process specified. Accordingly proprietary names wherever mentioned in the Specification, schedule of Rates or on the drawings shall be deemed to mean the provision of the named product or process or an approved alternative.

Notwithstanding the above no items shall be used for the works except those as specified in the contract documents except with the permission of the Employer's Representative. Any points, which differ in the contract documents to the Contractors normal practice, may receive consideration at tender stage if referred to the Employer's Representative.



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If no reference is made at tender stage it will be assumed that the Contractor will proceed exactly according to this specification.

Improper materials

The Employer's Representative shall have the power to order during the progress of the works the removal from site of any material, which in his opinion is not in accordance with this contract, the substitution of proper materials, and the removal and proper re-execution of any work, which in respect of materials and workmanship is not in accordance with the contract. This condition is not withstanding any previous tests or interim payments.

Liability for defects

Works showing defects or damage, whether caused by or as a consequence of negligence on behalf of the Contractor or not and regardless of whether the defects are discovered during the progress of the works or upon completion of the works, and regardless of whether the works have been approved or fully certified, the Contractor shall make good, at his own expense, such damage or defects discovered. On refusal to do so the Employer shall be entitled to carry out the work necessary and recover the expenses associated with such work.

Allow for maintaining the works in perfect condition for 12 months after the issue of the Employer's Representative's Certificate of Substantial Completion in accordance with the Conditions of Contract.

Conditions of building and site

The Contractor shall be responsible for making good any damage caused to the fabric or decor of the building or site by, or as a result of, his negligence or the negligence of his employees or contractors or others unnamed or otherwise. All rubble and waste shall be removed as it arises. Upon completion of the works, the site and building shall be thoroughly cleaned to the satisfaction of the Employer.

The Contractor shall pad ladders or similar equipment so that the building structure or finishes are not damaged in anyway. He shall also ensure that oil, grease or similar goods do not cause damage to the structure during the execution of the works.

Local authorities

The Contractor shall observe and comply with the requirements of all Statutes and Byelaws and serve notice on the Authorities or Owners of water, gas, electricity or any other items, which may be affected in any way by the execution of the works.



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Plant

The Contractor shall supply all necessary slings, tackles, scaffolding, haulage, instruments, materials, apparatus, tools and labour for delivery and erection of the works, and for the completion and testing of the works to the entire satisfaction of the Employer's Representative.

Loss, theft, damage and injury

The Employer or Employer's Representative shall not bear any responsibility for the loss, theft or damage of equipment or materials associated with the works either during delivery or at any time during the execution of the works. All plant, equipment, tools, workmanship and materials shall comply with the relevant safety standards. The Contractor shall bear responsibility for the safety of his employees and agents throughout the execution of the works.

Copyright

Copyright is reserved on the Consulting Engineers' documents, which include all drawings, specifications, sketches and the like. These documents may only be used in relation to the works as outlined in this contract. Photocopying of documents is not permitted without prior permission of the Consultant Engineer. Any copies of documents made during the execution of the works shall be returned to the Consulting Engineer prior to final payment

Contractors drawings

The Contractor shall prepare if requested by the Employer's Representative any working drawings necessary for proper completion of the Contract. Two copies of each drawing shall initially be submitted to the Employer's Representative and upon approval the Contractor shall provide 6 no. copies of said drawings for distribution.

Working drawings shall show the final arrangement of all items of plant and their associated connections, all control assemblies and panels, as well as the routing of all pipework and ductwork. The Contractor shall consult with all relevant parties and in the preparation of his working drawings so as to ensure there is no conflict between the Mechanical, Electrical and other services, Architectural or structural elements.

Variations, extras and omissions

No variation shall vitiate this Contract or save as hereinafter provided or give rise to any claim for compensation.



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Where an extra, variation, omission is required the Contractor shall submit a price for such variation, omission or extra to the Employer's Representative in writing within seven days of the request for such a price.

He shall not proceed with such alteration, variation or extra until such a time as he has received a Variation Order in writing from the Employer's Representative.

No payment shall be made whatsoever to the Contractor for any variation, alteration, addition or extra unless a Variation Order is produced. Variations shall be priced at the rates submitted by the Contractor with his tender where such are applicable.

Pricing

Un-priced items

Any item left un-priced shall be deemed to be included for in the tender and the cost of the item shall be deemed to be spread across and included in the rates generally.

Currency

All prices and rates shall be deemed to be denominated in Euros (€).

Electricity supply, electric wiring and equipment

All electrical equipment is to be suitable for the standard ESB supply of 400/230V @ 50hz AC.

Where starters or controls are provided with any equipment included under the mechanical services contract, they shall be handed over to the Electrical Contractor together with their wiring diagrams, for erection and commissioning by him.

Electrical sub-systems certification

All electrical subsystems shall be certified as having been carried out in compliance with the requirements of the ETCI Wiring Regulations.

Copies of the ETCI Subsystems certificates, accompanied by the relevant test results, shall be included with the ETCI Completion Certificate in the Health and Safety File for the project.

In the event of the Contractor failing to secure subsystem certificates for all items of equipment then the Contractor shall be liable for the cost of having the system tested, remedied as necessary and certified.



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The tender figure shall be deemed to include for all costs incurred by the Contractor in providing the appropriate documentation.

Proprietary names

Wherever a proprietary name is used to specify a material or process it shall be deemed to have the term '**or equivalent**' appended to it. If applicable, if the Contractor proposes an alternative material or equipment, this material or equipment shall be approved by the Employer's Representative prior the end of the tendering period.

Where a material or process is described by reference to its proprietary name, the name is used to indicate the standard of construction, appearance, ease of maintenance and durability acceptable to the Client / Employer's Representative. The Client / Employer's Representative will approve the use of alternatives where such alternatives are shown to equal or surpass the qualities of the product or process specified. Accordingly proprietary names wherever mentioned in the Specification, Schedule of Rates or on the drawings shall be deemed to mean the provision of the named product or process or an approved alternative

'Safepass' accreditation

The Contractor shall comply with the requirements of the construction industry's safety accreditation scheme, known as the 'Safepass' scheme.

Decision of the Employers Representative

The decision of the Employer's Representative on all questions relating to the execution of the works, the meaning of the Drawings and Specification, the manner of the execution of the works or the quality of the materials, the nature, quality of the works executed or what amount was included in the Contract shall be final, conclusive and binding.

Works outside the contract

The contractor should note that claims for additional works will not be entertained unless specifically requested in writing by the Employer's Representative.

Waste management

The site shall at all times be kept as clean and tidy as possible and the contractor shall be responsible for removing debris and rubbish on a regular basis. Removal of waste from site shall comply with the statutory waste management requirements



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Damage

External:

The Contractor shall note that any damage to the existing yards, main entrance, grassed areas, access roads or paved areas that may arise during construction stage of the project and caused by the construction works or by the Contractor's vehicles or staff, is to be made good by him at no extra cost to the Client.

The Contractor should provide all necessary protection to existing paved, grassed and landscaped areas around the site and shall make good any damage caused by lack of such protection at no extra cost to the Client.

The work is not to interfere in any way with the public roads. In particular, the Contractor is to ensure that these areas 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. Any damage caused to the surrounding public roadways shall be made good to the satisfaction of the Local Authority at the Contractor's expense. Any damage caused to the surrounding barracks roadways shall be made good to the satisfaction of the Client at the Contractor's expense.

Internal:

The Contractor shall note that any damage to the existing walls, windows, floor coverings, ceilings, doors, etc. that may arise during construction stage of the project and caused by the construction works or by the Contractor's plant or staff, is to be made good by him at no extra cost to the Client. Any damage caused to the internal building as listed above shall be made good to the satisfaction of the Client at the Contractor's expense.

Interpretation of this specification and drawings

This specification has been written using simple, direct language wherever possible. Imperative terms such as 'provide' and 'submit' mean that the Mechanical Contractor shall 'provide' or 'submit' the relevant samples, documentation or information. If any discrepancies exist or there is any doubt about the interpretation of the Documents, obtain clarification from the Project Manager.

Declaration of Performance/CE markings

General:

All materials, equipment and plant used in the works shall be fit for the use for which they are intended and for the conditions in which they are to be used in.



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All materials, equipment and plant shall adhere to the following:

- Shall bear a CE mark in accordance with the provisions of the Construction Products Directive (89/106/EEC)
- Shall comply with an appropriate harmonized standard, European technical approval or national technical specification as defined in article 4(2) of the Construction Products Directive (89/106/EEC)
- Shall comply with an appropriate Irish Standard or Irish Agreement Board Certificate or with an alternative national technical specification of any member state of the European community, which provides in use an equivalent level of safety and suitability.

The Contractor shall provide a Declaration of Performances (DOP's) cert for all materials, equipment and plant used in the works.

Evidence:

The Contractor shall provide evidence of Declaration of Performances(DOP's) and CE markings for all equipment, plant and material used in this project upon request by the Employers Representative.

Trade union rates and agreements

The Contractor must be in compliance with all Trade Agreements and the Contractor shall pay all employee's connected with the project to current trade union rates. If the Contractor appoints Sub-Contractor's to complete work then they too shall be compliant with current trade union agreements.

This will be monitored on site to ensure that all the Contractors employees and subsequent Sub-Contractors are in compliance with all Trade Agreements and that all are paid current union rates.

All employee's and Sub-Contractors employed by the Contractor for the duration of the works shall have their union cards on them at all times.

Timescale, working hours, payment, etc.

Refer to the Main Contractor for specific details on these requirements.



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BUILDING CONTROL REGULATIONS

General:

All works shall be carried out to the new Building Control (Amendment) Regulations (BC(A)R), S.I. 9 of 2014.

Therefore, the Contractor shall allow for the following over the following stages of the contract:

Commencement Stage:

- Familiarise themselves with the drawings, specifications and documents lodged with the Commencement Notice.
- Ensure a competent person is assigned to oversee the Construction works.

During Construction:

- Install the services and construct the building in accordance with the plans and specifications.
- Ensure that the workmanship complies with the requirements of the Building Regulations.
- Ensure that materials which they select and for which they are responsible comply with the requirements of the Building Regulations.
- Co-operate with the design team, the Assigned Certifier and other certifiers.
- Co-operate with the Assigned Certifier for the implementation of the site inspection plan.

Upon Completion:

- Sign the Certificate of Compliance (completion).
- Provide to the Assigned Certifier, such documents for which they are responsible, as may assist the Assigned Certifier to collate particulars for the purposes of handover and certification, and/or for further submissions to the Building Control Authority.
- We will require Certificate of Compliance with the Building Regulations and relevant standards and manufacturers requirements at this stage.
- Ensure the coordination and provision of all test certificates and confirmations to the satisfaction of the Assigned Certifier or other designated inspectors or certifiers providing Ancillary Certificates;



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- Maintain records.

Inspections during the Construction Process:

The Contractor shall allow the following for inspections during the Construction Phase:

- Contractor to give the Engineer at least 5 days notice to carry out a necessary inspection.
- All services that are to be hidden or concealed shall be left exposed until inspected.
- Prior to closing up services in walls, ground, attics, etc., all tests shall be completed and sign off sheets shall be signed and witness signed. Test sheet to contain the name of the tested, name of the witness, type of test, duration of test and results recorded.
- No cost variations will be accepted for time delays or opening up for inspections if these procedures are not followed.

BUILDERS WORK

General:

All Builders work associated with the execution of this Contract shall be carried out under the main contract by the Main Contractor. The Contractor shall liaise with the Main Contractor on all builders work requirements relating to their installations and shall prepare detailed builders work drawings for the Main Contractor.

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 of 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:

- 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.



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Opes through Fire Barrier Membrane:

All services through fire barriers, fire walls or floor slabs shall be sleeved either side of the fire barrier/wall/slab. All opes shall be filled in and fire proofed by the Main Contractor after services is installed and commissioned. Allow for all necessary works. Liaise with Main Contractor in ensure that all opes for services are fire-proofed.

CO-ORDINATION

The Contractor shall allow for liaising with all other trades in relation to coordination. Before any works are started on site, the Mechanical Contractor shall hold a meeting with the Electrical Contractor to co-ordinate the M&E installations in the building. The co-ordination of the electrical installations shall be the responsibility of the Electrical Contractor but the Mechanical Contractor shall allow for co-ordinating the mechanical installation with the Electrical Contractor.

The Mechanical Contractor shall provide all information necessary and on time to the Main Contractor for the proper discharge of this responsibility. The Mechanical Contractor shall agree all methods, sequences timing and all relevant details of the works within his contract with the Main Contractor in advance and shall not deviate from this agreement unless otherwise agreed in writing with the Contractor. No adjustments will be made to the mechanical 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 Mechanical Contractor shall liaise with all other trades when co-ordinating their works.

The Mechanical Contractor shall mark out opes and holes on all floor and wall surfaces as required to the satisfaction of Services Engineer, Structural Engineer and Main Contractor in sufficient time to allow the Main Contractor complete his works to programme.



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(5-) MECHANICAL WORKS

General

The Contractor shall be responsible for all mechanical works and 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. 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.

50.0 MECHANICAL SITE SERVICES

50.01 Existing underground mains water supply to the building

The existing underground mains water supply to the existing building shall be retained.

50.02 Decommissioning of the existing plastic oil tank and associated oil pipework

Existing oil tank:

The Contractor shall allow for decommissioning and removing the existing external plastic oil tank and associated oil line that is currently in place to the school building. The oil tank is located in the same location as the new LPG Gas Tank as indicated on drawing 51(M001).

The new boilers installed in the building shall be gas boilers that shall be fed directly from LPG gas tanks.

The Contractor shall allow for the following works:

- Decommissioning and removal from site of the existing plastic oil tank that is installed for the external boiler. The approximate dimensions of the oil tank is 2000mm diameter by 3000mm high. The tank is manufactured from plastic.
- Drain and remove any oil within the existing tank. Drain and flush out oil tank prior to dismantling. Collect oil and dispose of in accordance with current waste disposal legislation. This shall be completed by a



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registered oil collection company as Rilta Environmental Ltd., or equivalent.

- Cap the existing oil line from the oil tank to the boilerhouse of the building.

50.03 New LPG gas tank compound

General:

As indicated in 50.02, the existing oil tank and oil supply line to the building shall be decommissioned and removed.

A new LPG gas tank compound shall be installed for the new LPG gas supply to the building. The new LPG gas tank compound shall be installed by the Contractor as part of these works.

New LPG gas tanks compound shall be installed for the new LPG gas supply to the building. The new LPG gas tanks compound shall cater for a one-tonne LPG gas tank. The LPG gas tank and all associated gas pipework in the LPG gas tank compound shall be completed by FloGas or equivalent.

The LPG gas tank shall be installed by Flo Gas in the gas tank compound. The Contractor shall allow for connecting the new underground LPG gas pipework to the pipework from the LPG gas tank in the LPG gas tanks compound.

Builders works required for the new LPG gas tank compound:

All builders works required for the new LPG gas tanks compound shall be completed by the Main Contractor as part of this contract.

LPG gas storage tank:

Refer to 50.04 below

Builders attendances to LPG tank installation:

A new LPG gas tank compound shall be built by the Main Contractor for the new one-tonne tanks for the gas supply to the building.

The Contractor shall allow for all builders works and builders work attendances in building the new LPG gas tank compound for the gas tank. All associated builders work for the gas tank installation shall be carried out under this contract by the Main Contractor.

The appointed Main Contractor shall be completely responsible for all builders work. A suitably qualified Building Contractor shall be employed by the Main Contractor to carry out the associated works. Due allowance for this item must



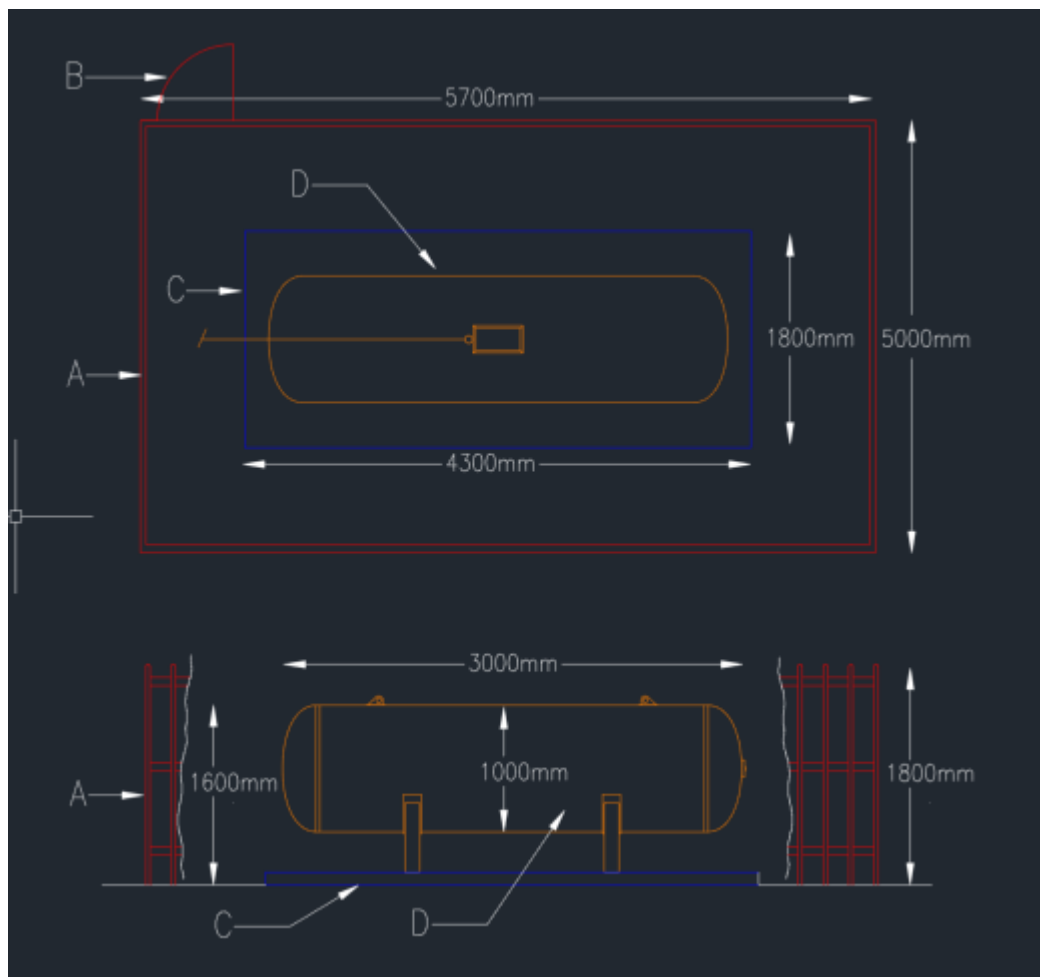
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be allowed for in the tender price. See 'Builders Work Schedule' in 'Volume C1' of this document for further information.

See detail on drawing and detail below for information on the installation of the tank.



A	The tank compound must be surrounded by a fence of minimum height of 1800mm and located 1000mm from the tank. Fence shall be 12 gauge 52mm x 52mm weld-mesh or chain link steel fence.
B	Gate to be installed in fencing for gas compound. Gate must open outwards and be non-self locking
C	Level Reinforced concrete base to a depth of 100mm on 100mm Compact Hardcore. Minimum of 100mm depth on firm subsoil with well compacted hardcore on top. Finished surface of concrete must not be below surrounding ground level. For ease of maintenance, all areas inside the fencing compound shall be concreted.
D	One Tonne LPG gas tank

The following is a list of the works required:



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Concrete base for LPG tank:

Install a concrete base for the tank. Allow for a base of 4300mm long by 1800mm wide. Base shall be a minimum of 150mm depth on firm subsoil with 200mm deep well compacted hardcore on top. Finished surface of concrete must not be below surrounding ground level.

Allow for digging the ground and installing a suitable 200mm well compacted foundation for the new concrete base for the LPG gas tank.

Allow for all works in excavating the ope in the ground, filling with suitable 200mm deep well compacted hardcore and then installing a 150mm thick plinth that is above the ground level.

The tank shall be installed in a grassed area so the Contractor shall allow for all works in installing the base in the grass area.

Fencing:

The tank compound must be surrounded by an 1800mm high industrial type palisade fence. Size as indicated on the detail above. Fencing shall be 1800mm high and shall be located 1500mm from the LPG tank as the detail above.

The minimum specification for the fencing shall be 12 gauge 52mm x 52mm x 52mm weld-mesh or chain link steel fence. The tank compound dimensions is as indicated on the drawings which is 5700mm by 5000mm.

Entrance gates in the fencing:

The Contractor shall allow for the installation of 2no entrance gates in the fencing into the LPG gas tanks compound for access into the tanks. The entrance gates shall be installed at either end as indicated on the detail above.

The Contractor shall allow for the installation of the two access gates as indicated in the detail above. The gate shall open outward and shall not be self-locking.

Separation distance:

The Contractor shall ensure that there is a 3000mm safety distance from the tank to all buildings, boundaries, property lines, trees, manholes or any other fixed sources of ignition.



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50.04 Attendances to the installation of the new LPG gas tank

As indicated in 50.03, a one-tonne LPG gas tank shall be installed in the new LPG gas tank compound to supply LPG gas to the building.

The Contractor shall allow for all attendances in dealing with Flo Gas (or equivalent) in the supply and installation of the new LPG gas tank.

The Mechanical Contractor shall be responsible for arranging for the supply of the LPG gas tank to site, which shall include the following tasks:

- On appointment, liaise with the gas tank supplier on when the gas tank will be required.
- Ensuring that the LPG gas tank compound is in compliance with their regulations in regards to separation distances, builders work, fencing, etc.
- To liaise with the tank and gas supplier in order to ensure any capital contributions due are paid in good time and so as not to delay the completion of the project.
- Sign any paperwork required and forward all of same to the gas supplier.
- Provide for all necessary liaisons and attendances to the gas supplier
- Comply with follow regulations: I.S. 820:2000 Non Domestic Gas Installations, I.S.813, Domestic Gas installations and I.S. 265, Code of Practice for the Bulk Storage of Liquified Petroleum Gas Part 1.

50.05 External underground gas pipework from the LPG gas tank compound to the boilerhouse

General:

As indicated in 50.03, a new LPG gas tank compound with a new one-tonne LPG gas tank shall be installed for the new LPG gas supply to the boilerhouse cater for the gas supply to the new gas-fired heating system for the school building.

As a result, a new underground gas supply pipe will be required from the new LPG gas tank compound to the boilerhouse as indicated on the drawings. The new underground gas pipe shall be installed in a trench which shall be excavated and dug by the Main Contractor as part of this work. Refer to drawing 51(M001) for further information and the route of the underground trench to the boilerhouse.

The underground gas pipework shall pop-up out of the ground on the external wall of the boilerhouse and shall then pop into the boilerhouse at low level as indicated on the drawings. Refer to the drawings for sizes, locations, quantities, lengths and routes of pipework required.



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The size and type of the underground gas supply pipework to the boilerhouse from the LPG gas tanks shall be 63mm MDPE (Medium density Polyethylene) pipe.

The Contractor shall allow for the supply and installation of the new underground gas pipe from the LPG gas tank compound to the boilerhouse as indicated on the drawings.

The Contractor shall also allow for all necessary builders works and trenching for the new underground gas supply. Refer to the 'Builders Work Schedule' in 'Volume C1' of this document for the trenching required.

New underground gas pipework:

The Mechanical Contractor shall allow for the supply and installation of the new underground gas pipe from the LPG gas tank compound to the boilerhouse as indicated on the drawings.

The Mechanical Contractor shall allow for a new underground 63mm MDPE gas pipework between the LPG gas tank compound and the boilerhouse as indicated on the drawings.

The Contractor shall allow for an approximate pipework length of 100metres.

Location, routes and sizes of all underground gas pipework is as indicated on the drawings. The gas installation in the building shall comply with I.S. 820:2019.

Refer to the site services drawing 51(M001) for further information. No plastic polyethylene pipe shall enter the building.



The underground gas pipework shall adhere to the following specifications:

- 63mm diameter.
- Pipework shall be medium density polyethylene (MDPE).
- PE 80 material strength.
- Certified to I.S. E.N. 1555.
- Kitemark Certified to GIS/PL2-2.
- 8.0Mpa minimum required strength.



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- Shall be suitable for natural gas and LPG gas.
- Shall be yellow in colour.
- Internal abrasion resistant.
- Stress cracking resistant.
- Not notch sensitive.
- Complies with I.S. 820:2019.
- Certificated by British Gas Transco Ltd, DVGW, and others.
- Manufactured by a BS EN ISO 9001:2008 company.
- Allow for all necessary fittings and valves etc.

Transition to the new external overground gas pipework at the boilerhouse:

The underground gas pipework (in MDPE) shall pop-up out of the ground at the boilerhouse and then then transition to external gas pipework (in steel) so that steel pipework can enter the boilerhouse as indicated on the drawings.

Therefore, as the underground gas pipework pops-up out of the ground at the boilerhouse, it shall transition to metal steel pipe which shall rise on the wall of the boilerhouse to enter the boilerhouse at low level. Refer to 51.06 for the specification on the overground external gas pipe.

Allow for all works in connecting the new 63mm MDPE underground gas pipework to the new external 50mm gun barrel steel gas pipework on the wall of the boilerhouse.

A new main isolation valve shall be installed on the new external 50mm external gun barrel steel pipework at low level externally before the gas pipework enters the boilerhouse so that the gas supply can be isolated to the boilerhouse from outside the boilerhouse.

Refer to section 54.04 for details on the gas isolation valves.

Pressure testing of underground pipework:

General:

The Mechanical Contractor shall allow for carrying out a strength and soundness test on all the new underground gas pipework installed.

A pressure test shall be carried out on the new underground gas pipework before the external trench is filled in.

The Mechanical Contractor shall confirm that the pipework has passed the test and all is satisfactory with the underground gas pipework before the trench is filled back in.



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In the event of a failure of a test, the defect shall be repaired, defective part replaced, and the pipe replaced. After rectification works have been completed, the test shall be completed.

The test shall be carried out using air, nitrogen or another inert gas. Water shall not be used as a test fluid. Oxygen or distribution fuel gas shall also not be used.

Test equipment:

The test equipment used for the test shall be capable of being read in graduations of at least 1% of the required test pressure.

- For pressures $\leq 100\text{mbar}$, a water gauge (manometer) with a millimetre scale should be used.
- For pressures $\leq 300\text{mbar}$, a mercury or High Specific Gravity manometer should be used.
- For pressures $\geq 300\text{mbar}$, a verified gauge should also be used

Test pressure:

The test pressure chosen for a strength and soundness test to be carried out on any pipework shall be a function of its intended maximum operating pressure (MOP) as indicated below. The applied test pressure shall not exceed the pressure that any component of the pipework is capable of withstanding.

Test pressure and stabilisation periods for gas pipework shall be as follows:

Maximum operating pressure (MOP)	Test pressure (for NG)	Test pressure (for LPG)	Temperature stabilisation min
greater than 2 bar and less than or equal to 5 bar	$1,40 \times \text{MOP}$	$1,40 \times \text{MOP}$	15 ^a
greater than 100 mbar and less than or equal to 2 bar	$1,75 \times \text{MOP}$	$1,75 \times \text{MOP}$	10
greater than 40 mbar and less than or equal to 100 mbar	$2,5 \times \text{MOP}$	$2,5 \times \text{MOP}$ (minimum 150 mbar)	5
less than or equal to 40 mbar	100 mbar	150 mbar	5

^a For test pressures greater than 2 bar it is necessary to condition the pipework before the test commences to allow for the elastic qualities of PE (creep).



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Maintain this pressure without pumping for at least 1 hour without any drop in pressure. Repeat test as directed until system is proven gas tight.

Comply with all supplier's requirements. Upon completion of pressure testing, each system shall be purged with its own gas.

The entire installation shall comply with I.S. 820:2019 Non-Domestic Gas Installations.

Testing and commissioning:

Once the strength and soundness test has been successfully completed, the Mechanical Contractor shall provide a declaration commissioning cert of successful completion of the test. This shall be completed by the person responsible for the test and shall include the following information:

- Date and time of test.
- Description of 'Strength and Soundness Test'.
- The diameter of pipework tested.
- The duration of the test.
- The pressure of the test.
- Type and sensitivity of the gauge used.
- Result of test.
- Confirmation that the gas pipework installation is installed in compliance with I.S. 820:2019.
- Name and signature of the competent person that completed the test.

Trenching:

All trenching required for the new gas pipework shall be completed by the Main Contractor as part of this contract.

The Main Contractor shall also allow for all necessary builders works and trenching for the new underground gas supply. Refer to the 'Builders Work Schedule' in 'Volume C1' of this document for the trenching required. Refer to the detail on drawing 51(M001) for detail on the trench required for the underground gas pipe.

50.06 External overground gas pipework

General:

As highlighted in section 50.05, a new 63mm underground MDPE gas pipe shall be supplied and installed by the Mechanical Contractor to the boilerhouse from the new LPG gas tank compound.



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The underground gas pipework (in MDPE) shall pop-up out of the ground at the boilerhouse and then then transition to external gas pipework (in steel) so that steel pipework can enter the boilerhouse as indicated on the drawings.

As indicated on the drawings,, the 63mm underground plastic MDPE gas pipework shall transition to a 50mm gun barrel steel pipe at low level on the wall of the boilerhouse. This steel pipework shall then rise on the external wall of the boilerhouse to enter the boilerhouse at low level.

Refer to the drawings for sizes, locations, quantities, lengths and routes of pipework required.

Allow for all works in connecting the new 63mm MDPE underground gas pipework to the new external 50mm gun barrel steel gas pipework on the wall of the boilerhouse.

External overground gas pipework:

As indicated on the drawings, the 63mm underground plastic MDPE gas pipework shall transition to a 50mm gun barrel steel pipe at low level on the wall of the boilerhouse. This steel pipework shall then rise to low level on the external wall of the boilerhouse to enter the boilerhouse at low level. Refer to the drawings for sizes, locations, quantities, lengths and routes of pipework required.

Allow for all works in connecting the new 63mm MDPE underground gas pipework to the new external 50mm gun barrel steel gas pipework on the wall of the boilerhouse.

Refer to 50.05 for further information on how the gas pipework enters the boilerhouse.

The Mechanical Contractor shall supply, install, test and commission all the 50mm overground external gas pipework on the wall of the boilerhouse as indicated on the drawings. Size and route of all overground external gas pipework is as indicated on the drawings.

All new external gas pipework shall be carried in mild steel. No plastic polyethylene pipe shall enter the building or be installed in the building.

All pipework must be sleeved when passing through structural walls.

All new external gas pipework shall be installed in black steel pipe Class B seamless medium gauge, Blue band to B.S. 1387 with all joints welded, steel butt welding to B.S. 1965 to match pipe.



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Fitting material shall be steel butt welding B.S. 1965 to match pipe or steel welding to B.S. 10 table E. No joints are to be installed on the pipework and all pipework shall be welded throughout to be in accordance with I.S. 820:2019.

All new external gas pipework shall have all joints welded throughout its run.

Jointing by means of threaded joints will only be tolerated where this is necessary for connection to items of plant. Where this is necessary the joint shall only be made using an approved jointing tape as PTFE as per BS 3212.

The Mechanical Contractor shall supply and install pipework, brackets and supports as required for the gas installation as indicated on the drawings.

The gas pipework installation in the building shall comply fully with I.S. 820:2019 Non-Domestic Gas Installations.

Welding:

All new external gas pipework 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.

Bracketing and supports for gas pipework

All new external gas pipework 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 the gas pipework.

Supports shall be arranged to be as near as possible to changes in direction and joints. The following are the bracket intervals for the steel gas pipework:

BORE (mm)	HORIZONTAL (m)	VERTICAL (m)
15	2.0	2.5



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20	2.5	3.0
25	2.5	3.0
32	2.7	3.0
40	3.0	3.5
50	3.0	3.5
65	3.0	3.5
80	3.0	3.5
100	3.0	3.5
125	4.0	4.0

Isolation valve:

A new main isolation valve shall be installed on the new external 50mm external gun barrel steel pipework at low level externally before the gas pipework enters the boilerhouse so that gas supply to the boilerhouse can be isolated from outside. Refer to section 54.04 for details on the gas isolation valves.

Painting of gas pipework:

All new external gas pipework installed overground 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 exterior primer to the external pipework.
- **Step 3:** Paint the external gas pipework with two coats of Yellow Gas Paint (Ochre paint) to highlight that it is 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 54.02, 54.03 and 54.04 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 54.02, 54.03 and 54.04 for information on testing and commissioning required.



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51.0 HEATING CENTRE

General:

This section covers the heating centre installation in the plantroom. Section 56.0 deals with the LPHW space heating installation throughout the building. The Contractor shall include for the supply, installation, testing and commissioning of a LPHW heating centre as shown on the drawings and described in this specification.

New pumps, BMS controls, associated fittings, other heating equipment, etc. shall be fitted in the plantroom. Care is to be taken to avoid running pipe work runs over electrical services and distribution boards.

The space heating installation is a low-pressure hot water, accelerated and sealed system. The system is designed for a flow temperature of 82 degrees C and return temperature of 71 degrees C. Heat emitters have been sized to maintain an indoor temperature of 21 degrees C in permanently occupied areas and a temperature of 18 degrees C in transit areas and stores, when the outdoor air temperature is -4 degrees C.

There shall be a new LPHW Heating Circuit to serve the New ASD Unit Extension.

The new Individual LPHW circuit for the New ASD Extension shall be served from the existing low loss flow and return header located in the plantroom. The installation shall be served by the new oil supply as shown on the drawings.

The Contractor shall include for the testing and commissioning of the new LPHW circuit serving the New ASD Extension once all works are completed. All testing must be witnessed by Employer's Representative.



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51.01 Survey of the existing installation in the boilerhouse

General:

Once appointed, the Contractor shall carry out a detailed survey of the existing plant and installation in the existing boilerhouse in the building. On this survey, the Contractor shall note the following:

- Location, model, details and sizes of the existing gas boilers, associated burners and the associated flues in the boilerhouse.
- Location, details and size of the existing heating services pipework throughout the boilerhouse.
- Location, details and sizes of the existing water services pipework throughout the boilerhouse.
- Location, details and sizes of the existing gas pipework in 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.
- Location and details of the existing MCC controls panel in the boilerhouse.
- All other installations and the general layout of the plant and pipework in the boilerhouse.

Photographic Survey:

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

51.02 Decommissioning of mechanical items in the existing boilerhouse

The Contractor shall allow for decommissioning and removing the following items in the boilerhouse of the building:

- Decommissioning, stripping out and removal from site of the large existing gas boiler in the boilerhouse.
- Decommissioning and removal from site of the existing gas burner that are currently in place for the existing gas boilers. The existing burners are a 'Riello' burner.
- Decommissioning, stripping out and removal of the existing steel flue for the boiler.
- Decommission and removal of the existing heating circulating pump for the 3no heating zones.
- Decommission and removal of all the existing heating services pipework throughout the boilerhouse.



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- Decommissioning and removal of the existing MCC controls panel.
- Decommissioning and removing of the oil supply pipework in the boilerhouse.
- Decommissioning and removing the existing expansions tank in the tank room for the heating system in the boilerhouse.
- All other items as identified on the drawings.

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 determine the exact scope of decommissioning works by visiting the site prior to submission of tenders. 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.

51.03 New gas boilers, low loss header and pre-assembled cascade header

General:

As highlighted in section 51.02 above, the existing gas boilers, pipework, plant, controls, etc. in the boilerhouse shall be decommissioned and removed.

In replacement, 2no gas condensing boilers that shall be installed in a cascade arrangement as specified below and indicated on the drawings shall be installed to provide supplementary heating to the building.

New gas condensing boilers:

The Contractor shall allow for the supply, installation and testing of a cascade boiler system consisting of 2no gas condensing boilers installed in cascade arrangement.

The 2no new gas condensing boilers shall be installed in a line on the wall on a wall mounted or free-standing frame.

The Contractor shall allow for all cascade components and all necessary items for the complete installation such as the specific boiler rack assembly, individual header connection sets, reversible supply and return headers, hydraulic separator assembly with flanged system connections and moulded insulation kit.



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

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

Boilers to be used in conjunction for a heating system that is designed for a flow temperature of 80 degrees Celsius and return temperature of 60 degrees Celsius.

The boilers shall be mounted on a pre-assembled hydraulic low loss header arrangement that shall be a pre-assembled purpose-built bespoke system for the boiler mounting that can be wheeled into place. This low loss header shall be wall or floor mounted and shall be suitable for the supplied boilers.

The Contractor shall allow for the following for the boilers and the associated cascade system:

- 2no gas condensing boilers as specified below. The boilers shall be installed in a line on the wall as indicated on the drawings/
- Suitable wall mounted or free standing floor frame for the 2no boilers in the proposed mounting arrangement.
- Main horizontal flow and return pipes for the boilers and cascade system.
- Interconnecting boiler flow and return pipes and gas supply pipes from the boilers to the headers.
- All isolating valves and safety valves.
- Pre wired and plugged boiler primary pumps – VSD type.
- High quality insulation shell for all cascade pipework.
- Cascade arrangement complete with pumps

Frame:

The 2no boilers and cascade header arrangement shall be installed on a wall mounted or free-standing frame. The frames shall consist of a combination of I-poles with an intermediate frame.

One intermediate frame is required per boiler. The top of the frame can be used as a cableway.

The nuts and bolts required are included with the delivery, along with installation instructions.



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Boiler specification & construction:

The boiler specification and construction shall be as follows:

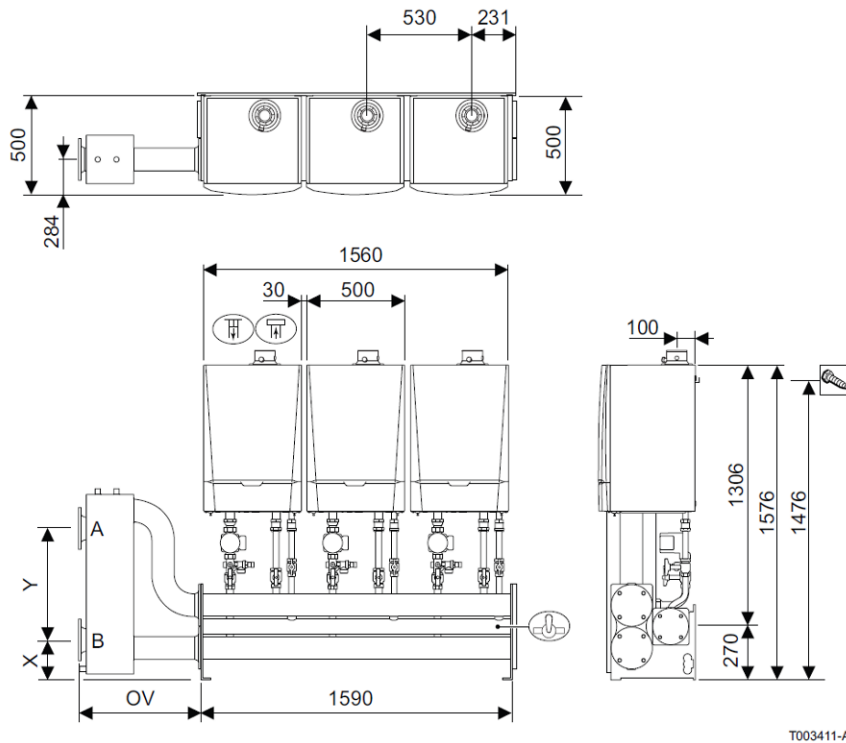
<u>Specification:</u>	Gas-fired (natural gas) condensing boiler with a rated output of 103.9kW @ 80°C/60°C temperatures.
<u>Quantity:</u>	2no
<u>Configuration:</u>	2no wall mounted gas boilers (natural gas) shall be installed in a wall mounted configuration cascade system on a pre-assembled skid. See below for information on skid.
<u>Proposed Model:</u>	Remeha Quinta Ace 115 (or equal and approved)
<u>Burner Type:</u>	Fully modulating pre-mix burner that is suitable for use with the boiler
<u>Pump:</u>	Boilers to be supplied with individual shunt pumps
<u>Control:</u>	Self-contained control panel on each boiler with output for link to BMS control Panel
<u>Type of boiler:</u>	Condensing
<u>Heat exchanger:</u>	Cast aluminium heat exchanger
<u>Fuel:</u>	Natural gas
<u>Casing:</u>	Steel
<u>Operation:</u>	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
<u>NOx Level:</u>	Low NOx less than 24mg/kWh
<u>SBEM Efficiency:</u>	SMBE seasonal efficiency GCV of 95.4%
<u>Warranty:</u>	2no years on the boiler and 7no years on the heat exchanger.

See typical arrangement below with measurements.



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T003411-A

- A** System flow; connection DN 100 / DIN 2631 (8 holes)
- B** System return; connection DN 100 / DIN 2631 (8 holes)
-  Gas supply connection DN 50 / DIN 2633 (4 holes)
-  Air inlet / Flue gas discharge concentric connection
Quinta Pro 30/45 = 80 / 125 mm
Quinta Pro 65/90/115 = 100 / 150 mm
-  Suspension points
- OV** Low loss header
DN 65 = 633 mm
- X** Distance to system return connection = 200 mm
- Y** Distance to system flow connection = 560 mm

Connection kit with pump:

For each of the 3no boilers, the Contractor shall include for a connection kit to be supplied with each boiler to connect to the pre-assembled cascade header arrangement.

The boiler connection kit consists of service shut-off valves in the flow, return and gas pipes and also include the pipes between boiler and main pipes.



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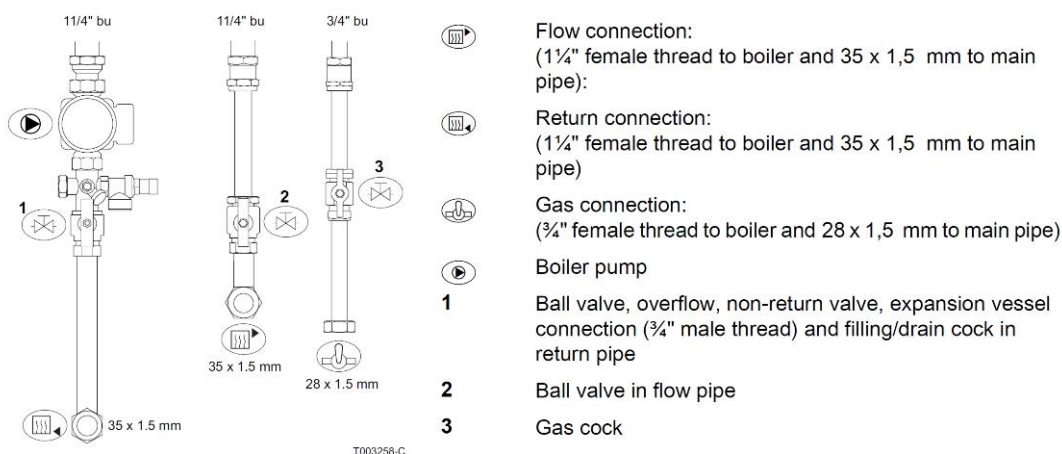
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Each kit shall comprise of the following:

- Flow connection consisting of a pipe connection with isolation valve to the boiler and pre-assembled cascade header arrangement. Refer to drawings for sizes.
- Return connection consisting of a pipe connection with isolation valve to the boiler and pre-assembled cascade header arrangement, speed-controlled high efficiency circulation pump, overflow, non-return valve, expansion vessel connection and drain cock. Refer to drawings for sizes.
- Gas connection consisting of a pipe connection with isolation valve to the boiler and pre-assembled cascade header arrangement. Refer to drawings for sizes.
- Extension module AGU2.551 for 0-10V control of a modulating pump and/or boiler capacity feedback to the building management system.
- Thermal insulation on each connection set.

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



Total output duty of cascade system

The total output and specification of the cascade system shall be as follows:

<u>Total Output:</u>	207.8kW @ 80°C/60°C temperatures.
<u>Each Boiler Output:</u>	103.9kW @ 80°C/60°C temperatures.
<u>Quantity of boilers:</u>	2no
<u>Flow:</u>	80°C
<u>Return:</u>	60°C



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Pre-assembled low loss header and accessories:

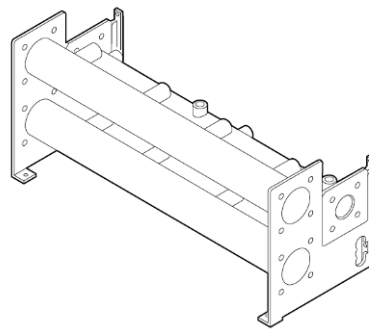
The 2no wall mounted gas boilers shall be supplied with a pre-assembled cascade header and mounting frame for the complete cascade installation of the 3no wall mounted boilers. A low loss header shall also be supplied with the system.

The boilers shall be supplied fully fitted and mounted on a pre-assembled header arrangement.

The return, flow, and gas connections of the individual boilers are connected using the fittings supplied by means of flat connections to main pipes for return, flow and gas. These pipes are welded onto a frame that rests on the floor and is fixed to the wall or to a freestanding frame.

The low loss header supplied has flange connections, which can be fitted to the left or right of the cascade main pipe as required. The blind flanges supplied are then fitted on the other side. A common PVC condensed water discharge pipe can be installed in the frame. For this purpose, holes have been made in the frame into which this pipe can be fitted sloping downwards.

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



The low loss header shall have the following specification and accessories:

- DN100 hydraulic cascade header to suit the cascade system of the 3no wall mounted boilers.
- DN100 low loss header to suit the cascade header system.
- 100mm diameter hydraulic isolation flow and return header arrangement c/w flanged PN 16 flow and return connections. Please note that due to the future installation of a heat pump installation, a 100mm diameter hydraulic isolation flow and return header arrangement shall be installed.
- Header arrangement to be insulated. Include for thermal insulation on the header arrangement.



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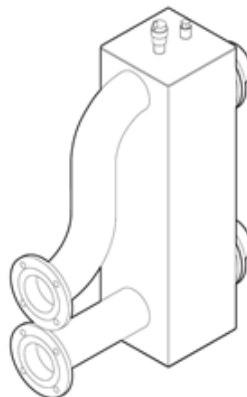
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- Self-supporting frame for the wall mounting of the header arrangement.
- Low loss header on header arrangement. Low loss header shall be supplied with brackets for wall mounting and shall be complete with thermal insulation.
- Frame manufactured from fully welded Epoxy Powder Coated 40SQ. Box Section.
- 4no boiler condensate collector pipe system for 3no boilers. The condensate header shall have the following:
 - Condensate header with tee and brackets
 - Drain hose for connecting to the drainage system
 - Connection hose for condensate drain from trap
 - Connection hose for draining the safety valve for each boiler
- Boilers c/w individual shunt pumps.
- All associated pipe work and fittings, safety valves etc. (Safety valves set at 3bar unless stated otherwise).
- Boiler connection kits.
- Flanged flow and return connections to the system.
- 1no drain valve from low loss header.

Hydraulic low loss header for the pre-assembled low loss header:

The Contractor shall allow for the supply and installation of a of a DN100 hydraulic low loss header to suit the cascade system. The hydraulic low loss header shall adhere to the following specification:

- Low loss header DN 100
- 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





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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.

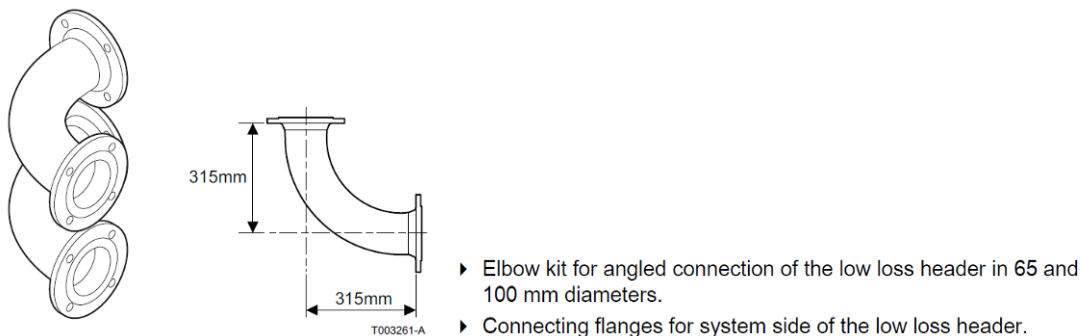
Angled connections shall be installed of one side of the pre-assembled headers for connection to the new low loss header.

Angled connections shall be installed of the other side of the pre-assembled headers for future 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 future connection of the heat pump to the heating installation.
- Allow for installing a flanged blank plate on the 2no angled connections that shall be installed on the flow and return pipework of the other side of the pre-assembled headers for future connection of the heat pump to the heating installation.

Refer to the details below for the angles connections that shall be installed.



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.



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Control Notes:

Each boiler shall be supplied with an integral controller for weather-compensated operation. However, there is a new MCC controls panel to be installed in the boilerhouse, which shall modulate the temperature output of each boiler dependant on the external temperature.

Therefore, each boiler shall be controlled through the MCC controls panel as per points below. The boiler supplier shall ensure that the boilers supplied are suitable to be controlled by the MCC controls panel as highlighted below.

- The boilers temperature shall be variable, controlled by the BMS system, dependant on the outside temperature. The boilers must be capable of receiving a temperature set point signal from the control system.
- The boiler(s) must be capable of operating permanently at flow temperatures as low as 45 °C because their temperatures will be controlled by a weather compensation routine in order to maximise system efficiency.

Site visits by boiler supplier:

The boilers 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 flues are 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 boilers once all electrical and mechanical connections are completed to the boilers. It is imperative that this site visit it co-ordinated with the BMS controls commissioning so that the boilers are being commissioned at the same time the BMS controls are.



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This is to ensure that all connections from the boilers to the BMS controls are completed to the satisfaction of the boilers Commissioning Engineer and the BMS 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 BMS controls.

- 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 51.04 below for further information.

Condensate from the boilers:

Refer to section 51.05 below for further information.

51.04 Flues

Existing flue:

The existing flue from the existing boiler shall be decommissioned and removed. 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.

New flues for the boilers:

The Contractor shall allow for a new flue from each new gas boiler (2no in total) to exit the building vertically through the existing roof of the boilerhouse as indicated on the drawings.

A flue from each boiler shall be brought out independently from each boiler vertically through the existing flat roof 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 shall be supplied by the boiler supplier and shall be compatible with the proposed boiler.



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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

A new plastic (PPs) concentric flue shall be installed for each new gas boiler as indicated on the drawings. The flue kit shall be as KT216, or equivalent. This flue kit includes the following:

- 1no vertical terminal
- 1no universal roof seal pack

The flue from each boiler shall be a 100mm/150mm diameter concentric flue that shall rise from each boiler to exit the building vertically through the existing roof of the boilerhouse to terminate externally.

All changes of direction in the flue must be limited to a maximum angle of 45°. 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 each flue with a 32mm to a drain outside the boilerhouse.

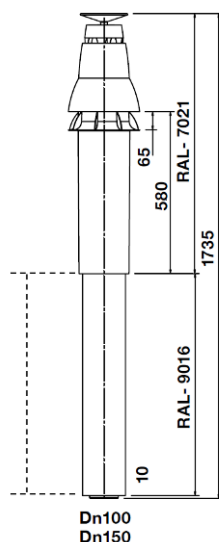
See detail below for the required flue installation and items required for the flue installation:



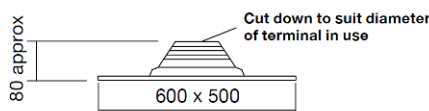
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See detail below for the roof seal pack that is supplied with the flue kit:



Allow for all necessary accessories for the flue installation for each boiler. The flue supplied for each boiler shall be suitable to the boilers listed in section 51.03 above so consult the boiler supplier before ordering the flue for each boiler.

The flue system for each boiler shall be supplied with the boilers from the boiler supplier and the Contractor shall discuss the installation of the required flue installation with the boiler supplier to ensure that all components for the correct installation of the flues is supplied and included in the tender costs.

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

The flue system for each boiler shall be a plastic (PPs) flue and shall comprise of the following for each flue (refer to detail above):

- Terminal with condensate drain on the flue.
- Boiler coding card for the flue.
- 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 flue from the boiler.
- Necessary lengths of flue pipe for the installation (measurement to be taken on site but for tendering purposes allow for 2000mm).
- Flue connection to the boiler.
- Necessary inspection pieces.
- Necessary flue inspection pieces (straight).



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- Necessary flue bends (quantity and type to be confirmed by the Contractor to the supplier).
- Necessary flue sliding couplings and fixing clamps (quantity and type to be confirmed by the Contractor to the supplier).
- Necessary flue adaptors (quantity and type to be confirmed by the Contractor to the supplier).

Soundness test:

A simple soundness test shall be carried out on each flue from each boiler 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.

Existing roof:

The existing roof of the boilerhouse is a flat concrete roof. The internal finish of the roof in the boilerhouse is a concrete roof. Externally, the flat roof cover is a torch-on felt cover.

As highlighted above, the Contractor shall allow for a new flue from each new gas boiler (3no in total) to exit the building vertically through this existing roof of the boilerhouse. As a result, the Contractor shall allow for coring this existing roof for the new flues and patching and sealing the opes once the new flues are installed. Allow for all works in sealing the roof and flues once they are installed.

51.05 Pipework, fittings, valves and accessories

Pipework:

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.



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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 Mechanical 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 throughout the building and the plantroom/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 heating services pipework.



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- 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.

Recommissioning:

The Contractor shall allow for commissioning the new LPHW heating circuit recommissioning the entire system throughout 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.



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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 $\pm 5\%$ 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.



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Strainers:

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.



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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.

The pressure gauges shall have the following features:

- 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





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Temperature Gauges:

The Contractor shall allow for the supply and installation of temperature gauges on the pipework as indicated on the drawings. 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 °C and °F
- Accuracy class 1 to BS EN 13190:2001



Systematic Valve Charts:

All valves supplied and fitted by the Contractor in the plantroom/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 plantroom/boilerhouse shall be labelled with appropriate colour identification bands, flow indication arrows and zone numbers.



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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



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80	3.0	4.0
100	3.0	4.6
125	3.7	5.5

51.06 Insulation on LPHW and water services pipework in the boilerhouse

All new LPHW (Low Pressure Hot Water) heating services flow and return pipework and all new water services pipework installed throughout the boilerhouse shall be thoroughly insulated as described below.

The Mechanical Contractor shall allow for all works in insulating the new LPHW heating pipework and water services pipework in the boilerhouse.

All new LPHW pipework and all new water services pipework installed 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 Mechanical 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.



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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:

All 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 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 Mechanical 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, in the boilerhouse and on all external pipework.

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.



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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.



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- 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 in the boilerhouse shall be provided with one coat of red oxide paintwork prior to fitting insulation.

Refer to section 51.05 above for further information.

51.07 Condensate pipework from the new boilers and flues

The Contractor shall allow for a 32mm condensate drain from each of the 2no new gas boilers and a 32mm condensate from each of the new flues as indicated on the drawings.

The condensate drain shall be connected to a 32mm 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 condensate 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 51.08 below on the condensate neutraliser.



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51.08 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.

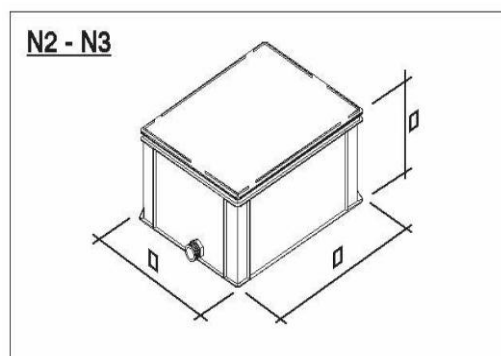
The condensate neutraliser shall increase the PH level of the condensate captured from the boilers/water heater to a value of between 6.5 and 9. Once treated in this way, the condensate can be disposed off through the normal municipal drain/sewer network.

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





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51.09 Circulating pumps

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 and P-02	Primary Pump for Boilers 1 and 2	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 51.03 for the specification on the pump.					
P-03	Heating Zone 1 GF for the building	1no	Grundfos Magna3D 32/120F (twin head) (or equivalent)	40mm Dia	-	-	230-1-50
P-04	Heating Zone 2 GF for the building	1no	Grundfos Magna3D 21/120F (twin head) (or equivalent)	40mm Dia	-	-	230-1-50



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Pump No.	Service	Qty	Pump Model	Line Dia (mm)	Flow (l/s)	Head (Mtr)	Elec Supply
P-05	Heating Zone 3 ASD GF for the building	1no	Grundfos Magna3D 32/120F (twin head) (or equivalent)	32mm Dia	-	-	230-1-50
P-06	Heating Zone 4 1F for the building	1no	Grundfos Magna3D 32/120F (twin head) (or equivalent)	32mm Dia	-	-	230-1-50
P-07	Hot water pump	1no	Grundfos Magna3D 42/120F (twin head) (or equivalent)	42mm Dia	-	-	230-1-50

Pumps shall fulfil the following criteria:

- All circulation pumps for heating zones shall be provided with built 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.



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- 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.

51.10 New pressurisation unit and expansion vessels for the heating system

New pressurisation unit:

The Contractor shall allow for the supply and installation of a new pressurisation unit in the boilerhouse for the new boilers and heating system.

The new pressurisation unit shall be as follows:

Ref	System	Number of Pumps	Static Head (m)	Maximum working pressure (m)	Model
PU-01	LPHW	2	15	20	Grundfos PHT A T180 (or equivalent).

The pressurisation unit shall have the following features:

- Twin pressurisation unit
- The pressurisation unit must be capable of serving both sides of the plate heat exchanger
- 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



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- Pressurisation unit shall be a fully packaged two 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/MCC controls 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



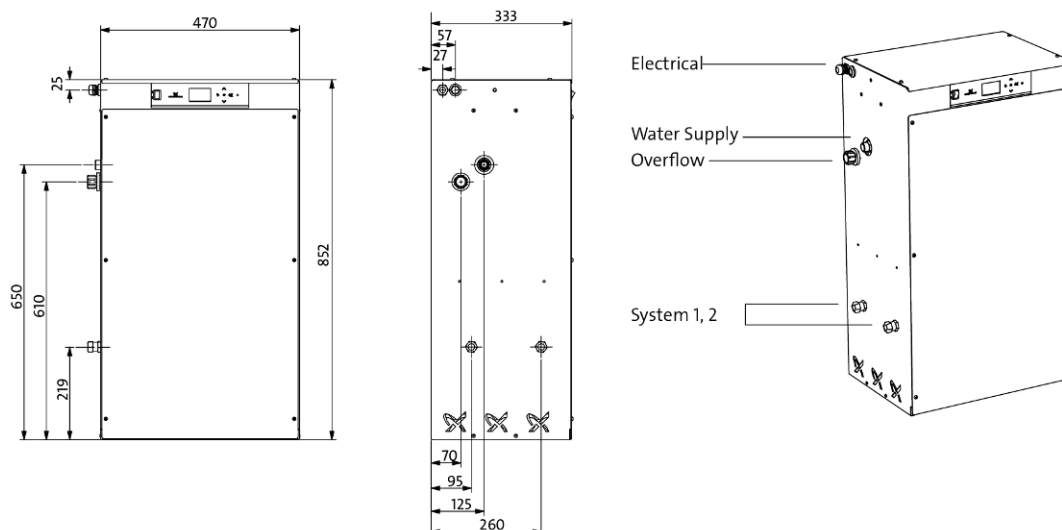
See below for dimensions and connections.



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Expansion vessels for the secondary side of the heat exchanger:

Two new expansion vessels shall be installed in the boilerhouse for the secondary side of the heating system and shall be installed on the secondary side of the heat exchanger. The Contractor shall supply and install the following expansion vessels for the secondary side of the heating system:

Ref	Qty	System	Volume (litres)	Maximum working pressure (bar)	Connection	Model
EV-01	1no	LPHW	100 litres	10	22mm	GT-HR-100 PN3 R1V (or equivalent).

Each vessel shall have the following features:

- Each vessel comprises a high strength carbon steel shell.
- Each vessel shall have a non- replaceable SBR rubber diaphragm and liquid compartment with a polypropylene liner (PP).
- Each vessel fitted according to DIN EN 13831. Approval according to Pressure Equipment Directive 2014/68/EC.
- Dimensions of each vessel is 740mm diameter by 1102mm high.
- Weight when empty 60kg.
- 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



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- CE compliant and WRAS approved.

Expansion vessel for the primary side of the heat exchanger:

A new expansion vessel shall be installed in the boilerhouse for the primary side of the heating system and shall be installed on the primary side of the heat exchanger. The Contractor shall supply and install the following expansion vessel for the heating system:

Ref	Qty	System	Volume (litres)	Maximum working pressure (bar)	Connection	Model
EV-02	1no	LPHW	50 litres	10	22mm	GT-HR-50 PN6 R3/V (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 480mm diameter by 670mm high.
- Weight when empty 21kg.
- 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 existing mains water pipework to the new pressurisation unit:

There is an existing 28mm mains water services pipework in the boilerhouse and the Contractor shall allow for taking a 22mm mains water connection of this existing mains water pipework in the boilerhouse and extending this to connect to the new pressurisation unit.

All existing mains water services pipework in the boilerhouse is copper and all new water services pipework to be installed in the boilerhouse shall be copper.



Refer to section 53.02 for further information.

51.11 Dosing pot

The Mechanical 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 +82°C
- Min operating temperature is +1°C
- Designed to PD 5500:2009 category 3
- CE marked
- Dimensions of unit is 670mm high by 225mm wide by 225mm diameter.





51.12 Plate heat exchanger

General:

The Contractor shall allow for the supply and installation of a stainless steel plate exchanger on the heating system in the boilerhouse to hydraulically separate the primary heating side (new boiler plant) from the existing secondary heating side (heating system and heating circuits in the building).

The plate heat exchanger shall be as follows:

- Model: Cipriani SE#0300+067M95PNPV0AA11 (or equivalent). Supplier to confirm exact number of plates and size of heat exchanger required.
- Output: Plate exchanger shall be suitable to supply 120kW at 80°C/60°C temperatures.
- Type: Gasket type stainless steel
- Material: Plate Material must be made from AISI 316L with a minimum thickness of 0.4mm
- Frame Material: Carbon steel
- Plates (material/thickness): AISI 326L (EN 1.4404) / 0.4mm
- Gaskets (material/type): NBR / Glue-free Plug-in design
- Connections size: DN80 (80mm)
- Connections type: Studded ports EN
- Connections material: Rubber lining
- Number of passes: 1
- Relative direction of fluids: Counter current
- Primary F&R Temp: 80°C/60°C
- Secondary F&R Temp: 75°C/55°C
- Max number of plates: 101
- Insulation jacket: Insulation jacket to be supplied with the unit.
- Frame: Frame to be supplied with the unit. Frame shall be in mild steel and shall be epoxy painted.
- Max. operating pressure: 15 bar.
- Max pressure drop: 4.3kPa
- Flow rates: 5.22 litres/sec
- Design standard: WRAS, ACS, OHSAS 18001
- Dimensions: 1124mm high x 933mm long x 509mm wide
- Weight (empty/operating): 354kg/405kg



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Connections to the plate heat exchanger:

The connections on the new plate heat exchanger shall be studded 80mm flanges so allow for flanged connections to the new plate heat exchanger.



Connection of the new plate heat exchanger to the new boilers and new headers:

The new plate heat exchanger shall be connected to the new boilers cascade system header arrangement for the boilers and also the new flow and return headers in the boilerhouse.

Refer to the drawings for sizes, locations, quantities, lengths and routes of pipework required.

The Contractor shall allow for all works in supplying and installing the new plate heat exchanger and connecting the new plate heat exchanger to the new boilers cascade system header arrangement for the boilers and also the new flow and return headers in the boilerhouse.

All new pipework shall be installed in gun-barrel steel.

The new plate heat exchanger shall have all connections flanged so all allow for all necessary pipework, flanges, labour, materials, etc. in connecting the new plate heat exchanger to the new pipework as indicated on the drawings.

Lifting of plate exchanger into place:

The weight of the new plate heat exchanger is 354kg and the dimensions of the plate heat exchanger is 1124mm high x 933mm long x 509mm wide. The



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Contractor shall allow for all necessary resources, equipment, labour, etc. in installing the plate exchanger in place.

51.13 BMS Controls

51.13.01 General

A new BMS controls panel and system in the Heating Centre shall be installed and commissioned.

The Mechanical Contractor shall be completely responsible for the supply, installation, testing and commissioning of a new independent Building Management Controls System for the mechanical plant in the building which shall provide a means of controlling and indicating the performance of the mechanical systems within set criteria.

The new building management system (BMS) 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.



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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 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 / BMS Vendors summary scope shall include:

- MCC-01. Form 2B located in the existing Heating Centre.
 - Provision of integrated differential pressure control valves.
 - BMS 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 BMS cables in the field.
 - Termination of BMS cables at the BMS panel.
 - Generation of Sequence of Operations (SOO) document.
 - Detailed documentation.
 - 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).
 - Operation & Maintenance Manuals

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.



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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 Mechanical 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.

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 mechanical 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 school building within selected rooms as indicated. Control cabling shall be housed in steel conduits throughout including routes to temperature sensors throughout the school building and sports hall. 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.



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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 Mechanical Contractor shall ensure his tender figure includes fully for complete testing and commissioning by the controls specialist.

The Mechanical Contractor shall provide certification from the supplier to the Employer's Representative certifying that commissioning has been carried out. The Mechanical 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 three occasions following substantial completion to carry out 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 3no 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.

51.13.02 Control Functions

Control Functions

The BMS controls for the building shall be controlled by 3no different interfaces which are as follows:

1. The primary user interface shall be through the use of a client supplied computer that is connected to the user's communications network. The building management system will be connected to the client's communication network and shall offer to the network a web based user interface that can be opened in any of the following web browsers: Internet Explorer, Firefox, Google Chrome. The computer in question shall be the School Principals computer.
2. Secondly, in addition to the web based user interface a digital touchscreen keypad mounted interface shall be provided offering the client full control over the building management system. This keypad shall be mounted on the front of the BMS control panel and shall be a digital touchscreen panel as Cylon SiteGuide V2.2, or equivalent.



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The touchscreen shall adhere to the following:

- 7"(800mm x 450mm) colour screen
 - Touchscreen
 - 512 MB RAM
 - 256 MB ROM
 - USB host
 - USB Client.
3. The third form of user interface shall be run-on push buttons for each heating zones which shall be located as indicated on the drawings. These buttons shall allow the heating system within each zone to be instantly turned on for a fixed, timed period for that heating zone. See description of push buttons below for further information.

Heating

The space heating installation is a low-pressure hot water, accelerated and sealed system. The system is designed for a flow temperature of 82 degrees Celsius and return temperature of 71 degrees Celsius. Control of heat emitter output shall be by weather compensation.

Each circuit's 3-port motorised mixing valve 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 3-ports flow water temperature in proportion to the external air temperature. Other features include 2- 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 schedules:

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, through the modulation of the 3-port mixing valves. The controls system must send a signal in an appropriate format to the mixing valves in order to instruct the valves to change their temperature as the external temperature changes.

- Frost Protection:



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

- Zone Control:

Separate time schedules shall be provided for each of the LPHW circuits 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 3no LPHW circuits for the building.

- 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 boilers shall be controlled as follows:

- Heat Dissipation:

When the boiler is not in use, its associated pump shall turn off after a five minute run on period.

- 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.

Water Heating

Hot water shall be supplied from an LPHW hot water heater. The hot water heater shall be enabled by a seven day time schedule and during the hot water time schedule the associated two-port valve shall open and the pump shall run. Once the temperature of the hot water has been reached, the pump for this zone shall turn off and the two-port valve shall close.

Room Temperature Controls

The existing room temperature controls within the existing school building shall be retained.



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Control Display Keypad

A digital touchscreen control display screen for the Building Management System (BMS) shall be mounted on the front of the BMS controls panel in the boilerhouse.

This wall mounted touchscreen will allow the controller to view and change all items relating to the Building Management 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 on the front of the BMS control panel 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 Buttons

Run-on timers (out-off-hours push buttons) shall be installed for each heating zone that will give the Client control over the timing of each heating zones for the Building. Each button shall be clearly labelled, showing the area served.

There shall be one number push button installed for each zone as indicated on the drawings. Each Run-On controller/push buttons for each heating zone 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.

The button installed must allow the operator to cancel the decision made, forcing the system to return to its automatic control mode.

If one of the circuits is called on by this method then the boiler, pumps, and associated zone valves 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.



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BMS Outstation Panel

The main BMS 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 BMS 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.
- Integral digital touchscreen unit on the front of the main BMS panel as Cylon SiteGuide V2.2, or equivalent. This panel shall allow the user full control over the BMS system.
- Interface to the remote run-on push buttons.
- Interface to the Buildings IT network

See drawing 51(M001) for a Controls Schematic which highlights what items are required.

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.

51.13.02 Monitoring

For the purpose of gathering information on the buildings performance the following secondary check meters shall be interfaced to the Buildings Management System for Monitoring:

- Mains water usage for the building (secondary water meter shall be installed on the incoming mains water line entering the building as per the mechanical schematic).
- Electrical usage for the building (secondary electricity meter shall be installed in the main electrical board which shall be linked back to the BMS controls panel).
- Gas usage for the building (secondary gas meter shall be installed on the incoming gas line entering the building as per the mechanical schematic).



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Notes for internal Water Meters:

- Water meters shall be supplied by Sontay, Siemens or equivalent.
- Water meter type to be ultrasonic and shall be complete with modbus interface or other interface to allow connection to the BMS provided
- Meters shall pass to the BMS the actual reading on the meter and not just pulses.
- The meters shall be accurate over the full range shown above
- The meters shall be accurate to within 0.05 l/s the total pressure drop through the meter shall be no more than 5kPa at the maximum flow.

Notes for internal Gas Meters:

- Gas meters shall be supplied by Sontay, Siemens or equivalent.
- Gas meter type shall be complete with modbus interface or other interface to allow connection to the BMS provided
- Meters shall pass to the BMS the actual reading on the meter and not just pulses.
- The meters shall be accurate over the full range shown above
- The meters shall be accurate to within 0.2m³/hr while of the maximum flow.

51.13.03 Information Distribution

Web Server:

The control system shall be provided with a web server that is capable of connecting to the Buildings I.T. network via a Cat 6A connection.

This web server shall have an IP address and detail the necessary monitoring information as detailed above. In addition to the provision of the above points as information, the web server must be capable of receiving instructions to control the system with the same functions as the face mounted panel on the MCC, but shall also provide full system display, and warning functions. The exact format of the information offered by the web server must be agreed with the Employers Representative prior to installation.

Graphic provision:

The controls specialist must provide neat, clearly understood graphics on the Clients PC for the web based control system. Each item that the User interacts with shall be provided with clear instructions as to its function and the parameters that can be adjusted or viewed. The controls system shall offer a graphical plotting function for all system readings over no less than a three day period.



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Help Text:

The controls system should be intuitive and shall include help text for all items with which the user can interact. This help text must be written in clear English and must be easily understood by an individual with limited technical knowledge. Include, beside all schedules, a clear help text explaining how to modify the schedule values, and holiday over ride schedules, providing a clear example using screen prints as appropriate to maximise clarity.

Each user input must include help text clearly indicating its function and normal (default settings). The on screen control help text shall also draw attention to the values that appear when the sensor or setting is malfunctioning. Including default open or closed loop feedback readings.

Software backup

The controls specialist must provide a full backup copy of any software used for the control system in order to allow the end user (or their appointed controls specialist) to re-install the software in the event of a system failure.

The user must be provided with all required passwords to allow an alternative controls specialist to access or reinstall the software in the event of a future system failure.

51.14 Flush out, pressure test and corrosion inhibitor

Flush out of new pipework:

Upon completion of the installation but before fitting any pumps; all pipework 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.



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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 and the new 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.

51.15 Full system re-balance

The contractor shall carry out a full heating system re-balance on completion of the works to ensure adequate flow through each of the radiators within the existing building and new extension building.

51.16 Commissioning

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



52.0 DRAINAGE & REFUGE DISPOSAL

52.01 Soils & wastes pipework

A system of uPVC soils and wastes pipework shall be provided for under this contract for the new ASD Unit Extension Building by the Mechanical Contractor as indicated on the drawings, for the removal of water-borne soil and waste matter from all sanitary fitments and sinks. This contract includes for soils and wastes above the ground floor slab only, up to and including connection to the drain provided by others at ground level. All underground drainage by others.

All waste pop-ups/builders waste floor sockets in the building shall be provided by others. These waste pop-ups/builders waste floor sockets shall be installed in the Ground Floor slab and the Mechanical Contractor shall allow for connecting all the new waste pipework in the new ASD Unit Extension Building to these new builders sockets. The Mechanical Contractor extend all waste pipework from these waste pop-ups in the Ground Floor slab to all the sanitary ware fittings and items as indicated on the drawings. See drawings for the exact layout of the waste pipework installation in the building and the sizes of the pipework required.

All new waste services pipework to be installed in the new ASD Unit Extension Building shall be installed in uPVC. Refer to drawings for soils and waste routes and sizes.

The soils and wastes shall be designed as a single stack system. Rodding points for cleansing the soils and wastes system shall be provided throughout. Access points shall be provided at low level as indicated on the drawings all above the flood level of the lowest sanitary fitment. The Mechanical Contractor shall be responsible for including all access points required to safely clean and maintain the complete soils and wastes installation without requiring destructive intrusion into the system.

The Mechanical Contractor shall be responsible for including all access points required to safely clean and maintain the complete soils and wastes installation without requiring destructive intrusion into the system. Access points shall include access doors above flood level at each floor in all SVP's.

In the event that the Employer's Representative deems any part of the system to be provided with inadequate access for cleaning the Contractor shall fit additional cleaning doors without charge to the contract.

The exact setting out of ground sockets to suit the actual sanitary ware or any other equipment to be installed shall be the responsibility of the Main Contractor, however the Mechanical Contractor shall make a representative



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available to the Main Contractor to assist with the planning and setting out of all ground sockets and also all soils and wastes points throughout the building.

52.02 Floor gullies

The Mechanical Contractor shall also be responsible for the supply and installation of a stainless steel floor gully in the boilerhouse as indicated on the drawing. The floor gully shall be manufactured from 316L stainless steel and shall be supplied complete with heel guards and foul air traps and connected to the local waste system. Gully positions to be agreed before installation commences. Refer to the drawings for locations and quantities of floor gullies required.

Floor gully shall be supplied by Kent Stainless, Richmond Trading or equivalent. The floor gully to be installed for the boilerhouse shall be as KVT170/110TPSQ (or equivalent) with foul air trap KFT110, grade 316 stainless steel with Square Perforated Cover Plate. The gully shall be suitable for installation in a concrete finished floor.



52.03 Soil vent pipes

New soil vent pipes shall be installed by the Mechanical Contractor as indicated on the drawings for the venting of the waste pipework in the building. Soil vent pipes shall rise vertically through the building to terminate above roof level in locations indicated on the drawings. These vent pipes shall be fitted under this contract. Final locations to be agreed with the Employer's Representative.

All soil vent pipes shall be complete with weathering sleeve and vermin guard.

52.04 Connection to equipment

The Mechanical Contractor shall be responsible for the installation and connections of all sanitary fitments, WC's, WHB's, sinks, etc., in the toilet areas and boilerhouse as indicated on the drawings. All these items shall be supplied free issue by others to the Mechanical Contractor for fitting.

The Mechanical Contractor shall allow for connecting the new uPVC soils and wastes pipework for the new sanitary fitments, kitchen equipment, sinks, etc. to the waste pop-ups in the building as indicated on the drawing.



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The Mechanical Contractor shall allow for all final uPVC waste connections to all WHB's, sinks, WC's, etc. as indicated on the drawings. All sanitary ware shall be supplied free issue to the Mechanical Contractor by the Main Contractor.

52.05 Fire collars

The Mechanical Contractor shall be responsible for the supply and installation of all fire collars for the soils and wastes pipework.

Waste pipes shall pop through the floor slab and fire walls in parts of the building as indicated on the drawings. Where these pipes pass through any fire compartment, intumescent fire collars shall be installed on the uPVC pipe and fixed to the floor.

Fire collars shall be installed on any plastic waste pipework over or equal to 50mm. Refer to the drawings for locations and quantities.

These collars shall seal the uPVC pipe in the event of a fire. Locations as indicated on the drawings. Where soils and wastes pipework passes through fire compartment walls, intumescent fire collars shall be installed on the uPVC pipe and fixed to the wall. Locations as indicated on the drawings.

Fire collars shall be installed on all uPVC waste pipework larger than 50mm diameter. The Mechanical Contractor shall be responsible for the supply and installation of all fire collars for the soils and wastes pipework. Fire collars shall adhere to the following specifications:

- Have a mild galvanised casing
- 2-hour fire rating metal shell produced in two hinged halves and lined with intumescent material. Fire rated for 120minutes.
- Surface mounted
- Lightweight and easy to install
- Design allows for thermal movement of the pipe.
- Fixing brackets mechanically attached to the collar housing
- CE rated.
- Tested to BS476 Part 20 & EN 1366-3
- CE Marked
- Suitable for PVC, PVC-U, PE, HDPE, MDPE & PP pipes
- Can be retrofitted
- Performance unaffected by weathering (Type X Durability)

Fire collars shall be installed in accordance with manufacturer's instructions. See drawings for further information on location of fire compartment walls.



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52.06 Insulation on waste pipework

General:

Insulation shall be applied to all internal soils and wastes pipework located in ceiling voids, service shafts, box-outs, etc. This includes all uPVC waste pipework and chemical resistant Vulcathene waste pipework.

The Mechanical Contractor shall allow for the supply and installation of the insulation on the required waste pipework in the ceiling voids, service shafts, box-outs, etc.

Insulation:

All new uPVC waste pipework and chemical resistant Vulcathene waste pipework above the ceiling, in service voids, box-outs, etc. shall be insulated using Isover Climpipe, Rocklap H&V, (or equivalent) foiled back mineral wool insulation, or equivalent. 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 for the waste services pipework in the ceiling void, in service voids, box-outs, etc.

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.

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



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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 0 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.



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- *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.

52.07 Overflow pipework from water tank

New overflow pipework shall be installed for the cold water storage tank as indicated on the drawings.

Once the new water tank is installed, the Contractor shall allow for new overflow pipework from the water tank and its associated drip tray to the external as indicated on the drawings.

All new overflow and drainage pipework shall be installed as indicated on the drawing. The Contractor shall ensure a neat installation and all pipework shall be installed parallel to walls, ceilings and partitions. Sizes and routes as indicated on the drawing.

All new overflow pipework from the water tank and drip tray shall be installed in uPVC plastic pipework.

All overflow pipework shall be fitted with mesh screens of maximum 0.65mm x 0.65mm holes to prevent the ingress of vermin.



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53.0 WATER SERVICES

53.01 Mains water services pipework and installation

General:

Allow for the connecting the new mains water services pipework for the new areas to the existing mains water services pipework in the existing boilerhouse and for all attendances and material in doing so. The material of the incoming pipe is 'Class C' uPVC pipework and the material of the internal mains water pipework is multi-layer composite plastic pipework.

New internal mains water services pipework:

New pipework for the internal mains water services pipework installation in the building shall be installed in multi-layer composite plastic pipework.



Multi-layer composite plastic pipework (MCLP) for all internal mains water services pipework shall be as follows:

- Non-crossed linked polyethylene pipe.
- 100% diffusion-resistant multi-layer composite pipe
- Five-layer (PE-RT – adhesive agent – continuously overlapped welded aluminium adhesive agent PE-RT). PE-RT multilayer barrier pipe, with a PE-RT layer on the outside, a PE-RT layer on the inside and an aluminium pipe in between.
- The PE-RT multilayer barrier pipe shall be manufactured from high density cross-linked polyethylene plastic with an aluminium foil layer on the outside wall of the pipe which in turn is covered with a layer of polyethylene material.
- WRAS Scheme approved.
- Suitable for drinking water.
- Pipe shall have an oxygen barrier. The aluminium layer on the outside wall of the pipe shall act as an oxygen barrier.
- The pipe and fittings shall be certified by the Irish Agreement Board (IAB) Conform to BS 7291- 1:2006 and IS EN 1254 Part 3: 1998.



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- The PE-RT multilayer barrier pipe shall be manufactured from high density cross-linked polyethylene plastic with an aluminium foil layer on the outside wall of the pipe which in turn is covered with a layer of polyethylene material.
- The PE-RT pipe shall meet the requirements of Class 1, 2, 4 and 5 service conditions as specified in Table I of ISO 15875-1: 2003 - *Plastics piping systems for hot and cold water installations - Cross-linked polyethylene (PE-X). The minimum wall thickness of the pipe shall be 3.0mm.*
- The pipe shall meet the requirements for Class S service conditions specified in Table 1 of BS 7291-1: 2001 for a service life of 50 years and BS 7291 - 2.
- 25year warranty

Pipework shall be as Uponor MCLP pipe, or equivalent. Include for the necessary tools and equipment in installing the pipework and fittings.

Allow for all necessary bracketing, valves, compression fittings, tee's, connections, etc. to complete the installation as per drawings.

Allow for all connection pieces in connecting the existing copper and cast-iron water services pipe to the new plastic composite pipe.

Jointing of pipework:

To ensure successful jointing, PE-RT pipe ends shall be cut smoothly and squarely. This shall be achieved with a PE-RT pipe shears.

Jointing shall be achieved using compression fittings to IS EN 1254 standard.

Composite press fittings shall be manufactured from high grade PPSU (Polyphenylsulfone), with a stainless steel pressing sleeve. Highly resistant to virtually all building chemicals, screeds and materials.

There shall be inspection windows on the pressing sleeves help to review the connection before and after pressing.



Allow for all compression adapters for connections of the multi-layer composite pipework to any fitting or equipment.





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Pipework installation:

As all plastics materials expand & contract with temperature change greater than metal pipes, due allowance in pipe runs shall be made on installation to accommodate expansion & contraction of the pipe.

Bending shall be in accordance with the manufacturer's recommendations. The ending operation shall not result in either indentations or deformations on the inside or outside of the pipe. The pipe should not be heated with a hot airgun/blow lamp or similar type of equipment. The PE-RT pipelines shall be fixed to a load bearing base as referenced in Table 1 below and immediately before and after a pipe elbow, using the appropriate clamps. Surface mounted fixing of PE-RT pipes shall be carried out with pipe clips including insulation material. The insulation material shall be compatible with the plastic pipe.

The fixing of PE-RT pipe on a wall shall be installed with the correct support system and using the specified pipe clips. All clips should be positioned in such a way so that due allowance for expansion and contraction of the pipework is provided (See Table 1 below for the maximum pipe clip spacings).

Pipe Dimension (mm) Max. Pipe clip spacing	Max. Pipe clip spacing(m)
14 x 2.0	0.8
17 x 2.8	0.9
21 x 4.0	1.0
26 x 4.0	1.0
33 x 4.9	1.1
50 x 4.9	1.3
90x 8.5	1.5

Table 1 - indicating maximum clipping distances

As with all plumbing piping PE-RT pipe should be sleeved when passing through walls and protected from nails, etc., when placed under floorboards or buried under plaster, screed. Pipe runs shall be secured to joists using PE-RT pipe clips. The recommended spacing of supports shall be as shown in the Table 1 above. The pipes shall be secured on the sides of joists. All pipework supports shall be in strict accordance with B.S. 3974. Structural timbers should be notched only with the permission of the architect or structural engineer and in accordance with CL. 13.7.9. of BS 6700: 2006. *Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages.*

When commissioning the system it must be flushed with water. The system must be checked for leaks after all the air has been removed and before the pipes are insulated. The system shall be tested hydraulically by subjecting the pipes, pipe



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fittings and connected appliances to a test pressure of not less than 1.5 times the maximum working pressure in accordance with Clause 3.1.12.3.4 of BS 6700: 2005 - *Specification for Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages*. There shall be no visible leakage of water and the pressure will be maintained for one hour. As with all plumbing systems care shall be taken in the layout of pipe runs to avoid damage from nailing.

Pipework fittings:

Pipe brackets shall be suitable for the PE-RT composite plastic pipe and shall be supplied by the pipework supplier. Pipework shall be arranged neatly and shall have a clearance from finished floor level of 100mm. Allow for a gradient of approximately 1:60 in the direction of the flow of water. 'U' bolts shall be fitted at intervals of 6m for controlling lateral movement. Brackets shall be fitted at the following spacings:

<u>Pipe bore</u>	<u>Support centres</u>
15mm	1.2m
22mm	1.2m
28mm	1.5m
35mm	1.5m
40mm	1.8m
54mm	1.8m
90mm	1.8m

Labelling:

After insulating all new water services pipework in the building, all new pipework installed in the building shall be labelled with appropriate colour identification bands and flow indication arrows.

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.

The Mechanical Contractor shall provide steel plate labels with the following inscribed 'Drinking Water' at each drinking water location.

Insulation:

All mains water pipework within unoccupied areas (shafts, service voids, ceiling voids, furniture, walls or false ceilings) shall be insulated. Allow for the fitting, installation and connection of mains water supply to all the sanitary ware and



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the water storage tank as indicated on the drawings. See Section 53.06 for further information on the insulation of the pipework. See drawings for routes, sizes, etc. of pipework.

Main Isolation valves:

Allow for the supply and installation of all the necessary isolation valves on the new mains water services pipework to the water tank and certain areas in the building as indicated on the drawings.

Ensure all isolation valves are suitable for the multi-purpose composite plastic pipe and that all valves can be installed in conjunction with this pipe. Allow for all connections, connectors, compression fittings, fittings, etc. in installing the isolation valves to the new pipe.

All valves shall be lockable and shall be WRAS approved for use with mains water supply.

Main isolation valves shall be Crane D171 level valves, or equivalent.



Local Ballofix Valves:

Allow for the supply and local installation of ballofix isolation valves to all mains water supply pipework to the new sanitary ware fittings as indicated on the drawings so that the mains water supply to each sanitary ware fitting can be easily isolated.

Ballofix valves are to be installed on all mains water supplies to all new sanitary ware fittings so that they are capable of independent isolation.

Allow for all connectors, compression fittings, fittings, etc. in installing the ballofix valves to the new multi-layer composite pipe.

Ballofix valves shall be as follows:

- Chrome plated brass isolation valve.
- Supplied with a simple screwdriver slot operation for isolation.
- Compression ends to BS EN 1254-3



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ASD Unit:

All the main runs of the mains water services pipework shall be installed above the ceiling in the ceiling void and as a result, shall be insulated. All the mains water services pipework in the building that will drop down the walls from the high level pipework shall be recessed and flush mounted. The Mechanical Contractor shall mark the size and location of the chasing required for the hidden pipework to the Main Contractor.

All mains water pipework within unoccupied areas (shafts, service voids, walls or false ceilings) shall be insulated. Allow for the fitting, installation and connection of mains water supply to all the sanitary ware and water storage tanks as indicated on the drawings. See Section 53.06 for further information on the insulation of the pipework.

See drawings for routes, sizes, etc. of pipework.

General areas:

All the main runs of the mains water services pipework shall be installed above the ceiling in the ceiling void and as a result, shall be insulated. All the mains water services pipework in the building that will drop down the walls from the high level pipework shall be surface mounted.

All mains water pipework within unoccupied areas (shafts, service voids, walls or false ceilings) shall be insulated. Allow for the fitting, installation and connection of mains water supply to all the sanitary ware and water storage tanks as indicated on the drawings. See Section 53.06 for further information on the insulation of the pipework.

See drawings for routes, sizes, etc. of pipework.

Labels:

The Mechanical Contractor shall provide steel plate labels with the following inscribed 'Drinking Water' at each drinking water location.



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53.02 Cold water services pipework and installation

General:

Cold water services shall be provided throughout the building as indicated on the drawings.

The cold water services system is a boosted system from the new cold water storage tank which is located in the attic space as indicated on the drawings. The contractor shall allow for making connection to the main cold water pipework in the plantroom before feeding the new extension of the building.

New cold water services pipework:

All new internal water services pipework for the cold water services pipework to be installed in the building shall be installed in light gauge copper to I.S. EN 1057:2006.

It shall be suitable for bronze welding. Tubes shall be to uniform thickness, smooth, clean and free from internal and external defects. All ends shall be cut clean square with the tube axis.

All cold water services pipework shall be installed in copper.



Copper tube for all internal cold water services pipework shall be as follows:

- Irish copper tube
- CE marked
- Complaint with BS EN 1057
- Material Analysis:
 - Material Grade Phosphorus de-oxidised copper; Cu-DHP or CW024A as defined in BS EN 1976.
 - Minimum Copper Content 99.90% (including silver)
 - Phosphorus 0.015-0.040%



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-
- Total Impurity Maximum 0.060% (excluding phosphorus and silver)

Where possible, all the main runs of the cold water services pipework shall be installed above the ceiling in the ceiling void and as a result, shall be insulated.

All the cold water services pipework in the building that will drop down the walls from the high level pipework **shall be surface mounted in the general areas and recessed mounted in the ASD Unit Areas of the school**. The Mechanical Contractor shall ensure a neat installation and all pipework shall be installed parallel to walls, ceilings and partitions.

All cold water services pipework shall be sleeved as they pass through floor slabs and internal blockwork walls.

The whole of the pipework shall be bronze welded with approved filler rods and flux. The filler rod shall contain a small amount of phosphorous or silicon to prevent any oxidation in the joint when made. Compression fittings shall not be used.

The composition of phosphor bronze and filler rod shall be typically as follows:

- Brass: 60% copper, 40% zinc (with silicon or phosphorous additives)
- Phosphor Bronze: 95% Copper, 4.5% tin, 0.5% phosphorous.

Flux having a borax base shall be used in paste form, which shall be uniformly spread over the surface to be jointed. If flux powder is to be used, it shall be wetted to form a paste prior to jointing. Flux shall not be used in powder form.

Bends shall be made from the pipework. Up to 38mm shall be made with spring bending tubes and the radii shall not be less than 3 times the diameters of tube. All exposed pipework shall be thoroughly cleaned and surfaces prepared to a smooth polish finish by using emery cloth. Surfaces scored or scratched or otherwise damaged shall not be acceptable.

Pipework fittings:

Pipe brackets shall be heavy G.M. screw-on type. Pipework shall be arranged neatly and shall have a clearance from finished floor level of 100mm. Any hot and cold pipework run in the attic space shall be supported as specified for heating pipework.

Allow for a gradient of approximately 1:60 in the direction of the flow of water. 'U' bolts shall be fitted at intervals of 6m for controlling lateral movement. Brackets shall be fitted at the following spacings:



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Pipe bore

Support centres

15mm	1.2m
22mm	1.2m
28mm	1.5m
35mm	1.5m
40mm	1.8m
54mm	1.8m

Labelling:

After insulating all new cold water services pipework in the building, all new cold water services pipework installed in the building shall be labelled with appropriate colour identification bands and flow indication arrows.

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.

Insulation:

All cold water services pipework within unoccupied areas (shafts, service voids, ceiling voids, furniture, walls or false ceilings) shall be insulated. Allow for the fitting, installation and connection of cold water supply pipework to all the sanitary ware and the water storage tank as indicated on the drawings.

See Section 53.06 for further information on the insulation of the pipework. See drawings for routes, sizes, etc. of pipework.

Main Isolation valves:

Allow for the supply and installation of all the necessary isolation valves on the new cold water services pipework to the water tank and certain areas in the building as indicated on the drawings. Main isolation valves shall be Crane D171 level valves, or equivalent.





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Local Ballofix Valves:

Allow for the supply and local installation of ballofix isolation valves to all cold water supply pipework to the new sanitary ware fittings as indicated on the drawings so that the cold water supply to each sanitary ware fitting can be easily isolated. Ballofix valves are to be installed on all cold water supplies to all new sanitary ware fittings so that they are capable of independent isolation.

Ballofix valves shall be as follows:

- Chrome plated brass isolation valve.
- Supplied with a simple screwdriver slot operation for isolation.
- Compression ends to BS EN 1254-3



53.03 Hot water services supply pipework and installation

General:

Hot water services supply pipework shall be provided throughout the new extension building as indicated on the drawings.

The hot water services supply system shall be a boosted system.

Hot water shall be supplied from the existing hot water services cylinder in the boilerhouse and a boosted supply shall be supplied from the new centralised cold water storage tank to the water heater for the supply and hot water supply throughout the building as indicated on the drawings.

New hot water services supply pipework:

All new internal water services pipework for the hot water services supply pipework to be installed in the new extension building shall be installed in light gauge copper to I.S. EN 1057:2006.

It shall be suitable for bronze welding. Tubes shall be to uniform thickness, smooth, clean and free from internal and external defects. All ends shall be cut clean square with the tube axis.

All hot water services supply pipework shall be installed in copper.



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Copper tube for all internal hot water services supply pipework shall be as follows:

- Irish copper tube
- CE marked
- Complaint with BS EN 1057
- Material Analysis:
 - Material Grade Phosphorus de-oxidised copper; Cu-DHP or CW024A as defined in BS EN 1976.
 - Minimum Copper Content 99.90% (including silver)
 - Phosphorus 0.015-0.040%
 - Total Impurity Maixma 0.060% (excluding phosphorus and silver)

Where possible, all the main runs of the hot water services supply pipework shall be installed above the ceiling in the ceiling void and as a result, shall be insulated.

All the hot water services supply pipework in the building that will drop down the walls from the high level pipework **shall be surface mounted in the general areas and recessed mounted in the ASD Unit Areas of the school.** The Mechanical Contractor shall ensure a neat installation and all pipework shall be installed parallel to walls, ceilings and partitions.

All hot water services supply pipework shall be sleeved as the pass through floor slabs and internal blockwork walls.

The whole of the pipework shall be bronze welded with approved filler rods and flux. The filler rod shall contain a small amount of phosphorous or silicon to prevent any oxidization in the joint when made. Compression fittings shall not be used.

The composition of phosphor bronze and filler rod shall be typically as follows:



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- Brass: 60% copper, 40% zinc (with silicon or phosphorous additives)
- Phosphor Bronze: 95% Copper, 4.5% tin, 0.5% phosphorous.

Flux having a borax base shall be used in paste form, which shall be uniformly spread over the surface to be jointed. If flux powder is to be used, it shall be wetted to form a paste prior to jointing. Flux shall not be used in powder form.

Bends shall be made from the pipework. Up to 38mm shall be made with spring bending tubes and the radii shall not be less than 3 times the diameters of tube. All exposed pipework shall be thoroughly cleaned and surfaces prepared to a smooth polish finish by using emery cloth. Surfaces scored or scratched or otherwise damaged shall not be acceptable.

Pipework fittings:

Pipe brackets shall be heavy G.M. screw-on type. Pipework shall be arranged neatly and shall have a clearance from finished floor level of 100mm. Any hot and cold pipework run in the attic space shall be supported as specified for heating pipework.

Allow for a gradient of approximately 1:60 in the direction of the flow of water. 'U' bolts shall be fitted at intervals of 6m for controlling lateral movement. Brackets shall be fitted at the following spacings:

<u>Pipe bore</u>	<u>Support centres</u>
15mm	1.2m
22mm	1.2m
28mm	1.5m
35mm	1.5m
40mm	1.8m
54mm	1.8m

Labelling:

After insulating all new hot water services supply pipework in the building, all new hot water services supply pipework installed in the building shall be labelled with appropriate colour identification bands and flow indication arrows.

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.



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Insulation:

All hot water services supply pipework within unoccupied areas (shafts, service voids, ceiling voids, furniture, walls or false ceilings) shall be insulated. Allow for the fitting, installation and connection of hot water supply pipework to all the sanitary ware and the water heater as indicated on the drawings. See Section 53.06 for further information on the insulation of the pipework. See drawings for routes, sizes, etc. of pipework.

Main Isolation valves:

Allow for the supply and installation of all the necessary isolation valves on the new hot water services supply pipework to the water heater and certain areas in the building as indicated on the drawings. Main isolation valves shall be Crane D171 level valves, or equivalent.



Local Ballofix Valves:

Allow for the supply and local installation of ballofix isolation valves to all hot water supply pipework to the new sanitary ware fittings as indicated on the drawings so that the hot water supply to each sanitary ware fitment can be easily isolated. Ballofix valves are to be installed on all hot water supplies to all new sanitary ware fittings so that they are capable of independent isolation.

Ballofix valves shall be as follows:

- Chrome plated brass isolation valve.
- Supplied with a simple screwdriver slot operation for isolation.
- Compression ends to BS EN 1254-3





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53.04 Hot water services return pipework and installation

General:

Hot water services return pipework shall be provided throughout the building as indicated on the drawings.

The hot water services return system shall be returned to the existing hot water cylinder via a hot water return pump in the boilerhouse. Hot water return pipework shall be brought to within 200mm of the hot water supply pipework to a sanitary ware item. Therefore, the dead leg shall not be more than 200mm.

New hot water services return pipework:

All new internal water services pipework for the hot water services return pipework to be installed in the building shall be installed in light gauge copper to I.S. EN 1057:2006.

It shall be suitable for bronze welding. Tubes shall be to uniform thickness, smooth, clean and free from internal and external defects. All ends shall be cut clean square with the tube axis.

All hot water services return pipework shall be installed in copper.



Copper tube for all internal hot water services return pipework shall be as follows:

- Irish copper tube
- CE marked
- Complaint with BS EN 1057
- Material Analysis:
 - Material Grade Phosphorus de-oxidised copper; Cu-DHP or CW024A as defined in BS EN 1976.
 - Minimum Copper Content 99.90% (including silver)



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- Phosphorus 0.015-0.040%
- Total Impurity Maximum 0.060% (excluding phosphorus and silver)

Where possible, all the main runs of the hot water services return pipework shall be installed above the ceiling in the ceiling void and as a result, shall be insulated.

All the hot water services return pipework in the building that will drop down the walls from the high level pipework shall be **shall be surface mounted in the general areas and recessed mounted in the ASD Unit Areas of the school**. The Mechanical Contractor shall ensure a neat installation and all pipework shall be installed parallel to walls, ceilings and partitions.

All hot water services return pipework shall be sleeved as they pass through floor slabs and internal blockwork walls.

The whole of the pipework shall be bronze welded with approved filler rods and flux. The filler rod shall contain a small amount of phosphorous or silicon to prevent any oxidation in the joint when made. Compression fittings shall not be used.

The composition of phosphor bronze and filler rod shall be typically as follows:

- Brass: 60% copper, 40% zinc (with silicon or phosphorous additives)
- Phosphor Bronze: 95% Copper, 4.5% tin, 0.5% phosphorous.

Flux having a borax base shall be used in paste form, which shall be uniformly spread over the surface to be jointed. If flux powder is to be used, it shall be wetted to form a paste prior to jointing. Flux shall not be used in powder form.

Bends shall be made from the pipework. Up to 38mm shall be made with spring bending tubes and the radii shall not be less than 3 times the diameters of tube. All exposed pipework shall be thoroughly cleaned and surfaces prepared to a smooth polish finish by using emery cloth. Surfaces scored or scratched or otherwise damaged shall not be acceptable.

Pipework fittings:

Pipe brackets shall be heavy G.M. screw-on type. Pipework shall be arranged neatly and shall have a clearance from finished floor level of 100mm. Any hot and cold pipework run in the attic space shall be supported as specified for heating pipework.



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Allow for a gradient of approximately 1:60 in the direction of the flow of water. 'U' bolts shall be fitted at intervals of 6m for controlling lateral movement. Brackets shall be fitted at the following spacings:

<u>Pipe bore</u>	<u>Support centres</u>
15mm	1.2m
22mm	1.2m
28mm	1.5m
35mm	1.5m
40mm	1.8m
54mm	1.8m

Labelling:

After insulating all new hot water services return pipework in the building, all new hot water services return pipework installed in the building shall be labelled with appropriate colour identification bands and flow indication arrows.

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.

Insulation:

All hot water services return pipework within unoccupied areas (shafts, service voids, ceiling voids, furniture, walls or false ceilings) shall be insulated.

Allow for the fitting, installation and connection of hot water return pipework to all the sanitary ware and the water heater as indicated on the drawings. See Section 53.06 for further information on the insulation of the pipework. See drawings for routes, sizes, etc. of pipework.

Main Isolation valves:

Allow for the supply and installation of all the necessary isolation valves on the new hot water services return pipework to the water heater and certain areas in the building as indicated on the drawings. Main isolation valves shall be Crane D171 level valves, or equivalent.





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Allow for the supply and local installation of ballofix isolation valves to all hot water return pipework to the new sanitary ware fittings as indicated on the drawings so that the hot water return to each sanitary ware fitting can be easily isolated.

Ballofix valves are to be installed on all hot water supplies to all new sanitary ware fittings so that they are capable of independent isolation.

Ballofix valves shall be as follows:

- Chrome plated brass isolation valve.
- Supplied with a simple screwdriver slot operation for isolation.
- Compression ends to BS EN 1254-3



53.05 Insulation of water services pipework

General:

All new water services pipework installed in the building (at high level exposed, in the ceiling void, in plantrooms, in walls, services, voids, service shafts, etc.) shall be insulated as described below. There is not a requirement to insulate the pipework exiting the wall at low level to the necessary sanitary ware fittings or any surface mounted pipework at low level.

Copper pipe work shall be insulated as follows:

- | | |
|----------------------------|-----------------------|
| • Pipes from 15mm to 42mm: | 30mm thick insulation |
| • Pipes from 42mm to 76mm: | 35mm thick insulation |
| • Pipes from 76mm: | 40mm thick insulation |

Insulation:

All copper pipework installed in the building for water services shall be insulated using Isover Climpipe, Rocklap H&V, (or equivalent) foiled back mineral wool insulation, or equivalent. 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 for the water services pipework throughout the building.



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All new pipework shall be insulated with foil backed insulation and shall be insulated as described above and clad in aluminium foil. The Contractor shall allow for the supply and installation of all insulation for the water services pipework.

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.

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



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Class 0 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.
'Part L' Compliance.

53.06 Connection to equipment and sanitary ware

The Mechanical Contractor shall be responsible for the installation and connections of all sanitary fittings, kitchen equipment, sinks, equipment in the Science Room, etc., which shall be supplied free issue by others to the Mechanical Contractor for fitting.

The Mechanical Contractor shall allow for connecting the new water services pipework to all the new sanitary fittings, kitchen equipment, sinks, equipment in the Science Room, etc. in the building as indicated on the drawing. Refer to the drawings for locations, sizes of pipework, types of pipework, etc.

All sanitary ware and equipment in the Science Room shall be supplied free issue to the Mechanical Contractor by the Main Contractor.

The Mechanical Contractor shall allow for connecting the new water services pipework to all the new sanitary ware as indicated on the drawing.



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53.07 Shower panels

The Mechanical Contractor shall allow for the supply & installation of a new anti-vandal shower equipment throughout the building as indicated on the drawings. The Mechanical Contractor shall allow for the supply and installation of the following shower panels:

Disabled Toilet:

The Contractor shall install 1no anti-vandal pre-plumbed shower panels in the disabled toilet as indicated on the drawings. The pre-plumbed shower panels to be installed in the disabled toilet as per image below.

The shower panel for the disabled toilet shall adhere to the following specifications:

- WRAS approved pre-plumbed shower panel with integral adjustable TMV3 approved thermostatic mixing valve with flow and temperature adjustment and with easy clean single spray handset, flexible hose and slide bar.
- The shower panel shall have a sliding rail with a flexible hose.
- User selection of flow and temperature (up to a safe, pre-set maximum)
- Shall have a satin finish stainless steel panel with hot and cold water pipe entry
- The panel shall be supplied with and integrated adjustable temperature selection, feeding a Rada TF503 push button timed flow control and vandal resistant chrome plated shower head with integral strainer, flow regulator and with adjustable spray angle.
- Shower panel as Rada PA-V8F with a satin finish stainless steel panel, or equivalent.





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53.08 Thermostatic mixing valves

Thermostatic mixing valves (TMV's) shall be fitted at all new wash hand basins and sinks (apart from the Cleaners Sink) throughout the building to prevent scalding as indicated on the drawings. The Mechanical Contractor shall allow for the supply and installation of all TMV's.

All TMV's shall be located such that a maximum dead leg of 200mm only is achievable on the blended water supply. All TMV's must adhere to the following specifications:

- Must be 'TMV 3' and WRAS approved.
- Supplied with ½" flat faced union connectors terminating in 15mm compression connections.
- Suitable for a minimum dynamic supply pressure of 0.15 bar.
- TMV's must give a flow rate of least 0.1 litres/second at an inlet head of 1.5 metres.
- Limited to a maximum temperature of 43°C to prevent scalding
- Valve body shall be D7R brass and feature a locked temperature shroud with preset maximum temperature stop facility.
- Comply with BS EN 1111 and BS EN 1287 and be suitable for use with low pressure systems.
- Be suitable for under basin installation
- Provide safe thermostatic shutdown
- Be complete with isolation valves, check valves, easily removable strainers and service free cartridges
- Shall be suitable for low-pressure loss systems.
- TMVs must never be connected to the mains water supply. They must only be connected to the hot water distribution services and cold water distribution services.
- The body shall be DXR brass nickel plated with a white plastic locking shroud.

Suitable valves as Rada (low-pressure loss) 215-t3dk, or equivalent.





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53.09 Water storage tank

General:

New one piece (Glass Reinforced Plastic) cold water storage tanks (2no. in total) shall be installed in the attic space of the building as indicated on the drawing. These tanks will then in turn supply cold water to all the necessary sanitary ware throughout the building.

The Mechanical Contractor shall include for the supply, installation, testing and commissioning of the following cold water storage tanks (see drawings for locations and further information).

The new cold water storage tanks shall be a 1500litre capacity, 1710mm long x 121mm wide x 1090mm high G.R.P. one piece water tank.

Include for the following accessories with the tank:

- Lid and cover
- Drip tray
- All tappings for mains supply, overflows, cold water supply (include on both sides of the tank).
- Screened overflow connection from the tank (include on both sides of the tank).
- Screened overflow connection from the drip tray.
- Screened air inlet vent on the top of the tank.

See below for specification of the water tank.

Specification of the new cold water tanks:

The Contractor shall allow for the supply and installation of the following cold water storage tanks.

- 1500 litre capacity one piece cold water storage tanks. The tanks shall be 1710mm long x 1210mm wide x 1090mm high G.R.P. one piece water tanks.
- The tanks shall be complete with internally flanged base, externally flanged side walls. All under water stays shall be stainless steel.
- Tanks shall be insulated to 'Format 30'. Water temperature shall not exceed 20°C.
- The whole of the tank installation shall be commissioned and maintained in accordance with BS 6700.



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- The G.R.P. one piece water tanks shall have a flanged thickness of 14.5mm and shall conform to BS 3692, BS 5252, BS 729, BS 3691, and DIN 53452, DIN 53455.
- All corner angles, gussets, divider carriers and roof supports shall be of the same material.
- All underwater bolts, tie bars, joiners etc., shall be stainless steel grade 316 S16. External bolts shall be mild steel to BS 3692 and galvanized to BS 729 and BS EN ISO 1461:1999.
- The tanks shall be supplied with a drip/condensation tray.
- All tanks shall be complete with all tappings for mains supply, overflows, cold water supply.
- Tank shall be supplied and installed by Tricel (Killarney), or equivalent.

Installation and steel supports:

The Mechanical Contractor shall liaise with the Main Contractor for all base details required for the installation of the water tanks. The tanks shall be installed in the attic space of the building as indicated on the drawings. Refer to the tank manufactures details and structural engineer for supports.

Tanks erected on elevated structures (RSJ beams or brick courses in one direction only). Bearers must be at 500mm centres. Bearer length must exceed nominal tank dimensions by a minimum of 150 mm plus any extra for fixings. All bearer walls to be flat and level. For bearer width see Tricel base/details recommendations.

Space required around the tank for maintenance:

The Mechanical Contractor shall ensure that when he installs the cold water storage tank, that for maintenance purposes, there is 500mm walking space left around all sides of the tank.

53.10 Control valves and ballofix valves

See sections 53.01, 53.02, 53.03 and 53.04 for information on control valves and ballofix valves.



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53.11 Direct hot water cylinder

General:

The Mechanical Contractor shall allow for the supply and installation of a direct water heater in the boilerhouse to supply hot water throughout the building as indicated on the drawings.

Water heater:

The Mechanical Contractor shall supply and fit the following water heater:

<u>Specification:</u>	Stainless steel cylinder AISI 316L c/w single fixed coil as Joule 250L Cyclone Air Indirect or equal or approved.
<u>Quantity:</u>	1no
<u>Type:</u>	Indirect hot water calorifier
<u>Nominal Input (Gross):</u>	23kW
<u>Max Operating Pressure:</u>	5Bar
<u>Storage Capacity:</u>	250 litres
<u>Dimensions:</u>	5400mm diameter x 1785mm high
<u>Weight when empty:</u>	56kg
<u>Unvented components:</u>	Intel Control Group, Zone Valve, Cylinder Thermostat, Tundish

The calorifier shall be supplied with the following:

- Electronic anode with impressed current
- Electronic unit control
- Electrical resistance attack 1" ½
- Thermostat
- Thermometer

A test certificate shall be forwarded to the Employer's Representative for inspection prior to ordering the vessel. The utmost care should be taken during installation to ensure the vessel is mounted perfectly level upon a formed concrete plinth to avoid airlocks.

53.12 Pressure test

The Mechanical Contractor shall hydraulic pressure test all new water services pipework in the building once all the pipework is installed. Pipework shall be tested prior to final connection to the sanitary ware items.

The pipework shall be pressure tested to 7 bar and shall remain drop tight for a period of at least 12 hours.



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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.

53.13 Sterilisation of the cold water system

General:

After satisfactory completion of the new cold water storage tank, the whole of the cold, mains and hot water services system for the building shall be chlorinated and sterilised.

The Mechanical Contractor shall allow for all works involved in sterilising the cold water storage tanks and the water services pipework in the building as described below. It is not a requirement to chlorinate the rainwater storage tank or pipework.

The following sterilisation procedure shall be carried out for the cold, hot and mains water services in the building:

Sterilisation Procedure:

All mains, hot and cold water services and the cold water storage tank shall be sterilised as follows before the system is brought into use:

- i) The pipes etc. shall be cleaned by flushing through to remove all dirt and debris and then emptied prior to sterilisation.
- ii) The necessary quantity of sterilising chemical to give a chlorine concentration of 20mg per litre shall be prepared in accordance with the manufacturer's instructions. If hypochlorite having 35% available chlorine is used, the proportions shall be 145 kg to 1000 litres of water.
- iii) A contact time of 24 hours shall be allowed when each section is full. If less than 10mg/litre is residual the system shall be re-chlorinated. Should reserves still not be established the contamination shall be located and a method of cleaning recommended.



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- iv) After successful chlorination the system shall be drained and refilled with mains water.

Disposal of Sterilising Water:

Sterilising water shall be disposed of into a foul sewer and never into a surface water sewer or water course.

Protective clothing and goggles shall be provided for the operatives carrying out this work in accordance with the Health and Safety at Work Act.

Bacteriological Test:

After the cold water storage tank has been emptied and the mains has been refilled to the tank, a sample of the water must be taken from the tank for bacteriological analysis. Great care must be taken when obtaining samples for testing and only sterile containers should be used. This sampling shall be carried out in the presence of the Engineer and/or his/her representative.

A copy of the Bacteriological test report must be submitted to Dublin Corporation, Water Division, Main laying Section.

Allow for taking a sample as described above from the new tanks and testing as described above.

Certificate of Sterilisation:

Detailed records shall be maintained for all sterilisation procedures carried out. A copy of Sterilisation Certificates for all parts of the system shall be submitted containing the following information:

Project Name:
Name of Contractor/Sub-contractor:
Service:
Method of Sterilisation:
Period of Sterilisation:
Signatures for Contractor/Sub-contractor:
Witness:
Date of Sterilisation:

53.14 Sanitary ware

All sanitary ware (apart from shower panel) shall be provided by the Main Contractor. The sanitary ware shall be provided by the Main Contractor to the Mechanical Contractor for fitting and installing in accordance with the Architectural Sanitary Ware Schedule. The Mechanical Contractor shall be responsible for the installation of all sanitary fitments.



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54.0 GAS SERVICES

54.01 External underground gas pipework

Refer to sections 50.05 above for further information

54.02 External overground gas pipework

Refer to sections 50.06 above for further information

54.03 Internal gas pipework in the building

Internal gas pipework in the boilerhouse:

As highlighted in section 50.06, the Mechanical Contractor shall allow for supplying and installing a new underground natural gas supply to the boilerhouse. This new gas supply shall then be subsequently connected to the new boilers and gas heater in the boilerhouse as indicated on the drawings.

Sections 50.05 highlights how the underground gas pipework will get into the boilerhouse and this section specifies the works to the gas pipework from when it enters the boilerhouse at low level.

The Mechanical Contractor shall allow for connecting to the new underground MDPE gas pipework outside the boilerhouse and bringing this gas pipework into the boilerhouse to connect to the new gas boilers as indicated on the drawings.

The gas installation in the building shall comply fully with I.S. 820:2019 Non-Domestic Gas Installations.

External gas pipework from the underground MDPE gas pipework into the boilerhouse:

Refer to section 50.05 for further information

Internal gas pipework:

Allow for the supply and installation of new internal gas pipework as indicated on the drawings. Sizes, routes and locations of all gas pipework are as indicated on the drawings.

No gas pipework shall be run through unvented voids. All pipework must be sleeved when passing through structural walls.

All internal gas pipework shall be carried in mild steel. No plastic polyethylene pipe shall enter the building or be installed in the building.



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All new internal gas pipework internally in the building shall be installed in black steel pipe Class B seamless medium gauge, Blue band to B.S. 1387 with all joints welded, steel butt welding to B.S. 1965 to match pipe.

Fitting material shall be steel butt welding B.S. 1965 to match pipe or steel welding to B.S. 10 table E. No joints are to be installed on the pipework and all pipework shall be welded throughout to be in accordance with I.S. 820:2019.

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

Jointing by means of threaded joints will only be tolerated where this is necessary for connection to items of plant. Where this is necessary the joint shall only be made using an approved jointing tape as PTFE as per BS 3212.

The Mechanical Contractor shall supply and install pipework, brackets and supports as required for the gas installation as indicated on the drawings.

The gas pipework installation in the building shall comply fully with I.S. 820:2019 Non-Domestic Gas Installations.

Welding:

All new internal gas pipework installed in the building 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 Mechanical 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.

Bracketing and supports for gas pipework

All new gas pipework 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 the gas pipework.



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Supports shall be arranged to be as near as possible to changes in direction and joints.

The following are the bracket intervals for the steel gas pipework:

BORE (mm)	HORIZONTAL (m)	VERTICAL (m)
15	2.0	2.5
20	2.5	3.0
25	2.5	3.0
32	2.7	3.0
40	3.0	3.5
50	3.0	3.5
65	3.0	3.5
80	3.0	3.5
100	3.0	3.5
125	4.0	4.0

Painting of gas pipework:

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

The Mechanical 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.

Pressure testing of pipework:

General:

The Mechanical Contractor shall allow for carrying out a strength and soundness test on all the internal gas pipework installed. In the event of a failure of a test, the defect shall be repaired, defective part replaced, and the pipe replaced. After rectification works have been completed, the test shall be completed.

The test shall be carried out using air, nitrogen or another inert gas. Water shall not be used as a test fluid. Oxygen or distribution fuel gas shall also not be used



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Test equipment:

The test equipment used for the test shall be capable of being read in graduations of at least 1% of the required test pressure.

- For pressures $\leq 100\text{mbar}$, a water gauge (manometer) with a millimetre scale should be used.
- For pressures $\leq 300\text{mbar}$, a mercury or High Specific Gravity manometer should be used.
- For pressures $\geq 300\text{mbar}$, a verified gauge should also be used

Test pressure:

The test pressure chosen for a strength and soundness test to be carried out on any pipework shall be a function of its intended maximum operating pressure (MOP) as indicated below. The applied test pressure shall not exceed the pressure that any component of the pipework is capable of withstanding. Test pressure and stabilisation periods for gas pipework shall be as follows:

Maximum operating pressure (MOP)	Test pressure (for NG)	Test pressure (for LPG)	Temperature stabilisation min
greater than 2 bar and less than or equal to 5 bar	$1,40 \times \text{MOP}$	$1,40 \times \text{MOP}$	15 ^a
greater than 100 mbar and less than or equal to 2 bar	$1,75 \times \text{MOP}$	$1,75 \times \text{MOP}$	10
greater than 40 mbar and less than or equal to 100 mbar	$2,5 \times \text{MOP}$	$2,5 \times \text{MOP}$ (minimum 150 mbar)	5
less than or equal to 40 mbar	100 mbar	150 mbar	5

^a For test pressures greater than 2 bar it is necessary to condition the pipework before the test commences to allow for the elastic qualities of PE (creep).

Maintain this pressure without pumping for at least 1 hour without any drop in pressure. Repeat test as directed until system is proven gas tight. Comply with all supplier's requirements.

Upon completion of pressure testing, each system shall be purged with its own gas. The entire installation shall comply with I.S. 820:2019 Non-Domestic Gas Installations.



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Testing and commissioning:

Once the strength and soundness test has been successfully completed, the Mechanical Contractor shall provide a declaration commissioning cert of successful completion of the test.

This shall be completed by the person responsible for the test and shall include the following information:

- Date and time of test
- Description of 'Strength and Soundness Test'
- The diameter of pipework tested
- The duration of the test
- The pressure of the test
- Type and sensitivity of the gauge used
- Result of test
- Confirmation that the gas pipework installation is installed in compliance with I.S. 820:2019
- Name and signature of the competent person that completed the test.

54.04 Isolation valves

New gas valves in new pipe work up to and including 50mm nom. bore shall be full bore ball type lever valves without transition couplings. Valves in pipe work over 50mm 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 lever 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.





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54.05 New gas detection system for the boilerhouse

New gas detection system:

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 LPG gas pipework entering 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 (LPG gas) and carbon monoxide detectors.
- All other accessories as required.



Model:

The gas detection system shall conform to the following parameters:

- Suitable gas detection system shall be as 'Medem 'AGDS-V' (or equivalent). The dimensions of the panel shall be 180mm wide by 130mm high by 60mm 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.



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- 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.



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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-V' panel.
- Gas solenoid valve (line sized to suit).
- Suitable gas detectors (natural gas). There 1no gas detector to be installed in total. Detectors shall be located at low level in the 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.

Discuss with the Electrical Contractor on site.



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55.0 COOLING SYSTEMS

N/A



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56.0 SPACE HEATING SERVICES

General:

This section covers the space heating installation extending from where the LPHW pipework leaves the plantroom, Section 51.0 deals with the heating centre. The Contractor shall include for the supply, installation, testing and commissioning of a LPHW heating system as shown on the drawings and described in this specification.

The existing boiler, pipework, pumps, BMS controls, associated fittings, other heating equipment, etc. are being retained in the plantroom. A new LPHW heating circuit shall be provided for the building. Care is to be taken to avoid running pipe work runs over electrical services and distribution boards.

The space heating installation is a low-pressure hot water, accelerated and sealed system. The system is designed for a flow temperature of 80 degrees C and return temperature of 60 degrees C. Heat emitters have been sized to maintain an indoor temperature of 21 degrees C in permanently occupied areas and a temperature of 18 degrees C in transit areas and stores, when the outdoor air temperature is -4 degrees C.

There shall be a total of 4no. new LPHW circuit to be installed in the new boilerhouse for the building.

Control of heat emitter output shall be by weather compensation. The boiler 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.

Frost protection is also included. Spare tappings shall be provided on the main flow and return low loss header to serve any possible future expansion.

Individual circuits shall be served from the existing low loss flow and return header located in the plantroom. The installation shall be served by the new oil supply as shown on the drawings. The Contractor shall include for the testing and commissioning of the new LPHW heating system once all works are completed. All testing must be witnessed by Employer's Representative.

The Contractor shall include for the testing and commissioning of the new LPHW heating system once all works are completed. All testing must be witnessed by Employer's Representative.



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56.01 Low water content radiators

Existing radiators in the building:

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-H2O 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 on the drawings.

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:

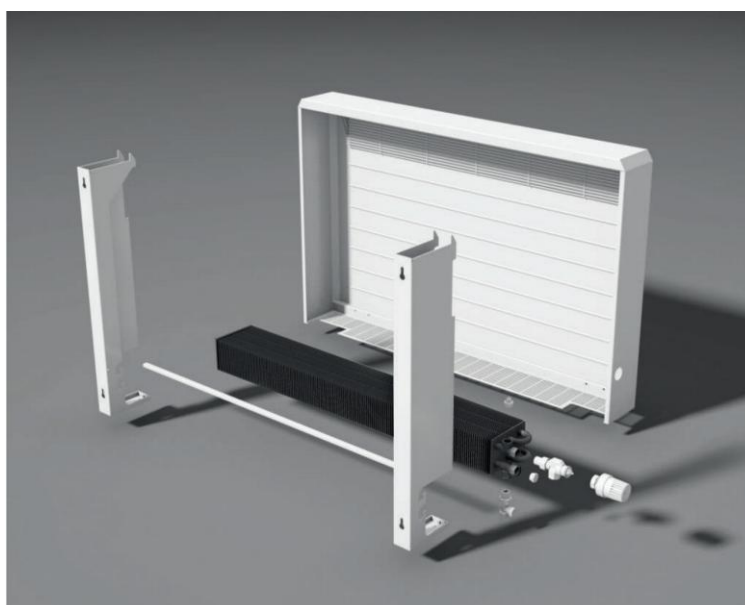
All new radiators shall be Low-H2O technology (low-water content) radiators. New radiators shall adhere to the following:



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General:

In general the radiators shall be as follows:

- Radiator shall be low surface temperature (Low-H₂O 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.



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- 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 53no. new low water content radiators to be supplied and installed in the building.

The radiator schedule is as below:



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Radiator Schedule									
Location	Ref	Style	Code	Type	Height	Length	Depth	Output at Δt 50	Output at Δt 30
Link Corridor	R01	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
Link Corridor	R02	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
Link Corridor	R03	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
Link Corridor	R04	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
Link Corridor	RR05	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	RR06	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
Mainstream Classroom 1	RR07	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	RR08	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	RR09	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
Mainstream Classroom 1	RR10	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	RR11	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	RR12	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
Multi Activity	RR13	Maxi WF	MAXW.074.063.130.101/WF	H11	740	2030	130	2555	1197
Quiet Space	RR14	Maxi WF	MAXW.059.1830.130.101/WF	H11	590	1830	130	1753	821
Storage	RR15	Maxi WF	MAXW.059.1830.130.101/WF	H11	590	1830	130	1753	821
Class Base	RR16	Maxi WF	MAXW.074.163.230.101/WF	H11	740	1830	230	3801	1765
	RR17	Maxi WF	MAXW.074.163.230.101/WF	H11	740	1830	230	3801	1765
	R18	Maxi WF	MAXW.074.163.230.101/WF	H11	740	1830	230	3801	1765
Lobby	RR19	Maxi WF	MAXW.059.1830.130.101/WF	H11	590	1830	130	1753	821
Acc WC	R20	Maxi WF	MAXW.059.830.130.101/WF	H11	590	830	130	674	316
Lobby	R21	Maxi WF	MAXW.059.1830.130.101/WF	H11	590	1830	130	1753	821
Staff WC	R22	Maxi WF	MAXW.059.830.130.101/WF	H11	590	830	130	674	316
Staff WC	R23	Maxi WF	MAXW.059.830.130.101/WF	H11	590	830	130	674	316
Sluice	R24	Maxi WF	MAXW.059.083.130.101/WF	H11	590	830	130	674	316
Office	R25	Maxi WF	MAXW.059.183.230.101/WF	H11	590	1830	230	3324	1542
Stairwell	R26	Maxi WF	MAXW.059.143.230.101/WF	H11	590	1430	230	2505	1162
Resource Room	R27	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	R28	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	R29	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
Set 2	R30	Maxi WF	MAXW.059.163.230.101/WF	H11	590	1630	230	2914	1352
Set 1	R31	Maxi WF	MAXW.059.163.230.101/WF	H11	590	1630	230	2914	1352
Secretary's Office	R32	Maxi WF	MAXW.059.143.230.101/WF	H11	590	1430	230	2505	1162
Principals Office	R33	Maxi WF	MAXW.059.163.230.101/WF	H11	590	1630	230	2914	1352
WC	R34	Maxi WF	MAXW.059.830.130.101/WF	H11	590	830	130	674	316
Classroom	R35	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	R36	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	R37	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
Classroom	R38	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	R39	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	R40	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
WC	R41	Maxi WF	MAXW.059.830.130.101/WF	H11	590	830	130	674	316
Entrance	R42	Maxi WF	MAXW.059.1830.130.101/WF	H11	590	1830	130	1753	821
Kitchenette	R43	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
Store	R44	Maxi WF	MAXW.059.1230.130.101/WF	H11	590	1230	130	1384	655
Classroom	R45	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	R46	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	R47	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
Lobby	R48	Maxi WF	MAXW.059.1830.130.101/WF	H11	590	1830	130	1753	821
Store	R49	Maxi WF	MAXW.059.1230.130.101/WF	H11	590	1230	130	1384	655
180,180,561,818	R50	Maxi WF	MAXW.059.830.130.101/WF	H11	590	830	130	674	316
Classroom	R51	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	R52	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733
	R53	Maxi WF	MAXW.074.203.230.101/WF	H11	740	2030	230	5794	2733

Thermostatic Radiator Valves (TRV's):

Some radiators shall be supplied with Thermostatic Radiator Valves (TRV's). Refer to section 51.06 below for further information.

The TRV's shall be supplied with the radiators as indicated. A special cut-out is required in the radiator casing for the TRV.

The Contractor shall allow for supplying and installing the TRV in conjunction with the new radiators and shall discuss the location and quantity of TRV's with the radiator supplier prior to ordering the radiators or the TRV's.



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56.02 LPHW Pipework and pipework supports

General:

New LPHW (Low Pressure Hot Water) heating flow and return pipework shall be installed throughout the building from the boilerhouse to all the radiators in the building as indicated on the drawings. Refer to the drawings for location, routes and sizes.

LPHW pipework:

All new LPHW (Low Pressure Hot Water) heating flow and return pipework to be installed throughout the building 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 new LPHW heating and flow services pipework shall be installed in gun barrel steel.

New LPHW flow and return pipework shall be supplied throughout the new extension building from the boilerhouse to all the new heat emitters throughout. Pipework shall be as specified in paragraph above. All LPHW flow and return pipework and the LPHW headers in the boilerhouse shall also be as specified above.



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Where possible, the main runs of heating pipework shall be installed in the ceiling void above the suspended ceiling.

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

LPHW pipework installed below the ceiling:

All new mild steel LPHW flow and return pipework installed below the ceiling shall have all joints welded, steel butt welding to B.S. 1965 to match pipe. Specification of pipework as highlighted above.

LPHW pipework installed above the ceiling:

All new mild steel LPHW flow and return pipework installed above the ceiling shall have all joints welded, steel butt welding to B.S. 1965 to match pipe or shall have threaded joints. Specification of pipework as highlighted above.

Painting of Heating Services Pipework:

All new LPHW (Low Pressure Hot Water) flow and return heating services heating distribution pipework installed throughout 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 Contractor 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 rust 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.



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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 in the attic space shall be run on suitable unistrut brackets that are either supported off the floor or off the wooden trusses.

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



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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

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.



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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.

Supply and commissioning:

The Contractor shall allow for supplying and commissioning the entire LPHW system throughout the building. 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 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



Circuit Valves:

Fit control valves on 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.



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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 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 immediately before the two-port valve. 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 $\pm 5\%$ 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.



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- Adaptor kit for use with copper tube.



Strainers:

Strainers must be installed to protect to the two-port valves or circuits 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.



Labelling:

All new LPHW flow and return pipework installed above the ceiling throughout the building shall be labelled with appropriate colour identification bands, flow indication arrows and zone numbers.



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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.

56.03 Below ground pipework (ASD Unit)

All underground pipework feeding radiator shall be multi-layer composite pipe shall be a non-crossed linked polyethylene pipe. The multi-layer composite pipe (MLCP) shall be 100% diffusion-resistant multi-layer composite pipe, five-layer (PE-RT – adhesive agent – continuously overlapped welded aluminium adhesive agent PE-RT) as Uponor MLCP pipe, or equivalent. The pipe shall be WRAS Scheme approved.





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56.04 Heating Manifold

Heating manifolds:

The Contractor shall install a suitably sized flow and return manifold with all necessary outlets on the manifold for all underfloor heating circuits in the Building as indicated on the drawings (connections to suit the number of circuits). The manifold shall supply all the circuits via underground F&R (flow and return) pipework so all areas shall be individually connected back to the the F&R manifold. The flow and return manifold shall be supplied with a drain valve on the header and all connections to the F&R manifold shall have isolation valves.

Underfloor heating manifolds to be constructed from Nickel plated brass with pin operation valve to return manifold and mechanical valve to flow manifold with lock shield and set valve facility to each heating loop.

Isolation valves, union valve and temperature gauges to all manifold connections on both flow and return connection.

All manifolds to be fitted with flushing points, valve and cap to both flow and return.

Manifolds for the underfloor heating system shall be fitted inside white powdered coated galvanized steel cabinets with flush or surface mounting. Manifold cabinets shall be sized to hold electrical smart box control and EuroFast floor mechanical manifold.

Mainifolds shall be as Eurotech Eurofast manifolds as supplied by Eurotech Group, or equivalent.

The contractor shall allow for restriction valves on the flow pipework to manifolds 1-3 to reduce the temperature of the water passing through the pipework. This will ensure that the new concrete floor don't crack.

Automatic air vents

Fit automatic air vents at all high points on all heating pipes at high level within the building. The Contractor shall ensure that pipes are laid with the correct gradient to eliminate air locks and to allow for adequate venting.



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56.05 Insulation

General:

All new LPHW flow and return heating services pipework installed in ceiling voids, box-outs, etc. shall be insulated as described in section 51.05 above.

Refer to section 51.03 for information on insulation required on all internal LPHW heating flow and return services pipework installed in ceiling voids, box-outs, etc.

Painting of Pipework prior to insulating:

Refer to section 56.02.

56.06 Radiator valves

The Mechanical Contractor shall allow for all necessary radiator control valves for all radiators. 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 valves are shall be Scanflow (F.F.) type, or equivalent.

56.07 Thermostatic radiator valves (TRV's)

The Contractor shall allow for the supply and fitting of thermostatic radiator control valves (TRV's) radiators as indicated on the drawings. Refer to the drawings and radiator schedule for a list of radiators where TRV's are to be installed on.

The TRV's shall be supplied with the radiators as indicated. A special cut-out is required in the radiator casing for the TRV. The Contractor shall allow for supplying and installing the TRV in conjunction with the new radiators and shall discuss the location and quantity of TRV's with the radiator supplier prior to ordering the radiators or the TRV's. See drawing for quantities and locations.

TRV's shall conform to the following:

- Conforms to BS EN215-1.
- Maximum operating pressure 10 Bar.
- Maximum water temperature 120°C.
- Maximum differential pressure 0.6 Bar.
- Differential Pressure Influence: 0.5K.
- Water Temperature Influence: 0.5K.
- Response Time: 26 minutes.
- Liquid Filled Sensing Element.
- Supplied in Chrome finish.



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- Hysteresis at nominal flow rate: 0.5K.
- Frost setting 8°C.
- Two way flow engineering
- Sizes shall be as final size of pipework to radiators.

TRVs shall be Herz TS 90 with Herz Thermostatic Head or equal and approved,



56.08 Motorised two-port valves and combined temperature sensor and CO2 sensor in rooms (controlled from BMS)

General:

Radiators and heating in the majority of the rooms as indicated on the drawings shall be temperature controlled from the BMS controls panel. To do this a two-port motorised valve shall be installed on the heating services pipework to the majority of rooms and this motorised valve shall be linked and controlled by the BMS controls panel.

A combined temperature sensor and CO2 sensor shall be installed in the room to control the temperature in the room. This sensor shall also be linked back and controlled by the BMS controls panel

The combined temperature/CO2 sensor and motorised two-port valve shall be supplied as part of the BMS controls package. Refer to section 51.22.

However, the Mechanical Contractor shall allow for installing the combined temperature/CO2 sensor and motorised two-port valve in each room as indicated on the drawings.

Quantities as indicated on the drawings. Refer to the drawings and the radiator schedule for what rooms requires a combined temperature/CO2 sensor and motorised two-port valve.



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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 quantities on the drawing where the two-port valve and thermostat arrangement shall be installed. See drawings to confirm quantities, locations and pipe sizes.

56.09 Flush out and pressure test

Flush out of new pipework:

Upon completion of the LPHW flow and return pipework installation in the building but before fitting any radiators; all pipework 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 Mechanical 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.

Test certificates for the testing of all pipework shall be provided by the Contractor for the testing of the pipework.

Power flushing:

The entire heating pipework system shall be power flushed using 'Ferno Powerflush II', or equivalent.



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56.10 Commissioning

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



57.0 VENTILATION WORKS

General

The Contractor shall be responsible for all ventilation works and shall ensure that the full price for this work is included in the tender price. This section of the Specification outlines the ventilation services installation and describes the particular requirements of the relevant services to be installed. 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.

Ductwork materials, construction and installation must comply with the relevant parts of the following publications:

- HVCA DW/144: Specification for sheet metal ductwork - low, medium and high pressure/velocity systems
- HVCA DW/143: A practical guide to ductwork leakage testing
- HVCA DW/154: Specification for plastics ductwork
- HVCA DW/171/172: Guide to good practice for kitchen ventilation systems
- HVCA DW/191: Guide to good practice for glass fibre ductwork
- HVCA TR/17: Guide to good practice, cleanliness of ventilation systems
- HVCA DW/TM2: Internal cleanliness of new ductwork installations
- BS 5588 & BS 476: Fire resisting ductwork and fittings construction.

57.01 Galvanised sheet metal ductwork

All new ventilation ductwork to be installed throughout the building shall be of the best quality galvanized sheet steel fabricated in accordance with good practice in a neat and workmanlike manner, true to size and internally free from sharp edges and obstructions.

It shall comply with the provisions of DW/ 144 - Specification for Sheet Metal Ductwork - published by the HVCA in 1982, and when erected be free from vibration and damping, rigid and truly air tight under operating conditions.

Standards:

- | | |
|------------------------------------|-------------------------|
| a) Pressure Classification: | Class B medium pressure |
| b) Leakage Classification: | Class B medium pressure |



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c) **Positive and Negative Pressures:** 1,000Pa Positive. 500Pa Negative.

d) **Materials:** Galvanised ductwork shall be made from continuously hot-dipped zinc coated wide strip sheet/plate and slit wide strip to BS.EN10142. GradeDX51D+Z, coating type Z275. The material shall be suitable for profiling and bending.

e) **Negative Pressure Classification:** Class B medium pressure.

Special Requirements:

Air Leakage Testing:

All low pressure supply and extract ductwork is to be leakage tested in accordance with DW/143 and the leakage limits in table B16.15 of the CIBSE Guide and DW/144.

Air leakage limits shall be $0.009 \times p^{0.65}$ litres / m² of duct surface area.

Protective Finishes:

Where galvanised ductwork is located outdoors and un-insulated, or where the galvanising is broken during the manufacturing process and installation, it shall be treated in accordance with Clause 2.20 of Section 2. All steel ductwork supporting members and flanges shall also be protected in accordance with Clause 2.20.

Outdoor ductwork must be protected, whether insulation or any other covering is applied or not, with two coats of chlorinated rubber paint. The surface must be properly de-greased and prepared for the paint. Colour of paint to be selected.

Installation of ductwork in the attic space

In order to install the new ductwork, the Mechanical Contractor shall allow for all brackets and bracing for the ductwork. The Mechanical Contractor shall allow for hanging the containment for the ductwork from the thrushes at low level in the attic space and installing suitable supports in order for the unistrut to be installed from the thrushes in the attic space.

In order to install the ductwork at low level in the attic space, the Mechanical Contractor shall allow for the following:



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- Dropping 10mm threaded rod from the thrushes at 500mm distances over the length of the ductwork run. Allow for a drop of approximately 400mm.
- The threaded rod shall be hung from the thrushes in the attic space via 10mm G-Clamps or supports shall be drilled into the ceiling for supports.
- The base supports for the ductwork shall be single channel unistrut. Supports shall be placed at 500mm distances over the length of the ductwork run. Allow for a drop of approximately 400mm.
- Allow for connecting the threaded rods to the single-channel unistrut.

57.02 New ductwork to and from the new heat recovery units

General:

As indicated on the drawings and specified in 57.08 and 57.09 below, the Contractor shall allow for the supply and installation of 9no new semi recessed heat recovery units in the building for the supply of fresh air to some rooms and also for the extract of stale air from those rooms.

The new heat recovery units and all associated ductwork from and to the heat recovery unit shall be installed by the Mechanical Contractor as indicated on the drawings.

The Mechanical Contractor shall allow for all ductwork to and from the new semi recessed heat recovery units as indicated on drawings. As indicated on the drawings, the following ductwork shall be supplied to and from each new heat recovery unit:

- Fresh air supply ductwork to the semi recessed heat recovery unit from the outside.
- Stale air return ductwork from the semi recessed heat recovery unit to the outside.

All ductwork to and from the new heat recovery unit as highlighted above shall be installed in galvanised steel ductwork. See below for specification on galvanised steel ductwork. See section 57.02 above for specification below on ductwork required for heat recovery units.

Routes and sizes of all ductwork are as indicated on the drawings.

All new ductwork from the new semi recessed heat recovery units shall be installed in circular ductwork. Allow for all necessary connections in order to connect the ductwork from the semi recessed heat recovery units to the relevant internal grilles as indicated on the drawings.



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The Contractor shall also allow for the complete supply, installation, testing and commissioning of the ductwork to and from the heat recovery units as indicated on the drawings.

All new ductwork to and from the semi recessed heat recovery units shall be insulated as described below. Refer to 57.04 for further information on insulation.

Allow for all necessary works and materials in connecting the necessary ductwork to all the relevant supply grilles in the ceiling, roof termination cowls on the roof and external louvres in the external walls as indicated on the drawings.

Allow for all necessary, materials, ductwork, ductwork drops, bracing, etc. for installing the ductwork to and from the semi recessed heat recovery units. Allow for all necessary, materials, ductwork, ductwork drops, bracing, etc. for installing all new ductwork to and from the semi recessed heat recovery units as indicated on the drawings.

The Contractor shall liaise with all other trades on site during installation and also for briefing staff on the correct operation of all aspects of the installation.

Insulation on ductwork:

All the new ductwork to and from the semi recessed heat recovery units shall be thoroughly insulated over the length of their run as described in 57.04.

Galvanised steel ductwork:

All new ventilation ductwork installed throughout the building for shall be of the best quality galvanized steel sheet fabricated in accordance with good practice in a neat and workmanlike manner, true to size and internally free from sharp edges and obstructions. See section 57.02 above for specification below on ductwork required for semi recessed heat recovery units.

57.03 Insulation to be installed on new ductwork

The Mechanical Contractor shall allow for insulating all the ductwork to and from each semi recessed heat recovery units in the relevant rooms as specified below and as highlighted on the drawings:

- All new fresh air supply ductwork to each semi recessed heat recovery unit from the outside.
- All new stale air return ductwork from each semi recessed heat recovery unit to the outside.



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All new ductwork as highlighted above shall be insulated using ISOVER (or equivalent) foiled back mineral wool compressed insulation or equivalent. All insulation shall be 50mm uncompressed insulation.

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. The insulation shall also be applied to all connections, bends, tees and valves. Insulation shall be applied by experienced pipe and duct coverers, as per best trade practice and manufacturer's printed installation directions. Insulation shall not be applied before surfaces are cleaned and systems tested. All insulation and finishes shall be class 'O' fire rated.

The entire installation shall be strictly in accordance with BS 5422: 2009, BS 5970, IS EN 13166:2012, BS 3958, B.S. 476 & BS 5608 as appropriate and manufacturer's recommended procedures. Thermal insulation of buried services must comply with BS 4508.

The Contractor shall include for the supply and installation of insulation to all new ductwork to and from the semi recessed new heat recovery units as indicated on the drawings. All ductwork shall be thermally insulated and incorporate a vapour barrier.

The insulation shall be pinned and bonded to the ductwork whether in rigid sheets or flexible rolls. All insulation shall have an aluminium foil laminate on the outside. All joints and penetrations of the vapour barrier shall be carefully sealed with sealant and finished in an approved adhesive tape.

The finished insulation on the ductwork shall have a fine galvanised wire mesh fitted over the entire ductwork for additional support and to prevent it from falling away due to self-weight. Joints in the wire mesh shall be on the top of the ductwork.

Insulation shall be 50mm thick on internal ductwork and have a thermal conductivity of 0.038W/MK at a mean temperature of 10° C. The Contractor shall employ the services of a specialist firm to carry out all ductwork thermal 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.

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



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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.

Supports shall be so arranged as to prevent the ingress of moisture to the insulation. The supports shall be insulated from the ductwork by lining the supports with insulation of sufficient density and thermal conductivity appropriate to the duty.

57.04 Flexible ducting

Flexible ducting shall be used to connect the circular ductwork to each grille, fan and any other ventilation unit.

Flexible ducting shall be of the acoustic type, SONADEC 25 AA3 (or equivalent) as supplied by 'Ventac'. Lengths of flexible ducting to grilles shall not exceed 1000mm.

57.05 New floor standing heat recovery units

General:

The Mechanical Contractor shall allow for the supply and installation of new floor standing Heat Recovery Units (HRU) and associated ductwork to and from the HRU in each of the following rooms as indicated on the drawings.

In total there shall be 9no floor standing heat recovery units c/w associated connections, controls, etc. installed throughout the building.

Each new HRU shall be installed the room shall be floor standing in each space throughout the building.



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The Mechanical Contractor shall allow for the supply, installation, testing and commissioning of the 9no new floor standing heat recovery units in the rooms as indicated on the drawings. This includes the heat recovery unit (HRU), associated controls, associated works, ductwork, etc. Refer to the drawings for locations.

The new semi recessed heat recovery units and all accessories shall be supplied, installed and commissioned by the Mechanical Contractor as part of this contract.

Specification of the new heat recovery unit:

The Contractor shall allow for the supply, installation and testing of the following heat recovery unit in each of the rooms as indicated on the drawings.

Please note that there are 9no HRU's to be supplied and installed throughout the building. The specification of each unit shall be as follows:

Quantity:

- Number of units: 3no
- Reference: HRU-01, HRU-02 & HRU-03.

Make and construction of the unit:

- Model: Versatile Saludem, or equivalent.
- Airflow range: 300-1440m³/h
- Dimensions: 2114mm high x 788mm deep x 906mm wide
- Ducting diameter: 250mm $\varnothing$ x 2no.
- Weight: 331kg
- Filter (Supply/Exhaust): ePM1 50% F7
- Heat Exchanger: RECOeconomic Type
- Electric Air Heater: 1.2kW
- Environmental Product Dec: ISO 14001 & Repa Register no. 5560778465.
- Materials: Sheet Metal 84%, Aluminum 4%, Polymeric material 1%, Mineral wool insulation 6%, Filter 1%, Electronic equipment 4%.
- Panels Colour: RAL 9002

Electrical & controls details of the unit:

- Supply voltage: Single phase 230V/50Hz
- Power rating: 400watts

Accessories to be supplied for each unit:

- Controller: Allow for the supply of a TAC 5 remote



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controller as CID37 2096 with each unit. The controller shall be installed in the room as indicated.

- CO2 sensor: Allow for the supply of a CO2 sensor with the unit. The wiring for this unit shall be discussed with the Electrical Contractor on site.
- Room Sensing: TBLZ-1-24-2 For wall mounting. Enclosure class IP 20.
- Timer: ELQZ-1-406-a 0-2 hour prolonged operation.
- Push button for prolonged operation: ELQZ-1-406-a 0-2 hour operation.
- Presence Detector: TBLZ-1-56
- Air quality sensor, room: ELQZ-2-504
- SD Card: TBLZ-1-62-a
- IQnomic Plus: TBIQ-2-1-aa (required for closing the motorised damper when the unit shuts off.
- Modular/terminal adaptor: TBLZ-1-55
- External wall hood: TBHF-2-0025-b
- Cover Plate: CACZ-2-07
- External air connection piece: CACZ-2-06
- Door Lock: TBLZ-1-57
- Damper with motor: TBSA-1-000-025-1-a Tightness Class 3, 250mm dia. connection
- Louvre Damper: TBLZ-1-54
- Electric Air heater,Salutem: CARE-1-01



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Image of the proposed floor standing heat recovery unit:



57.06 Motorised Back Draught Damper

The Mechanical Contractor shall allow for the supply and installation of motorised back draft dampers on the fresh and stale air ductwork to and from each of the heat recovery units.

The damper shall be powered directly from the heat recovery unit.

Allow for an enable signal from the heat recovery unit to each of the motorised dampers. The dampers shall open when the unit is activated and shall close when the unit is not in use.

The Mechanical Contractor shall allow for the supply and installation of these back draft dampers.

In total there are 24no back draft dampers to be supplied and installed on the ductwork which shall be as follows:

- Shut off damper with electric motor LM 24 A-F, LM 230 A-F, CM 23 F or CM230 F
- Consists of a DTU damper with 24 or 230 V motor added.
- Has a low height to fit in narrow spaces
- In outdoor installation, the motor shall be protected from direct UV radiation.
- Fulfills pressure class C in closed position.

Damper shall be as 'DTBLU 315' as supplied by Lindab, or equivalent.





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57.07 External louvres & External Wall Hoods

The Mechanical Contractor shall allow for the supply and installation of the following external louvres:

EXTERNAL FRESH AND STALE LOURVES (TYPES 'SAG' AND 'FAG')					
Ref No.	Qty	Type	Ductwork connection to louver (mm)	Size of neck connection on grill (mm)	Overall size of grill (mm)
SAG.01 to SAG.04	4no	CL-150 from the Series CL circular cast external louvers	125mm diameter	150mm diameter	150mm diameter
FAG.01 to FAG.04	4no	CL-150 from the Series CL circular cast external louvers	125mm diameter	150mm diameter	150mm diameter

Notes:

- Louvres shall have a metal aluminium finish.
- Louvres shall have a stainless steel bird mesh.
- Include for plenum on back of louver for ductwork connection.
- Suitable for external use.
- Samples of all grille / diffuser types to be provided on request
- All louvres shall be spray painted to a RAL colour to a RAL colour to match the proposed window frames and or rainwater goods. The grilles shall be finished with a polyester powder coating to RAL colour to match the external cladding on the building. Therefore, the Contractor shall allow for the powder coating of the grilles to the selected RAL colour which is to be approved by the architect/client. Include for spray painting the grilles as highlighted above.
- Samples of all grille / diffuser types to be provided on request





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EXTERNAL WALL HOOD				
Ref No.	Qty	Type	Ductwork connection to louvre (mm)	Overall Dimensions (mm)
EWL.01 to EWL.08	8no	Salutem external wall hood	250mm diameter	683mm wide x 470mm high x 220mm deep
Notes: ○ Made from aluminium-zinc plated sheet steel painted to a RAL colour to match the proposed window frames and or rainwater goods. ○ RAL 7021Environmental Class C4. ○ Installation 250mm dia. connections fitted with rubber seal rings. 				

Power coating and spraying of all external louvres:

All louvres shall be spray painted to a RAL colour to match the external cladding on the building. The louvres shall be finished with a polyester powder coating to RAL colour to match the external cladding on the building.

Therefore, the Contractor shall allow for the powder coating of the grilles to a the selected RAL colour which is to be approved by the architect/client.

Include for spray painting the grilles as highlighted.

57.08 Internal grilles

Supply and install all internal grilles, diffusers and disc valves as indicated on the drawings.



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SUPPLY AIR GRILLES (TYPE 'SG')

Ref No.	Qty	Type	Volume (m ³ /s)	Neck Size (mm)	Overall Size (mm)
PG.01 to PG.04	4no	Disc valve as KI 100 supply valve	-	100mm diameter	130mm diameter

- Grilles shall have RAL 9010 colour finish.
- Samples of all grille / diffuser types to be provided on request
- All grilles shall be manufactured from sheet metal with a stove enamelled white finish.
- The outer body is fitted with a gasket to form an airtight seal with the mounting ring



EXTRACT GRILLES (TYPE 'EG')

Ref No.	Qty	Type	Volume (m ³ /s)	Neck Size (mm)	Overall Size (mm)
EG.01 to EG.11	11no	Disc valve as KSU exhaust valve	-	100mm diameter	130mm diameter

- Grilles shall have RAL 9010 colour finish.
- Samples of all grille / diffuser types to be provided on request
- All grilles shall be manufactured from sheet metal with a stove enamelled white finish.





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57.09 Roof Terminal Cowls

The Contractor shall allow for the supply and installation of 8no roof termination cowls on the roof as indicated on the drawings. The Contractor shall allow for the connecting of the ductworks to the roof termination cowls and for the supply and installation of the roof termination cowls on the roof.

ROOF TERMINATION COWLS					
Ref No.	Qty	Type	Volume (m ³ /s)	Neck Size (mm)	Overall Size (mm)
RTC.01, RTC.02, RTC.03, RTC.04	4no	Roof termination cowl as 'Roof Termination Sets - 100mm'	-	100mm diameter	150mm long x 150mm wide x 100mm high
RTC.05, RTC.06	2no	Roof termination cowl as 'Roof Termination Sets - 150mm'	-	150mm diameter	200mm long x 200mm wide x 100mm high
RTC.07, RTC.08, RTC.09	3no	Roof termination cowl as 'Roof Termination Sets - 100mm'	-	100mm diameter	150mm long x 150mm wide x 100mm high
RTC.10, RTC.11, RTC.12, RTC.13	4no	Roof termination cowl as 'Roof Termination Sets - 100mm'	-	100mm diameter	150mm long x 150mm wide x 100mm high
○ Samples of all cowl to be provided on request ○ Cowls shall consist of direct mount spigot, adaptor kit, roof cowl, deflector and all screws as 'Roof Termination Sets - 315mm' as supplied by Vent-Axia, or equivalent. ○ Include for all accessories.					



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57.10 Extract fans

Extract fans shall be installed for the areas indicated on the drawings. These fans shall be supplied and installed by the Mechanical Contractor under the provision of this contract. The Contractor shall allow for all necessary accessories and connections. Supply & fit all extract fans as indicated in the drawings.

The Contractor shall liaise with the Electrical Contractor for extract fan power supply locations and wiring details for the wall mounted fan controllers. The Contractor shall allow for the supply and installation of the following extract fans:

Ref No.	Location	Type	Duty	CAT No.	Control
EF.01	WC 1	In-line Duct Mounted Extract Fan	101m ³ /hr @ 50Pa	TD-160/100 NT SILENT ECOWATT	By remote PIR Sensor as CPFL-S c/w 15 min overrun timer
EF.02	WC 1	In-line Duct Mounted Extract Fan	101m ³ /hr @ 50Pa	TD-160/100 NT SILENT ECOWATT	By remote PIR Sensor as CPFL-S c/w 15 min overrun timer
EF.03	WC 1	In-line Duct Mounted Extract Fan	101m ³ /hr @ 50Pa	TD-160/100 NT SILENT ECOWATT	By remote PIR Sensor as CPFL-S c/w 15 min overrun timer
EF.04	WC 1	In-line Duct Mounted Extract Fan	101m ³ /hr @ 50Pa	TD-160/100 NT SILENT ECOWATT	By remote PIR Sensor as CPFL-S c/w 15 min overrun timer
EF.05	Multi Activity	In-line Duct Mounted Extract Fan	240m ³ /hr @ 50Pa	TD-500/150-160	By remote PIR Sensor as CPFL-S c/w 15



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				ECOWATT	min overrun timer
EF.06	Changing Place	Changing Place	130m ³ /hr @ 100Pa	TD EVO-100 ECOWATT	
EF.07	ACC WC	In-line Duct Mounted Extract Fan	100m ³ /hr @ 50Pa	TD-160/100 NT SILENT ECOWATT	By remote PIR Sensor as CPFL-S c/w 15 min overrun timer
EF.08	Staff WC	In-line Duct Mounted Extract Fan	130m ³ /hr @ 50Pa	TD EVO-100 ECOWATT	By remote PIR Sensor as CPFL-S c/w 15 min overrun timer
EF.09	Staff WC	In-line Duct Mounted Extract Fan	130m ³ /hr @ 50Pa	TD EVO-100 ECOWATT	By remote PIR Sensor as CPFL-S c/w 15 min overrun timer

Notes:

1. PIR sensor shall be sensitive to infrared radiation emitted by bodies in movement, with a 360° detecting angle as CPFL-S (Surface mount model) or equivalent. The Contractor shall ensure that the remote PIR sensor is suitable for the extract fan to be installed.
2. All fans to have a run-off-timer incorporated into the fan.
3. The Contractor shall allow for supplying fans to suit the ducting installation, layout and sizes.
4. Extract fans to be as supplied by Ventac, Vent Axia, Systemair or equivalent.
5. The in-line extract fan installed in the multi-sensory room shall be controlled from a single phase electronic speed controller.
6. **All extract fan must comply with the NZEB/BER assessment. The fan shall have a SFP (Specific Fan Power) of 0.3w/l/s as outlined in Table 6 from TGD Part L.**

PIR sensor for toilet extract fans:

All fans for the toilets shall be controlled by a remote PIR sensor. The PIR sensor shall be sensitive to infrared radiation emitted by bodies in movement, with a 360° detecting angle as CPFL-S (Surface mount model) or equivalent.



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57.11 Volume control/balancing dampers

Supply and install volume control damper valves on the branches of ductwork as indicated on the drawings. Sizes shall match the size of the duct where the damper is indicated to be located.

Dampers shall be manufactured from aluminium and shall be complete with spigot connections as required. Balancing dampers shall be opposed blade type balancing dampers, complete with operating lever, quadrant and locking device.

Manual dampers shall include a device for positioning and locking the damper blades. The positions of all manual dampers, as set after final regulation, shall be indelibly marked at the adjusting devices.

Standard volume control dampers for rectangular ductwork shall be as 'HVC-NCA Series 900 (Model B)' for rectangular duct (or equivalent) as supplied by Lindab, or equivalent.



Standard volume control dampers for circular ductwork shall be as 'HVC-NCA Series 900 (Model C)' for circular duct (or equivalent) as supplied by Lindab, or equivalent.



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All dampers shall adhere to the following specifications:

- Shall be tested to DW144 Class D at a static pressure of 2000Pa for a minimum time of 15 minutes with negligible leakage recorded.
- Aluminium blades
- Stainless steel jamb seals.

57.12 Labelling and identification

All new ductwork (including above ceilings) shall be labelled with appropriate colour identification bands and flow indication arrows. Labels shall be provided on all ductwork indicating the function of each duct, the air quantity being carried, the air velocity and the direction of flow.

Where access doors into ducting are provided, these shall be labelled to indicate their function. The labels shall consist of laminated plastic tape 19mm high with self-adhesive backing and block capital lettering 12 mm high.

The Contractor shall identify and label in a clear and legible manner all ductwork services runs in accordance with DW / 144 Appendix B.

All identification shall be by means of self-adhesive flexible plastic labels, engraved plastic labels or stencilled lettering with permanent paint. All identification label colours to BS 4800 shall be in accordance with Table 18 of Appendix B.

All items of equipment such as heat recovery units, fans, dampers, etc. whatsoever, supplied and fitted by the Contractor under this section of the contract shall be provided with labels of approximate size 150 mm x 80 mm x 1.63 mm s.w.g. In general, all labels on equipment shall be engraved on rigid plastic plates and secured to the item of equipment by means of screws.

57.13 Commissioning

The Contractor shall allow for commissioning the entire ventilation and air-conditioning system once all works are completed within the building. The



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Contractor shall employ a suitably qualified company to carry out the commissioning. This shall include flow rates for each grill and the balancing of the dampers and fans to achieve the required flow rate in each room as indicated on the drawings.

The ventilation systems shall be regulated by proportional balancing as specified in the codes. The Contractor shall obtain from the Engineer a list of design flow rates and acceptable tolerances before commencing balancing operations.

The Contractor shall provide a commissioning report confirming the actual flow rate of each grill to the design flow rate and the reason for any discrepancies.



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58.0 PROTECTIVE SERVICES

58.01 Fire extinguishers

Supply and fit the fire extinguishers and fire fighting equipment for the building 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):

Types of fire extinguishers are as follows:

- **Type A:** 6litre Foam
- **Type B:** 2kg CO²
- **Type C:** 5kg Dry Powder
- **Fire Blanket:** Fire Blanket to BS 6575

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.



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59.0 COMMISSIONING AND HANDOVER

59.01 Commissioning of the systems

Extent Of Works

This section covers the commissioning of all services.

Order Of Commissioning

The Contractor shall allow for the commissioning of the services in the following order:

- a) Domestic cold water
- b) Mains water
- d) Boiler, gas services, LPHW services and heating controls
- e) Hot water
- f) Ventilation
- g) BMS

Principles And Procedures Of Commissioning

The Contractor shall carry out tests in accordance with C.I.B.S.E. commissioning codes and the following B.S.R.I.A. Application guides:

- Commissioning of Pipework systems: design considerations.
- Pre-commissioning cleaning of water systems.
- The commissioning of water systems in buildings.
- The commissioning of air systems in buildings.

Cleaning And Flushing Out

Before the Engineers authority to commence filling the system prior to commissioning is given, the Contractor shall satisfy the Engineer by means of a written report that the procedures as laid down in the Commissioning Codes as to system cleanliness have been complied with. The report shall set out in detail the procedures adopted in flushing out, cleaning by forced circulation, or chemical cleaning and inhibiting should this be decided. The report should set out, separately for each service, the personnel involved, locations dealt with and dates and times of operations, the flow rates and pressures involved, and other such matters as the Engineer may deem pertinent.

Mechanical Checkout

The Contractor shall submit a list of all plant items and ductwork and of the physical and mechanical checks, as set out in the codes, that have been carried



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out before system filling, and shall certify to the Engineer that these checks have been carried out.

Filling Of Systems

When the Engineer is satisfied as to the physical and mechanical checks that have been carried out, the Contractor shall fill the system with treated water to a prepared plan agreed by the Engineer, filling from the bottom upwards, where possible, so that air is moved to the appropriate points at a higher level in the system for venting.

Electrical Checkout

Before the Engineers' permission is granted to run pump sets, fans and other rotating equipment, or to apply heat, the Contractor shall satisfy the Engineer by means of a report that all electrical checks have been carried out, as set down in the Codes, and that all checks prior to pump and fan start up have also been completed.

Initial Setting To Work

When the Contractor has indicated to the Engineer that all checks have been carried out, he shall arrange to operate the systems generally in the order. Initial setting to work shall be carried out before heat is applied to the system so that design primary rates of circulation shall be established and any likelihood of primary flow rate variations due to modulation of unbalanced secondary systems have been eliminated. Before start up of the plant the Contractor shall report to the Engineer on the start up of each system and shall assure the Engineer of their satisfactory operation before start up of the plant.

Regulation of Flow

Circulating flow systems shall be regulated by proportional balancing as specified in the codes. The Contractor shall obtain from the Engineer a list of design flow rates and acceptable tolerances before commencing balancing operations.

Commissioning Records And Reports

All checks, measurements and adjustments must be recorded in writing at the time they are made by the commissioning staff, and copies made available immediately to the Engineer. The form that this report will take shall be agreed with the Engineer prior to commissioning.

When the Contractor is satisfied that the plant and systems have been correctly commissioned, he shall submit a final report to the Engineer, setting out all matters relevant, including all modifications and modifications to the systems



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and their controls, and listing all valve, damper and control settings, and normal operating flows, pressures, temperatures, running and starting currents and other operating characteristics. The final format of this report shall be agreed with the Engineer before completion.

Handover Of Systems

When the Contractor has satisfied the Engineer that all commissioning has been completed satisfactorily, that the Clients staff have been adequately briefed on all plant and in all maintenance procedures, that all spares have been duly handed over and placed in stores, and that all instruction and maintenance manuals, together with all record drawings, have been delivered to the Client and the Engineer, the Engineer shall issue Completion Certificates to the Contractor. Each section of the plant shall then be handed over to the Clients representative in the presence of the Engineer.

59.02 O&M manuals

The Contractor shall provide a Class D Operating & Maintenance manual.

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. THIS PROCEDURE SHALL BE STRICTLY ADHERED TO.

Three prints shall be supplied of each drawing in addition to 3no compact disks containing all drawings in AutoCAD 2008 Format.

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.

Three complete sets of Operating and Maintenance Manuals and record drawings shall be supplied to enable the Employer to operate and maintain the systems correctly. 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



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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

The 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 the 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 or misunderstanding including order number for each plant
- Installation instructions as provided by manufacturer
- Colour coding identification schedule for each building services system



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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 the 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. A similar report shall be prepared for tests which have been made. 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

Diagrams shall be prepared on A4 or A3 (297 x 420mm) paper

- Section Dividers

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



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- 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.

The Trade Contractor is advised that all Record Drawings and O & M Manuals in the form described herein must be handed over to the Engineer prior to the issue of a Practical Completion Certificate for the Trade Contract Works. Failure to issue these Record Drawings and O & M Manuals will also defer the issue of the Practical Completion Certificate until such time as they are received.

If the Trade Contractor fails to issue such documentation on time, then the Engineer will have the right to engage such other third parties to prepare these Record Drawings and O & M Manuals and any resultant cost incurred by him shall be borne and set against the Contract.

Identification of Services and Plant

All cable trays and trunking shall be labelled clearly with colour coded bands which identifies its content.

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.