

**Kildangan National School,
Monasterevin,
Co. Kildare,
W34DR40.**

ROLL NUMBER: 18675I

MECHANICAL SERVICES SPECIFICATION

VOLUME M1

**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 the construction of a new extension to Kildangan National School. The works includes for the supply and installation of new mechanical services in the new 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 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.

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. Gerd Benndorf,
Galileo Energy Services,
Unit A6,
M4 Business Park,
Celbridge,
Co. Kildare.
Tel: 01-6274103
E-mail: gerd@galileoenergy.ie
www.galileoenergy.ie*

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.

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.

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.

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.

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.

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.

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

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. 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.

NZEB/BER Compliance

This new extension building needs to be NZEB compliant.

An NZEB compliance report and calculation has been carried out for this project and the building is NZEB compliant based on all the plant, equipment, materials, etc. as specified below in the specification document.

The Contractor shall ensure that all items specified within this specification is installed as a preliminary NZEB/BER calculation has been carried out based on this specification.

If the Contractor is to deviate from the specified items within this specification and propose alternatives, the Contractor must ensure that these items match the specified criteria within this specification.

If in any case the Contractor takes the onus to install any item that isn't an equivalent to the specified items or isn't formally approved by the Engineer, then the Contractor shall be asked to carry out an individual NZEB/BER assessment to ensure it meets the desired NZEB/BER criteria. This shall be carried out at the Contractors expense and any cost implications for this shall be at the expense of the Contractor.

Timescale, working hours, payment, etc.

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

Coronavirus (COVID-19)

The Contractor shall insure that all workers on site collaborate on implementing the HSE's guidelines on social distancing for construction sites in order to protect themselves from the Covid-19 virus. The Contractor and all his Employees and Sub-Contractors shall comply with HSE guidance to protect themselves from the Covid-19 virus.

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;
- 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.

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.

M&E CO-ORDINATION

M&E Co-ordinator:

The co-ordination of the mechanical installations and electrical installations shall be the responsibility of the Main Contractor as they shall appoint a dedicated M&E Co-Ordinator for the mechanical installations and electrical installations on site.

In addition, the co-ordination of the electrical installations shall be the responsibility of the Electrical Contractor and the co-ordination of the mechanical installations shall be the responsibility of the Mechanical Contractor but both Contractors shall allow for co-ordinating their installation with each other and the M&E Co-ordinator.

All mechanical and electrical installations shall be co-ordinated by the M&E Co-ordinator which shall be the responsibility of the Main Contractor. The Main Contractor shall appoint a suitably qualified person to complete this role. The M&E Co-ordinator shall have relevant experience on site and experience in M&E installations:

The M&E Co-ordinator shall allow for the following (non-exhaustive list):

- Oversee the installation of the M&E installations for the duration of the projects.
- Detailed co-ordination of the M&E installations.
- Completing co-ordination drawings for the M&E Contractors on site.
- Ensuring that the M&E installations are completed and installed in compliance with design documents and current regulations.
- Programming of the M&E installations with the M&E Contractors and the Main Contractor
- Shall be responsible for reporting on progress and creating procurement schedule.
- Shall be responsible for the overall progress & quality of work.

-
- Responsible for ensuring the clients requirements are being met

Mechanical Contractors Co-ordination:

The Mechanical 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 mechanical installations and electrical installations shall be the responsibility of the Main Contractor as they shall appoint a dedicated M&E Co-Ordinator for the mechanical installations and electrical installations on site.

The Mechanical Contractor shall provide all information necessary and on time to the M&E Co-ordinator 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 M&E Co-ordinator 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 M&E Co-ordinator in sufficient time to allow the Main Contractor complete his works to programme.

METHOD STATEMENTS AND RISK ASSESSMENTS

Before any works commence in the building, the Mechanical Contractor shall submit risk assessments for the works and method statements for the works to the Main Contractor for works in the building.

The Mechanical Contractor shall allow for carrying out a risk assessment on all works and services to be installed in the building and shall highlight any risks to the Main Contractor.

Safety and Method statements must relate fully to this project only, e.g. the identification of hazards therein, and to enshrine the health & safety principles of

prevention in the protection of employees and for others who may enter onto this site, or be effected by this work outside the line of site fencing etc.

The safety statement shall include the names of authorized deputies and job titles. Commitment signed by the Managing Director of the company to uphold the health and safety principles of this project, in compliance with Regulation 12 of the 89 Act.

Method statements shall describe the method to be employed by the Contractor to ensure that hazards and risks associated with this work have been identified, and that the hazards or risks will be reduced or eliminated to an acceptable level as far as reasonable practicable.

The method statement shall also specify the plant or equipment to be used and the safety procedures to be adapted when using plant or equipment. The contractor is obliged to ensure that all works will be carried out in accordance with all relevant safety standards.

Method statements are required where a particular task involves a specific risk to people and to all other parties who may be affected by the contractor's actions.

Examples include the following:

- Working at heights
- Connecting to existing mechanical and electrical services
- Decommissioning of existing mechanical and electrical services
- Hot works in the building.

(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

The Mechanical Contractor shall be responsible for liaising with the Main Contractor for co-ordinating the builders work and trenching required for all mechanical site services. The Contractor shall be responsible for the final connections from the site services to the final equipment within the Plantroom and throughout the Building.

50.01 Liquified Petroleum Gas (LPG) Gas Tank Installation

General:

The existing heating center is heated via an underground oil supply line from an external oil storage tank. This oil services shall be removed by the mechanical contractor. The new LPG gas boilers shall be fed from a new underground LPG gas supply pipe from an external LPG gas tanks located as indicated on the drawings.

Trenching, piping shall be carried out by the mechanical Contractor as part of this contract. It shall be the responsibility of the main contractor to provide the LPG gas storage compound.

50.02 Underground gas pipework

General:

The Mechanical Contractor shall allow for supplying and installing an underground gas supply pipe from the LPG gas storage tank compound at to the building as indicated on the drawing. The Mechanical Contractor shall supply, install, test and commission this underground LPG gas line to the boiler house.

The mechanical contractor shall allow for an underground LPG gas line to come from the boilerhouse and be routed to connect into the existing incoming LPG gas pipework which currently serves the existing school building. Sizes and route of pipework is as indicated on the drawings.

Underground Gas Pipework:

Underground LPG gas shall be carried in Gas Medium density Polyethylene to B.S. 5750, or equivalent. All gas pipework shall be installed to suppliers requirements as Non-Domestic Gas installations I.S.820:2010. Size and route of pipework is as indicated on the drawings.



The underground gas pipework shall adhere to the following specifications:

- Pipework shall be medium density polyethylene (MDPE).
- 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. 820:2010
- Certificated by British Gas Transco Ltd, DVGW, and others.
- Complies with GBE/PL2 Part 1-1995.
- Manufactured by a BS EN ISO 9001:2008 company.

Allow for all necessary fittings and valves etc.

A new main isolation valve shall be installed on the pipework as the gas enters the boilerhouse and also as the gas pipe leaves the boilerhouse for the LPG gas supply in the existing building.

The new underground plastic gas pipework from the boilerhouse to the existing building shall rise outside the existing building, where it shall change to metal pipework and shall enter the building at low level where a manual isolation valve shall be provided. All gas pipework within the building shall be installed in mild steel. No plastic polyethylene pipe shall enter the building.

Allow for all necessary fittings and valves etc. All gas pipework shall be installed to comply with ICP 3&4 with appropriate colour labelling to comply with it.

Pressure testing of underground pipework:

Gas piping is to be tested with air under pressure of 10.4 bars. Maintain this pressure without pumping for at least 6 hours without any drop in pressure. Repeat test as directed until system is proven gas tight.

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

The entire installation shall comply with I.S. 820:2000 Non-Domestic Gas Installations.

50.03 External overground gas pipework

General:

The Mechanical Contractor shall allow for supplying and installing external overground gas pipework at the boiler house and where the new LPG gas supply enters the existing school building.

External overground gas pipework:

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

All gas pipework shall be installed to suppliers requirements as Non-Domestic Gas installations I.S.820:2010. Allow for all necessary fittings and valves etc.

Over ground LPG gas shall be carried in Black steel Pipe Class B seamless medium gauge, Blue Band to B.S. 1387 with flanged joints where necessary. Fitting material shall be Steel Butt welding B.S. 1965 to match pipe or steel welding to B.S. 10 table E.

Allow for all necessary fittings and valves etc. All gas pipework shall be installed to comply with ICP 3&4 with appropriate colour labelling to comply with it.

All gas pipework within the plantroom/boilerhouse and building shall be installed in mild steel. No plastic polyethylene pipe shall enter the building.

Size and route of pipework is as indicated on the drawings.

Painting of gas pipework:

All gas pipe work above ground shall be painted with two coats of yellow paint by the Mechanical 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 gas pipework:

Gas piping is to be tested with air under pressure of 10.4 bars. Maintain this pressure without pumping for at least 6 hours without any drop in pressure. Repeat test as directed until system is proven gas tight.

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

The entire installation shall comply with I.S. 820:2000 Non-Domestic Gas Installations.

50.04 Second Stage LPG Gas Regulator

The mechanical contractor shall supply and install a second stage LPG gas regulator on the LPG gas pipework rising externally on the building at the boiler house. Mechanical contractor shall supply a Jeavons J125-S5 1" regulator or equivalent as supplied by Southern Gas, Clonmel. The mechanical contractor shall install a protective cage over this second stage regulator for protection.

50.05 Decommissioning existing oil tank and oil line

Existing oil tank:

The existing oil storage tank shall be decommissioned and removed from site as detailed in ME(S001). This oil tank serves the existing oil fired boiler which is to be decommissioned and replaced with the LPG gas fired boilers. The mechanical contractor shall decommission the existing oil line supplying the existing boilerhouse.

51.0 HEATING CENTRE

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 headers extension, fully modulating boilers, pipework, pumps, BMS controls, associated fittings, other heating equipment, etc. shall be fitted in the plantroom. The mechanical contractor shall retain the pipework associated with 3no. existing heating circuits and 1no. hot water services circuits. 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.

Upon completion there shall be 3no. LPHW circuits within the boiler house, 2no. of which shall be existing. There shall be 2no. existing LPHW heating circuits serving the existing school, 1no. new circuit serving the new extension which shall be constructed. The mechanical contractor shall allow for the extension of the existing flow and return header as set out in drawing and specification.

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

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 new low loss flow and return header located in the plantroom. The installation shall be served by the new LPG gas 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 mechanical contractor shall allow for the decommissioning and removal from site of the existing oil fired boiler installed within the existing boilerhouse as detailed on the drawings.

Within the school boiler house there is 1no. oil fired boiler (Ferroli GN2 8) which is to be decommissioned. The existing oil supply line shall be decommissioned and removed from site. The existing MCC Panel shall be decommissioned and removed from site. All other equipment within the boiler house shall be retained.

The mechanical contractor shall allow for the installation of a new gas detection, gas sensors, gas slam shut valves etc associated with this installation as shown on the drawings.

51.01 Decommissioning existing Oil fired boiler System

The mechanical contractor shall decommission the 1no. existing floor mounted cast-iron sectional boiler and two stage burner, associated flue installation and MCC panel, and removed from site. This existing boiler may contain asbestos containing material and this asbestos containing material shall be decommissioned and removed by a registered Asbestos Removal Contractor. Refer to 'Removal of Asbestos Items' section in this specification for further information.

51.02 New Boilers & burners

The boiler shall be wall mounted gas fired unit with modulating pre-mix gas burner connected via a hydraulic low loss header. Each boiler shall be complete with casings, shunt 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 mounted and shall be suitable for the supplied boilers.

Boiler specification & Construction:

Specification: Gas-fired condensing boiler with a rated output of 115kW

<i>Quantity:</i>	2no
<i>Configuration:</i>	2no boiler shall be installed in a wall mounted.
<i>Proposed Model:</i>	Remeha Quinta Ace 115 LPG.Gas – boiler to be supplied by Eurogas (or equivalent)
<i>Burner Type:</i>	Fully modulating stainless steel pre-mix burner that is suitable for use with the boiler
<i>Pump:</i>	Boiler to be supplied with individual shunt pump
<i>Control:</i>	Self contained control panel
<i>Type:</i>	Condensing
<i>Heat exchanger:</i>	Stainless Steel
<i>Fuel:</i>	LPG gas
<i>Casing:</i>	Steel
<i>Accessories:</i>	• 2no temperature gauges for Flow from the boiler- minimum 100mm dial • 2no temperature gauges for Flow from the boiler- minimum 100mm dial • 2no. enclosed spring loaded safety valve from the boiler with pad lock and copper escape pipe arranged to discharge 200mm above finished floor level in an approved position - a type Bailey 1640a internal bore 40mm. • 2no Drain cock from the boiler 40mm

Total output duty of boiler

Total Output:	115kW
Quantity of boilers:	2no
Flow:	80 °C
Return:	60 °C
Min. Efficiency:	98% With 80/60 temperatures

Pre-assembled boiler plant in cascade arrangement to be supplied by Eurogas (or equivalent)

Pre-assembled low loss header and accessories:

The system shall be supplied with a pre-assembled low loss header and mounting frame for the complete installation of the 3no wall mounted boilers. The boilers shall be supplied fully fitted and mounted on a pre-assembled header arrangement. The low loss header shall have the following specification and accessories:

- 100mm diameter hydraulic isolation flow and return header arrangement c/w flanged PN 16 flow and return connections. Header arrangement to be insulated.
- 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.
- Boilers c/w individual shunt pumps.
- All associated pipe work and fittings, safety valves etc. (Safety valves set at 3bar unless stated otherwise).
- Boiler connecting pipe work
- Flanged flow and return connections to the system.
- 1no drain valve from low loss header

Site visits by boiler supplier:

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

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

- **Site Visit 1:**

Once the boiler is installed on the wall the Commissioning Engineer shall visit the site to ensure that the boiler is installed correctly as per manufacturers recommendations. This shall be completed before any connections are installed from or to the boiler i.e. before the flue is installed, before any gas is connected to the boiler, before any water connections is brought to the boiler, etc.

- **Site Visit 2:**

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

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

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

- Site Visit 3:

The Mechanical Contractor shall arrange with the boiler 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.

Control notes:

Each boiler shall be supplied with an integral controller as Remeha iSense MC4 programmable controller suitable for a multiple boiler installation (max. 4 No.) to provide digital time and temperature control using daytime and night setback settings. The controls will provide boiler sequencing and reverse sequencing to maximise boiler efficiency. In addition, the controller provides weather compensated operation. The controller shall be supplied with an outside temperature sensor, a common flow temperature sensor and an MC4 terminal connection panel where all of the boiler and sensor cabling is terminated. The outdoor sensor must be mounted on a north facing wall for the system to operate correctly. There is a digital input that can be used to enable the controller remotely via volt free signal.

However, there is a BMS control panel to be installed in the boilerhouse, which is to control the heating equipment and boiler.

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

- The boilers temperature shall be variable, controlled by the BMS system, dependant on the outside temperature. The boiler 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.

Condensate:

The Contractor shall allow for a 25mm condensate drain from each boiler to local drain in boilerhouse. Route the condensate drain pipe with a constant fall.

Refer to drawings and section 52.07 for further information.

Label on boilers:

The Contractor shall provide a 200mm x 200mm steel plate label screwed to the casing of the boiler with the following wording "*Important Notice: Do not reduce the boiler operating flow temperature below 80° Celsius.*"

51.03 Flues

New balanced flue for each boiler:

The Contractor shall allow for 2no. new balanced flues to be installed from the new gas boilers to exit the building through the roof as indicated on the drawings.

A new plastic (PPs) balanced steel flue shall be installed for each of the new gas boiler as indicated on the drawings. The flue from each boiler shall be a 100mm/150mm diameter balanced flue and shall rise from the boiler to exit the building at high level through the wall at 3300mm from finish ground level externally.

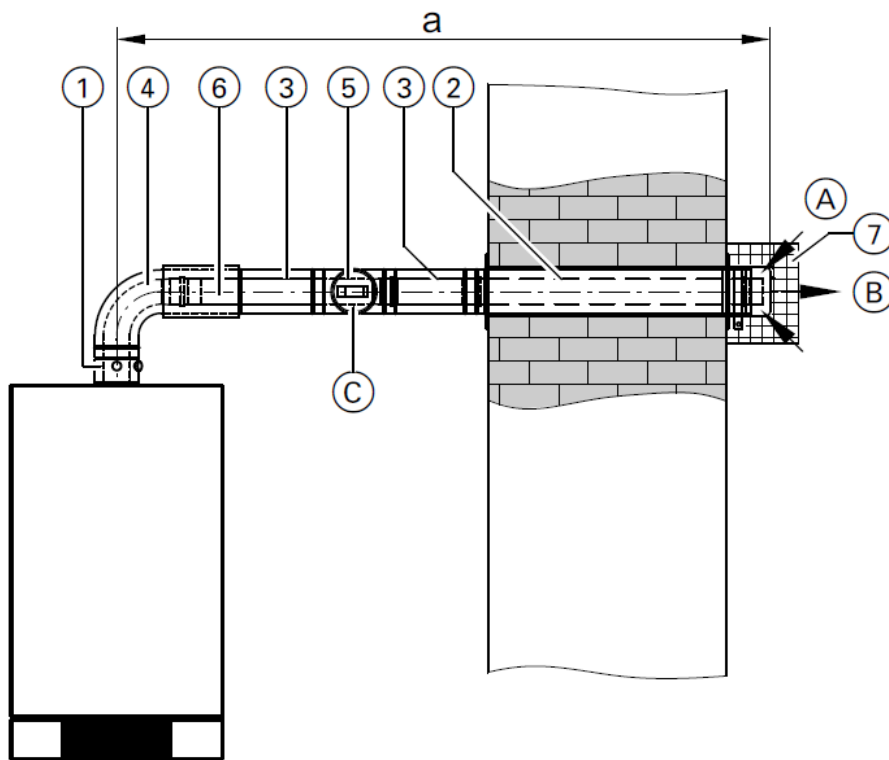
Each flue shall exit the boilerhouse at a minimum of 3300mm (to the centre of the flue) and 2000mm away from any opening window into the building. The approximate length of each flue required is 4000mm.

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

Allow for a condensate drain from the flue with a 25mm to a drain in the boilerhouse.

For balanced flue installations, the flue system must be approved to Building Regulations and certified to the appropriate EC Gas Equipment Directive. The flue shall be installed in accordance with CE-0085 BR 0432, system certification to DVGW-VP 113 and EC Gas Equipment Directive 90/396/EEC in conjunction with PPs flue pipes offered by Skoberne.

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



- (A) Ventilation air
- (B) Flue gas
- (C) Inspection port

Allow for all necessary accessories. The flue supplied shall be suitable to the boiler listed in section 51.01 above so consult the boiler and flue supplier before ordering the flue.

The flue system shall be supplied with each boiler 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 balanced flue system for each boiler shall be a plastic (PPs) flue and shall comprise of the following (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 balanced flue pipe for the installation (measurement to be taken on site but for tendering purposes allow for 2000mm).
- Balanced flue external wall connection.
- Balanced flue connection to the boiler.
- Necessary inspection pieces.
- Necessary balanced flue inspection pieces (straight).
- Necessary balanced flue wall bezels.
- Necessary balanced flue bends (quantity and type to be confirmed by the Contractor to the supplier).
- Necessary balanced flue sliding couplings and fixing clamps (quantity and type to be confirmed by the Contractor to the supplier).
- Necessary balanced flue adaptors (quantity and type to be confirmed by the Contractor to the supplier).
- External grill for covering flue on the external wall.

Soundness test:

A simple soundness test shall be carried out on the flue from the 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 balanced flue pipe.

The flue pipe is deemed to be sound if the CO₂ concentration in the combustion air is no higher than 0.2% or the O₂ concentration is at least 20.6%.

If higher CO₂ or lower O₂ values are measured, check the flue system for soundness.

51.04 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.

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.

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

Commissioning:

The Contractor shall allow for commissioning the entire system 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.

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.



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.

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



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.

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

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

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

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

Bracketing and supports

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

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

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

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

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

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

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

51.05 BMS controls

51.05.01 General

Introduction

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.

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

The Contractor shall appoint a suitably qualified controls specialist and the controls specialist shall be fully responsible for instructing, monitoring, testing, and co-ordinating the new controls installation. The provision of valves, actuators and any other components required for the controls system to function as described within the documents is the responsibility of the Contractor who may choose to have some or all of these items provided by the controls specialist.

The Mechanical Contractor / BMS Vendors summary scope shall include:

- MCC-01. Form 2B located in the plantroom.
- 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.

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

No electric wiring shall be carried out under this contract.

The Mechanical Contractor shall hand over all necessary items associated with the controls package, all relevant wiring diagrams and instructions as supplied by the controls specialist to the Electrical Contractor for wiring on site.

Commissioning and Handover

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

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

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

The 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.

51.05.01 Control Functions

Control Functions

The BMS controls for the building shall be controlled by 2no 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 a web browser.

2. Secondly, in addition to the web based user interface a digital touchscreen keypad mounted on the front of the panel in the boilerhouse shall be installed 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. The touchscreen shall adhere to the following:

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

Heating

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

Each 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.

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

The boiler shall be provided with the following control functions:

- Time control:

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

- Weather compensation:

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

Consult with the boiler manufacturer/supplier before designing the control system. The Contractor shall be responsible for ensuring that the boiler proposed by the Contractor is provided with the appropriate control modules to allow the boilers to allow its temperature set-point to be altered by the BMS.

- Frost Protection:

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

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

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

- Optimum start control:

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

- 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.

Zone Control

Separate time schedules shall be provided for the heating zone with the optimum start controller being activated when the heating zone schedule is called on.

Room Temperature Controls

Refer to Item 56.05 for further information.

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.

Time Control of hot water return pump

The contractor shall allow for time controlling the new secondary hot water pump to ensure that pump is only in operation when the system is running/functional.

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 button.
- Interface to the Buildings IT network

See drawing 51(M002) for the controls schematic which highlights what items are required.

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

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

51.05.03 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:

- 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).

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.

51.05.04 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.

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.

51.06 Insulation on pipework

General:

All new heating pipework throughout the building and in the plantroom/boilerhouse shall be insulated.

All LPHW heating flow and LPHW heating return pipework installed in the building and in the boilerhouse shall be insulated as follows:

- Pipes from 15mm to 20mm: 30mm thick insulation
- Pipes from 20mm to 40mm: 35mm thick insulation
- Pipes from 40mm to 80mm: 40mm thick insulation
- Pipes from 80mm: 50mm thick insulation

Where pipe work is to be laid in floor ducts, it shall be insulated as above and then wrapped in Oppanol (or equivalent).

Pipe work at high level in corridors or any other location where the insulation will be visible to the general public shall be insulated as described above.

All new pipework within the plantroom/boilerhouse or concealed within the building shall be insulated with foil backed insulation. Valve jackets provided with Velcro fixings shall be provided on all valves within the plantroom.

New pipe work within suspended ceilings, attic spaces or anywhere concealed from view shall be insulated as described above and clad in aluminium foil. All pipe work within the plantroom shall be insulated as described below and clad in aluminium foil.

Insulation:

All new LPHW heating flow and LPHW heating return pipework installed in the building and in the boilerhouse 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 heating 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

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.

Painting of Pipework prior to insulating:

Refer to section 51.03.

51.07 Circulating pumps

Allow for new pumps to be installed for the new heating centre. The Mechanical Contractor shall allow for supplying and fitting the following pumps:

Pump No.	Service	Qty	Pump Model	Line Dia (mm)	Flow (l/s)	Head (Mtr)	Elec Supply
P1	Primary Pump for Boiler 1	This variable speed pump 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 51.01 for the specification on the pump.					
P2	Primary Pump for Boiler 2	This variable speed pump 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 51.01 for the specification on the pump.					
P3	Existing Heating Zone 1	To be retained					
P4	Existing Heating Zone 2	To be retained					
P5	New Heating Circuit Zone 3 (New Extension)	1	Grundfos Magna 3 40/120F (twin head) (or equivalent)	40mm Dia	0.6l/s	5	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 connection.
- Graphical pump display with rotatable display horizontal and vertical module mounting, for display of operating status, control mode, rotation speed setpoint and fault/warning signals.
- Housing made of cast iron with cataphoretic coating, impeller made of glass-fibre reinforced plastic, stainless steel shaft with metal impregnated carbon plain bearings.
- Pumps must be installed in accordance with the manufacturer's recommendations and must comply with the requirements of IS/EN 60335-2-n51, BS 4082 : 1969 and BS 5257 : 1975 as applicable.
- Pumps must be 'type' tested in accordance with IS EN ISO 9906:2012 and BS EN 5198:1999. Pump curves must be submitted to indicate performance under all likely operating conditions.
- Flexible connections must be provided on the suction and discharge side of all pumps with end connections over 50 mm and elsewhere as indicated. Each pump must be installed with isolating valves on the inlet and outlet connections.
- Unless otherwise indicated, a strainer must be fitted on the inlet connection.
- Provide test certs for all pumps. Nameplates shall be installed on the pumps to show test and working pressures of each pump.
- Hot water return pumps shall be of all gunmetal construction with bronze impeller and screwed connections and shall be installed on the secondary return pipework from the water heater system. The pump shall be valved on the suction and delivery side.

51.08 Auto-fill unit and expansion vessel

The existing shall be retained.

51.09 Magnetic type Combined air-dirt separator and low loss header

The Contractor shall allow for the supply and installation of an air & dirt separator on the new low loss header for the heating system follows:

- Model: SpiroCross Magnet DN100 (or equivalent)
- Primary flow @ 1.5m/s: 47.0 m³/hr
- Pipework Size: 100mm diameter
- Connections: Flange connections
- Location: Main Plantroom
- Temperature range: 0 to 110 °C

-
- Max Operating pressure: 10 bar.
 - Insulation: Include for a specially made insulation set for the unit.

The unit shall not require a shut-off valve, bypass loop or unnecessary shut down of the system and shall be supplied c/w drain valve as manufactured by Spirotech or equivalent. This shall be supplied by Eurogas (or equivalent)



51.10 Frost heater

Allow for a 2kW electric frost heater to be located near the auto fill unit/expansion vessel in the plantroom. It shall be controlled by a frost thermostat located near the plantroom doors. Acceptable manufacturers are Honeywell or Dimplex, or equivalent. Hand over to the electrical for installation.

51.11 Condensate pipework in boilerhouse

The Contractor shall allow for supplying condensate pipework from the necessary appliances in the plantroom and that pipework to the nearest, drain, gulley or pop-up so that it safely discharges.

The Contractor shall allow for connecting condensate pipework to the following appliances and discharging that pipework to a local drain in the plantroom:

- Condensate from each boiler
- Condensate from each flue

All condensate pipework shall uPVC waste pipework and sizes shall be as indicated on the drawings, for the removal of water-borne soil and waste matter from all sanitary fittings and sinks.

The Contractor shall allow for installing a condensate neutraliser on the condensate from the boiler, flue and water heater. 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 be fitting in line with the condensate discharge pipe.

51.12 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.

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.

51.13 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

General:

A system of uPVC soils and wastes pipework shall be provided for under this contract by the Mechanical Contractor as indicated on the drawings, for the removal of water-borne soil and waste matter from all sanitary fittings, sinks, equipment, etc. 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 for the toilet areas and the boilerhouse area 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 building to these new builders sockets.

The Mechanical Contractor shall 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.

Waste pipework:

All new soils and waste services pipework to be installed for the toilet areas and the boilerhouse area in the building shall be installed in uPVC plastic pipework. Refer to drawings for soils and waste routes and sizes.

Cleaning and access points:

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 fitting. 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 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.

Soil vent pipes/soil stacks:

As indicated on the drawing, a number of soil vent pipes/soil stacks shall be installed for the waste pipework from the toilet areas. All vent pipes shall be installed in uPVC plastic pipework throughout. Refer to drawings soil vent pipes routes and sizes.

New soil vent pipes shall be installed by the Mechanical Contractor as indicated on the drawings for the venting of the waste pipework from the toilets 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/stacks shall exit the roof and shall extend 1000mm above the finished roof.

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

52.02 Floor gully

The Mechanical Contractor shall also be responsible for the supply and installation of stainless steel floor gullies in parts of the building as indicated on the drawing. Floor gullies shall be manufactured from 316L stainless steel and 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.

Floor gullies shall be supplied by Kent Stainless, Richmond Trading or equivalent. Gullies shall be as follows:

- Vinyl Floors:

Gullies shall be as KVV225/110TP (or equivalent) with foul air trap KFT110, grade 316 stainless steel with Cover Plate



- Tiled /epoxy resin/concrete floors):

Gullies shall be as KVT170/110TPSQ (or equivalent) with foul air trap KFT110, grade 316 stainless steel with Square Perforated Cover Plate.



Refer to the drawings for locations and quantities of floor gullies required.

52.03 Connection to equipment

The Mechanical Contractor shall be responsible for the installation and connections of all sanitary fittings, WC's, WHB's, sinks, etc., 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 fittings, kitchen equipment, sinks, etc. to the waste pop-ups in the building as indicated on the drawing.

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.

52.04 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.



52.05 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.

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 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.



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.

- *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.

52.06 Condensate pipework in boilerhouse

The Contractor shall allow for supplying condensate pipework from the necessary appliances in the plantroom and that pipework to the nearest, drain, gulley or pop-up so that it safely discharges.

The Contractor shall allow for connecting condensate pipework to the following appliances and discharging that pipework to a local drain in the plantroom:

- Condensate from each boiler
- Condensate from each flue

All condensate pipework shall uPVC waste pipework and sizes shall be as indicated on the drawings, for the removal of water-borne soil and waste matter from all sanitary fittings and sinks.

The Contractor shall allow for installing a condensate neutraliser on the condensate from the boiler, flue and water heater. 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 be fitting in line with the condensate discharge pipe.

52.07 Overflow pipework from water tank

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

Once the new water tank has been 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.

The Contractor shall ensure a neat installation and all pipework shall be installed parallel to walls etc. Sizes and routes as indicated on the drawing.

All new overflow pipework from the water tanks and drip trays 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. All overflow and drainage pipework shall be brought to an area of nuisance to ensure should there be an issue it can be easily noticed by the client.

53.0 WATER SERVICES

53.01 Mains water services pipework and installation

General:

New mains water services pipework shall be provided to the new extension building by the Mechanical Contractor as indicated on the drawings. New mains water services pipework shall be extended from the existing mains water supply pipework in the existing school building to connect to the new sanitary ware fittings in the new extension building as indicated on the drawings.

Existing mains water services pipework in the building:

New mains water services pipework shall be extended from the existing mains water supply pipework in the existing building to connect to the new mains water pipework in the new extension building as indicated on the drawings. The new mains supply will connect to the new cold water tank and serve any drinking taps in the new extension.

The Mechanical Contractor shall connect the new mains water services pipework for the new extension building to the existing mains water services pipework in the existing building as indicated on the drawings. Allow and for all attendances and material in completing this. See drawings for locations and routes of pipework.

The Mechanical Contractor shall allow for the supply and installation of any new mains water services pipework to all the necessary mains water outlets in the new extension as indicated on the drawings. Allow and for all attendances and material in completing this. See drawings for locations and routes of pipework.

The Mechanical Contractor shall allow for all works to the mains water services installation as indicated on the drawings.

Under current Irish water regulations mains water services pipework must be installed in approved polyethylene (PE) pipe.

The Mechanical Contractor shall allow for all works in connecting the new mains water services pipework for the new extension building to the existing mains water services pipework in the existing building as indicated on the drawings. This shall include and allow for the following works:

- Carrying out a survey of the existing mains water supply in the existing building so that the routes, isolation valves, pipework, etc. are known

prior to connecting into the existing mains water services pipework in the existing school building.

- Isolating the existing mains water supply in the existing school building.
- Draining down the existing mains water supply pipework installation in the existing school building so that the Mechanical Contractor can connect and tap into the existing mains water services pipework in the existing school building.
- Cutting into the existing mains water services pipework in the existing building in the location and taking a new connection of this existing pipework as indicated on the drawings. New pipework shall be extended from this location to supply the necessary items in the new extension. Allow for all attendances and material in completing this. See drawings for locations and routes of pipework.
- Install a new isolation valve on the new mains water pipework to the new extension building.
- Allow for installing new insulation on the area of the existing mains water pipework where the new connection is taken from or repairing the existing insulation.
- Once the new mains water services pipework is pressure tested, turn on the existing mains water supply in the existing building.
- Ensure that there are no visible leaks on the new or existing mains water services pipework.
- Check with the maintenance staff to ensure that there are no issues with the existing mains water supply to the building.

New mains water services pipework (overground):

All new internal pipework for the mains water services pipework to be installed as indicated on the drawings shall be installed in polyethylene (PE) pipe or Multilayer Pipe compliant to I.S. EN 12201/ IS 14659 or EN ISO 21003.

Pipe shall be suitable for above-ground installation, resistant to UV and chemical exposure. Joints shall be made using manufacturer-approved compression or electrofusion fittings. All pipework passing through floors or walls shall be sleeved to prevent damage. All new mains water services pipework shall be installed in polyethylene (PE) pipe or multilayer.

Polyethylene pipe or Multilayer pipe for all new internal mains water services pipework installed shall be as follows:

- CE marked
- Complaint with EN 12201 or EN 21003
- Must be suitable for potable water

Where possible, 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 new mains water services pipework below the ceilings in the rooms shall be surface mounted. The Mechanical Contractor shall ensure a neat installation and all pipework shall be installed parallel to walls, ceilings and partitions.

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

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 water services pipework installed in the ceiling void shall be adequately supported and braced via unstrut and clips.

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 mains water services pipework in the building, all new mains 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 new mains water services pipework installed within unoccupied areas (shafts, service voids, ceiling voids, furniture, boilerhouse, walls or false ceilings) shall be insulated.

Allow for the fitting, installation and connection of mains water supply pipework to all the items as indicated on the drawings.

See Section 53.04 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 areas 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 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. 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



53.02 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 shall be served via new gravity fed system. A gravity feed shall be supplied from the new cold water storage tank to supply the extension building.

The new cold water storage tank shall be located within attic space of the new extension as indicated on the drawings.

The existing cold water services throughout the existing school shall be retained.

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%
 - 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 recessed. 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:

<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 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.



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 building as indicated on the drawings.

The hot water services supply system shall be a gravity fed system.

A new hot water services supply shall be taken from the existing hot water services installation currently in operation within the existing school building.. The hot water is supplied from an existing in-direct hot water cylinder within the boilerhouse which shall be retained.

The existing hot water services throughout the existing school shall be retained.

New hot water services supply pipework:

All new internal water services pipework for the hot water services supply 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 supply pipework shall be installed in copper.



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 Maximum 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 recessed. 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 it passes 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:

- 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.

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



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 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.

The existing hot water services return installation throughout the existing school shall be retained.

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)
 - 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 recessed. 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.

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.



Local Ballofix Valves:

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 Dosing pot

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

The dosing pot shall adhere to the following specification:

- 6litre capacity
- Matt stainless steel finish
- Stainless steel vessel with inlet (return) and outlet (flow) valves
- Valve size 25mm BSP female
- Welded to BS EN 287
- Drain valve
- Filling valve.
- Stainless steel tundish
- Air release valve
- Wall mounting brackets
- Max operating pressure is 14 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



53.06 Insulation on 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.

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

Class O compliance. The factory applied aluminium foil facing shall meet the highest standards required by BS476: Part 6 'Fire propagation' and B.S. 476: Part 7 'Surface spread of flame'.

- Service temperature:

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

- Smoke and toxicity:

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

- Certification:

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

53.07 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.

53.08 Internal cold water storage tank

A cold water storage tank shall be installed in the attic space of the new ASD Unit Extension building as indicated in the drawing. This tank shall provide all necessary storage of cold water for the new ASD Unit Extension building.

The Contactor shall include for the supply, installation, testing and commissioning of the following cold water storage tank on the roof above the stairwell (see drawings for locations and further information). This new water tank shall be a 909 litre capacity, 1650mm long x 1055mm wide x 765mm high G.R.P. sectional water tank. Include for a drip tray, lid and ladder with the tank. Include for the following accessories with the tank:

- Lid and cover
- Drip trap
- All tappings for mains supply, overflows, cold water supply.
- Screened overflow connection.
- Screened air inlet vent on the top of the tank.

See below for specification of the water tank.

Specification of the new water tank:

- Tank shall be insulated to 'Format 30'. Water temperature shall not exceed 20°C.
- The cold water tank shall be sectional, constructed from panels which are 1000mm square using half and quarter panels where necessary.
- Water storage tank to be supplied with a lid and a drip tray.
- The whole of the tank installation shall be commissioned and maintained in accordance with BS 6700.
- The G.R.P. sectional water tank 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.
- Panels shall be hot pressed from specially formulated potable water grade of Glass Reinforced Plastic (G.R.P.)
- 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.
- The tank shall be supplied with warning/overflow pipes with a slight gradient to the drainage channel.

-
- The tank shall be supplied with an access hatch on top of the tank for tank maintenance and access.
 - The tank shall have an externally flanged base which allows the tank to be totally drained down.
 - The tank shall be supplied with a lid and the lid shall be heavy duty, formed from panel as per base design, consist of vertical supports at each panel intersection, with supports fixed to both lid and base panels using stainless steel straps grade 316 S16 and be complete with a secure lockable hinged access hatch of minimum 610 square.
 - Tank sides and lids shall be insulated with rigid section cell polyurethane foam with a protective GRP skin securely fixed and sealed to the tank panel surface using a gasket type seal. All pipe cut outs shall have bessels of the same material securely fitted and sealed to both the outer skin and panel face. All insulation to Format 30 finish.
 - It shall be the Contractor's responsibility to ensure that the base supports conform to the tank manufacturers recommendations and that the tank is placed under order in good time to allow easy assembly and positioning on site. All access and space requirements shall be finalised by the Contractor.
 - All tanks shall be complete with all tappings for mains supply, overflows, cold water supply.
 - All tanks shall be supplied with a 42mm screened overflow connection. All vents, warning pipes, overflows shall be fitted with mesh screens of maximum 0.65mm x 0.65mm holes to prevent the ingress of vermin.
 - The tanks shall be supplied with a screened air inlet vent on the top of the tank. All vents, warning pipes, overflows shall be fitted with mesh screens of maximum 0.65mm x 0.65mm holes to prevent the ingress of vermin.
 - If the tank depth is greater than 1.5m, the Contractor shall allow for the supply of internal and external ladders to be fitted on the tank, these ladders shall be stainless steel. The ladders shall have safety cages and conform to BS4211 2005.
 - All tanks and drip trays shall be complete with all tappings for mains supply, overflows, cold water supply.
 - Tank shall be supplied and installed by Tricel (Killarney), or equivalent.
 - Tank shall be suitable for external environment.

53.09 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.



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.

53.11 In-Direct hot water heater

The existing shall be retained.

53.12 Electric Shower Unit

General:

1no. electric showers shall be installed as indicated on the drawings. The Contractor shall allow for the supply and installation of an electric shower as indicated on the drawings. See drawings for locations and quantities.

The Contractor shall therefore allow for the supply and installation of a Mira Advance (or equivalent) 8.7Kw chrome thermostatically controlled electric shower (or equivalent) as indicated. Showers shall be supplied with Mira Response adjustable spray handset (or equivalent) and shall be complete with hose, clamp bracket, soap dish, slidebar and hose retaining ring/gel hook. Quantities as identified on the drawings:

- Quantity: 1no
- Brand: Mira Advance Flex Extra (8.7Kw)
- Control type: Thermostatically controlled electric shower
- Voltage: 230volt
- Amps: 40amp
- Min pressure: 1bar
- Approvals: WRAS, CE, BEAB
- Warranty: 2 years

Accessories:

Each shower shall be supplied with the following items accessories:

- Mira Response adjustable spray handset
- Hose
- clamp bracket
- soap dish
- slidebar
- hose retaining ring/gel hook.

Mounting height:

The control unit for the shower shall be mounted at a height between 750mm and 1000mm.

53.14 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.

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.

53.15 Sterilisation of the cold water tank and the water system

General:

After satisfactory completion of the new water services installation, the whole of the cold, mains and hot water services system for the extension 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.
- 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:



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

54.0 GAS SERVICES

54.01 External underground gas pipework

Refer to section 50.02 above.

54.02 External overground gas pipework

Refer to section 50.03 above.

54.03 Internal gas pipework in the extension

General:

As highlighted above, the Mechanical Contractor shall allow for supplying and installing an underground gas supply pipe from the LPG gas storage compound to the existing boilerhouse as indicated on the drawing. This gas supply shall then be subsequently connected to the boilers in the boilerhouse as indicated on the drawings.

The Mechanical Contractor shall allow for connecting to the incoming gas pipework into the building and connecting this gas line to the boiler and water heater in the boilerhouse as indicated on the drawings.

Refer to item 50.02 and 50.03 for further information on underground and overground gas pipework required for this installation.

Internal gas pipework in new building:

Allow for the supply and installation of new gas pipework to the boiler the boilerhouse 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.

All new internal gas pipework internally in the building shall be as 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. 820:2010.

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

If pipework is not welded, all internal gas pipework installed in voids, ceiling voids, vertical risers, etc. shall be sleeved in a pipe-in-pipe type installation. Sleeves shall be provided on all gas pipework concealed within voids. These sleeves shall be constructed of mild steel pipework and shall be open to the room at either side of the voids to ensure that a build-up of gas does not occur within voids.

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.

Painting of gas pipework:

All new internal gas pipework in the new 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.

Testing and commissioning:

When complete the entire gas pipework installation throughout the new building shall be thoroughly flushed out and tested with air under pressure of 7 bar. Maintain this pressure without pumping for at least 8 hours without any drop in pressure. Repeat test as directed until system is proven gas tight. After connecting appliances and where turning on gas supply to new lines, check for

leakage with meter. Comply with all suppliers requirements. Upon completion of pressure testing, each system shall be purged with its own gas.

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 nickle coated finish. The level shall be a plated steel lever with yellow plastic coating.



54.05 Gas detection system for the School boilerhouse

General:

The Mechanical Contractor shall allow for the supply and installation of a new gas detection system and gas solenoid valve on the new gas pipework entering the existing school 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 each boilerhouse at high level. 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)
- 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-4' (or equivalent). The dimensions of the panel shall be 180mm wide by 130mm high by 60mm deep.
 - The gas detection control panel shall be provided and shall conform to EN 50054 and shall be CE and BSI certified c/w 2no. gas sensors.
 - 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 gas 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 gas solenoid valve shall be connected to and controlled off the control panel in the Store.
 - The 230volt mains supply to the 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 5-year warranty.



Function:

- Gas detection for the devices in the boilerhouse.
- Providing a means of isolating the gas during an emergency.
- LCD display to communicate status of the system and view real time gas pressures.
- 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 gas safety system shall close on the activation of gas leak via the remote gas sensors.
- The gas safety system shall close on the activation of low pressure in the pipework.

Ancillaries:

- Gas detection system as the 'Medem AGDS-4' panel.
- Gas solenoid valve (line sized to suit).
- 2no AD-MED-M Gas Detectors. Detectors shall be located at low level due to the gas being LPG Gas.
- Gas detectors shall be IP44 rated and for use with LPG gas.

Commissioning:

- The Contractor shall include for the 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.



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Interface to the fire alarm system:

The new gas detection system shall be connected and interfaced to the fire alarm system for the building. Liaise with the Electrical Contractor on interfacing the fire alarm system to the gas detection system.

55.0 SPACE COOLING SERVICES

See section 57.0 for further information.

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. New headers, fully modulating boiler, pipework, 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 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.

Upon completion there shall be 3no. LPHW circuits within the boiler house, 2no. of which shall be existing. There shall be 2no. existing LPHW heating circuits serving the existing school, 1no. new circuit serving the new extension which shall be constructed. The mechanical contactor shall allow for the extension of the existing flow and return header as set out in drawing and specification.

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 new low loss flow and return header located in the plantroom. The installation shall be served by the new LPG gas 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 mechanical contractor shall retain all existing heating services zones, heating service pipework and associated radiators throughout the school building.

56.01. Radiators

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

Supply, install and fit radiators as specified in the schedule as indicated on the drawings. New steel panel surface mounted Low-H₂O (low water content) radiators shall be supplied and installed by the Mechanical Contractor throughout the building indicated on the drawings. The Mechanical 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. 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.

Radiators shall be fitted throughout the building as per drawings.



Radiator schedule is as follows:

Radiator Schedule								
Location	Ref	Style	Code	Type	Height	Length	Depth	Output at Δt 50
Entrance Lobby	R1	Maxi WF	MAXW.059.063.11.233/WF	11	590	2030	130	1969
Corridor 1	R2	Maxi WF	MAXW.074.203.11.233/WF	11	590	1030	130	890
Corridor 2	R3	Maxi WF	MAXW.074.203.11.233/WF	11	590	1030	130	890
Corridor 3	R4	Maxi WF	MAXW.074.203.11.233/WF	11	590	1030	130	890
Mainstream Classroom	R5	Maxi WF	MAXW.059.163.11.233/WF	11	590	1430	130	1321
Mainstream Classroom	R6	Maxi WF	MAXW.059.063.11.233/WF	11	590	2030	130	1969
Mainstream Classroom	R7	Maxi WF	MAXW.059.063.11.233/WF	11	590	2030	130	1969
WC 1	R8	Maxi WF	MAXW.059.203.11.233/WF	11	590	630	130	458
WC 2	R9	Maxi WF	MAXW.059.203.11.233/WF	11	590	630	130	458
Sluice	R10	Maxi WF	MAXW.059.203.11.233/WF	11	590	630	130	458
WC 3	R11	Maxi WF	MAXW.059.203.11.233/WF	11	590	630	130	458
Store	R12	Maxi WF	MAXW.074.203.11.233/WF	11	590	1030	130	890
Changing Place	R13	Maxi WF	MAXW.074.203.11.233/WF	11	590	1030	130	890
Office	R14	Maxi WF	MAXW.059.163.11.233/WF	11	590	1430	130	1321
Staff WC 1	R15	Maxi WF	MAXW.059.203.11.233/WF	11	590	630	130	458
Staff WC 2	R16	Maxi WF	MAXW.059.203.11.233/WF	11	590	630	130	458
Corridor	R17	Maxi WF	MAXW.059.203.11.233/WF	11	590	1030	130	890
Corridor	R18	Maxi WF	MAXW.059.203.11.233/WF	11	590	1030	130	890
Quiet Space 1	R19	Maxi WF	MAXW.059.203.11.233/WF	11	590	1030	130	890
Classroom 1	R20	Maxi WF	MAXW.059.163.11.233/WF	11	590	1430	130	1321
Classroom 1	R21	Maxi WF	MAXW.059.063.11.233/WF	11	590	2030	130	1969
Classroom 1	R22	Maxi WF	MAXW.059.063.11.233/WF	11	590	2030	130	1969

Classroom 1	R2 3	Maxi WF	MAXW.059.163.11.233/WF	11	590	1230	130	1105
Multi Activity Room	R2 4	Maxi WF	MAXW.074.143.11.233/WF	11	590	2030	130	1969
Classroom 2	R2 5	Maxi WF	MAXW.059.163.11.233/WF	11	590	1230	130	1105
Classroom 2	R2 6	Maxi WF	MAXW.074.083.11.233/WF	11	590	2030	130	1969
Classroom 2	R2 7	Maxi WF	MAXW.074.083.11.233/WF	11	590	2030	130	1969
Classroom 2	R2 8	Maxi WF	MAXW.059.163.11.233/WF	11	590	1430	130	1321
WC 4	R2 9	Maxi WF	MAXW.059.203.11.233/WF	11	590	630	130	458
WC 5	R3 0	Maxi WF	MAXW.059.203.11.233/WF	11	590	630	130	458

Radiator Specification:

Casing -

1. Super strong profiled front plates in 1.5m thick, Folded to 3.0m steel. Soft-design: rounded angles, to avoid accidental injury.
2. Scratch-resistant surface coating with a satin gloss finish. High UV resistance.
3. Unit to Come with Chamfered corners.
4. 20mm profile front panels
5. traffic white RAL 9016 glossy (233)
6. Casing shall have a 10 year guarantee
7. Front panel built from 1.5mm sendzimir galvanised steel plate, folded into 'U' channels giving double profile strength
8. Side panels built from 1.5mm sendzimir galvanised steel plate, folded to provide rounded corners
9. Brackets built from 1mm sendzimir galvanised steel plate, to be installed with a maximum intermediate distance of 1050mm
10. Casing locks supplied to prevent unauthorised removal of the casing from the brackets
11. Casing finished with a scratch-resistant polyester powder coating with a satin gloss finish in colour RAL 9016
12. Heat outputs shall be certified and tested in accordance with EN 442 supported by a CE Declaration of Performance
13. Touch Temperature must not exceed 43 degrees and must be guaranteed by manufacturer at a flow of 75 degrees
14. Rounded angles to avoid injury.

The Low-H2O emitter specification

1. Emitter shall be constructed from pure copper and aluminium, totally non-corrosive as emitter – Brass Header Must be used in the emitter.
2. Emitter shall have a 30 year guarantee
3. Emitter shall be pressure tested: 20 bar
4. Emitter as standard with extended air vent with transparent synthetic drain tube
5. Low water content – .98 litres per metre or less
6. Heat Exchanger must be corrugated.
7. Low-H₂O heat exchanger with dirt-repellent and dust-proof lacquer in graphite grey (RAL 7024).
8. DHSS DN4 Compliant
9. Complies With the safety requirement of DHSS DN4
10. Low H₂O heat exchanger manufactured from round, seamless tubes made of pure red copper to EN12735-2, with corrugated pure aluminium fins and two brass collectors. Aluminium fins feature collars for maximum surface area contact between tubes and fins. Brass collectors complete with 2no. ½" BSP brass connections. Same end connections suitable for left and right hand installation.
11. To maximise heat transfer, aluminium fins must provide the following minimum surface area of aluminium per metre of finned tube: Type 10 (33000cm²), Type 15 (50000cm²), Type 11/20 (67000cm²), Type 16 (101000cm²), Type 21 (135000cm²)
12. To maximise heat transfer, aluminium fins must provide the following minimum surface contact area with the copper tubes per metre of finned tube: Type 10 (1800cm²), Type 15 (2800cm²), Type 11/20 (3700cm²), Type 16 (5600cm²), Type 21 (7500cm²)
13. Complete heat exchanger assembly pressure tested to 20 bar and guaranteed suitable for a maximum working pressure of 10 bar.
14. Complete heat exchanger assembly electrostatically lacquered with anthracite grey epoxy polyester powder coating to RAL 7024.
15. Radiators shall be as manufactured by Jaga Maxi (or equivalent).

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 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.

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.

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
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.

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.

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.
- 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.

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



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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 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 51.05 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.

56.04 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.

56.05 Two-port valves & associated thermostat

General:

All the radiators in the classrooms as indicated on the drawings shall be provided with individual room temperature control by means of two-port motorised valves that are fed from a digital room temperature stat. Quantities as indicated on the drawings.

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

See specific detail on the heating services drawing for the specific piping arrangement for each two-port valve installation. In total there are 4no rooms where the two-port valve and thermostat arrangement shall be installed. See drawings to confirm quantities, locations and pipe sizes.

Digital Room Stats:

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

These digital room stats shall provide the following functions

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

The stats shall adhere to the following specifications:

- Temperature range: 0°C - 35°C
- Mounting type: Surface
- Digital display: Yes
- Dial lock: Yes
- Built-in sensor: Yes
- Accuracy: +/- 1.0°C
- Electrical supply: 230VAC
- Electrical rating: 3amp
- IP rating: IP30
- Dimensions (approx.): 92mm high x 92mm wide x 34mm deep.
- Guarantee: 2years

The Mechanical Contractor shall hand over all necessary items to the Electrical Contractor for wiring complete with any wiring diagrams or instructions as supplied by the specialist supplier. Wall mounted digital/electronic room thermostats shall be as EPH CDT, Heatmiser DS1-L, Seitron TAD 02M, or equivalent. The Contractor shall include for the supply and fitting of these valves and thermostats.



Two-port Valves:

Two-port valves shall be installed on the pipework into classrooms to control the heating within the room. See drawing for quantities, locations and piping arrangements. Two-port valves shall have the following specifications:

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

Two-port valves shall be as Myson, Honeywell, EPH, (or equivalent). Valve shall be 15mm/22mm Zone Valve and shall be supplied with and actuator head. The Contractor shall include for the supply and fitting of these valves as indicated on the drawings.



56.06 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 'Fernox Powerflush II', or equivalent.

56.09 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 SERVICES

General

The Mechanical 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 Extract ductwork

General:

The Mechanical Contractor shall allow for the supply, installation, testing and commissioning of the complete extract ventilation systems as indicated on the drawings. The extract systems shall comprise of associated ductwork and in-line extract fans as indicated on the drawings.

Ductwork:

All extract air ductwork as highlighted on the drawings shall be installed in galvanised steel ductwork. Routes and sizes as indicated on the drawings.

All new extract ductwork shall exit the building horizontally through the external wall as indicated on the drawings. Routes and sizes as indicated on the drawings.

All new extract ductwork shall be galvanised sheet metal. See section 57.05 below for specification below on ductwork required for the extract ventilation systems.

All of extract ductwork shall be circular.

Installation:

All of extract ductwork shall be circular. Allow for all necessary connections in order to connect the ductwork to the internal grilles and external louvres for the extract systems in the building.

The Mechanical Contractor shall allow for the supply and installation of all internal grilles and external louvres for the extract ventilation systems. Refer to items 57.08 and 57.09 for further information.

All main runs of new extract ductwork shall be situated within the false ceiling where possible. All ductwork shall be installed above the ceiling in the ceiling void. Allow for all necessary, materials, ductwork, ductwork drops, bracing, etc. for installing the extract ductwork.

The main runs of extract ductwork shall be installed at approximately 3200mm above finished floor level on the Ground Floor. The grilles from the main runs of ductwork (which shall be installed in the suspended ceiling) shall be installed at approximately 3000mm. Therefore, allow for a maximum ducting drop of 400mm.

The Mechanical 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.

57.02 Extract ductwork for the chemical store

Not Applicable.

57.03 Passive supply air ductwork

General:

The Mechanical Contractor shall allow for the supply, installation, testing and commissioning of passive supply ductwork to certain areas in the building as indicated on the drawings. The passive supply ventilation systems shall

compromise of passive supply ductwork, external louvres and internal grills as indicated on the drawings.

Ductwork:

All passive supply ductwork for the areas as highlighted on the drawings shall be installed in galvanised steel ductwork. Routes and sizes as indicated on the drawings.

All new passive supply ductwork shall exit the building horizontally through the external wall as indicated on the drawings. Routes and sizes as indicated on the drawings.

All new passive supply ductwork installed in the building shall be galvanised sheet metal. See section 57.05 below for specification below on ductwork required for the passive supply ventilation systems.

All of passive supply ductwork shall be circular.

Installation:

All of passive supply ductwork shall be circular. Allow for all necessary connections in order to connect the ductwork to the internal grills and external louvres for the passive supply ventilation systems in the building.

The Mechanical Contractor shall allow for the supply and installation of all internal grills and external louvres for the passive supply ventilation system for the building. Refer to items 57.08 and 57.09 for further information.

All main runs of new passive supply ductwork in the building shall be situated within the false ceiling where possible. All ductwork shall be installed above the ceiling in the ceiling void. Allow for all necessary, materials, ductwork, ductwork drops, bracing, etc. for installing the passive supply ductwork.

The main runs of passive supply ductwork shall be installed at approximately 3200mm above finished floor level on the Ground Floor. The grilles from the main runs of ductwork (which shall be installed in the suspended ceiling) shall be installed at approximately 3000mm. Therefore, allow for a maximum ducting drop of 400mm.

The Mechanical 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.

57.04 Chemical resistant ductwork from the fume cupboard

Not Applicable.

57.05 Galvanised sheet metal ductwork

All new ventilation ductwork throughout the building for the passive supply and extract ductwork 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 |
| 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 x 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 degreased and prepared for the paint. Colour of paint to be selected.

Hanging of ductwork from ceiling

The Contractor shall allow for installing the ductwork in the ceiling void. In order to complete this, the Contractor shall allow for hanging the containment for the ductwork from the existing purlins for the roof and installing suitable supports in order for the unitstrut to be installed in the ceiling void.

The brackets and unistrut for the ductwork shall be installed at approximately 3200mm above finished floor level on the Ground Floor.

In order to install the ductwork at high level, the Contractor shall allow for the following:

- Dropping 10mm threaded rod from the roof/ceiling slab at 500mm distances over the length of the ductwork run. Allow for a drop of approximately 2000mm.
- The threaded rod shall be hung from the roof/ceiling slab via 10mm G-Clamps or supports shall be drilled into the ceiling for supports.
- The base supports for the ductwork shall be 41mm double channel unistrut. Supports shall be placed at 500mm distances over the length of the ductwork run. Allow for a drop of approximately 2000mm.
- Allow for connecting the threaded rods to the double-channel unistrut.

57.06 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.

57.07 Fire dampers and access panels

Fire Dampers:

The Contractor shall supply and fit fire dampers on ductwork as indicated on the drawings. All new 'ES' rated fire dampers as indicated on the drawings.

The 'ES' rated fire damper must leak no more than 200m³/hr/m² at any point during the fire test. This also applies to the largest and smallest size of damper to be offered for sale at ambient temperature for the ES criteria to be applicable.

Unless otherwise indicated, each fire damper shall be held in the open position by a corrosion-resistant retaining device incorporating a replaceable fusible element. The fusible element shall operate at a temperature of 72°C.

Fire dampers shall be of proprietary manufacture and constructed from a corrosion resistant material such as stainless steel, or be galvanised or otherwise treated to minimise corrosion. The dampers shall be housed in a rigid frame, stainless steel corrosion resistant casing which shall not distort under fire conditions and stainless steel blades with minimum 6-hour integrity fire rating.

Fire dampers shall be located in such a position and be of a type that facilitates manual testing and re-setting. Fire dampers which are supported only by the ductwork in which they are located, or by combustible battens, frames or other methods that do not provide the fire resistance required are not acceptable.

Each fire damper casing shall be clearly marked with a permanent indication of the correct fixing attitude of the damper, the direction of air flow and the side at which access or maintenance openings shall be located.

Fire dampers provided in fire resistant ceilings shall be adequately supported either by the ceiling or from the structural soffit. It is not acceptable to form an opening, install a diffuser or grille and fit a fire damper above, if the gap between the ceiling opening and the fire damper does not achieve the fire resistance. Fire dampers shall be provided complete with installation frames. The Contractor shall provide details of fixings and supports to the Engineer for approval.

Dampers shall comply with the following:

- 'ES' rated fire and smoke dampers
- Single 430 stainless steel blade incorporating patented seal to provide both ambient and fire rated low leakage.
- Outer casing manufactured from galvanised steel with continuously welded corners and spigot connections comply with DW 144 class A B and C.
- E120 - Fire rated for 120minutes.
- Factory fitted 230v electrical actuator with thermal sensing to provide Fail-Safe-Closed operation. Electrical actuators are fitted with halogen free low smoke and fume cables.
- Electrical actuators shall have a 60 second reset time and a 20 second release time. Each actuator has a 72°C rated electrical thermal release (ETR). The ETR incorporates a safety electrical interlock that only permits actuator operation when correctly fitted. A green healthy indication lamp is built into the ETR to give a simple and clear visual check that the

actuator is receiving power, the ETR is correctly fitted and the thermal fuse is intact.

- A manual test switch allowing periodic operation of the damper for testing purposes simulates actuator fail-safe release under fire/smoke conditions. End switches are provided with each mode for reset and release monitoring
- When the power is switched on – Damper motors open.
- When power is switched off – Spring closure
- Fire dampers to be complete with factory fitted appropriate installation system, suitable for masonry wall, concrete floor or dry wall partition. (as specified)
- CE marked fulfilling the requirements of EN 15650
- Approved by LPCB and conforms to LPS1162 issue 4
- Fire tested to EN 1366-2
- Classified to EN 13501-3 (S120 vertical and horizontal)
- Corrosion tested to EN60068-2-52
- Tested Installation Method to suit Concrete/ Masonry Floors & Walls and Dry Walls
- Unique Self-Latching & removable thermal release mechanism cassette tested to ISO 10294-4
- Easy Single Handed Reset
- ASFP Grey book listed
- Nominal voltage 230V
- Power consumption in operation: 5 W
- Power consumption in rest position: 2.1 W
- Power consumption for wire sizing: 10 VA
- Auxiliary switch: 2 x SPDT
- Switching capacity auxiliary switch: 1 mA...3 (0.5 inductive) A, AC 250 V
- Ambient temperature normal operation: -30 to 55°C
- 24-month warranty period starting on the date of expedition.

Fire smoke dampers to be of type 'Swegon CSS' for circular ducts or equivalent.

Dampers shall be installed in accordance with manufacturer's instructions. Size of damper shall match size of duct as indicated on the drawings, where ducts range from sizes of 100mm diameter to 250mm diameter. Locations, sizes and quantities as indicated on the drawings.

Size of damper shall match size of duct as indicated on the drawings, where ducts range from sizes of 200mm diameter to 1000mm diameter. Locations, sizes and quantities as indicated on the drawings.

The Contractor shall supply and fit the fire dampers:

Fire Damper Schedule

<u>Ref. No.</u>	<u>Location and/or Area Served</u>	<u>Diameter (mm)</u>	<u>Length (mm)</u>	<u>Width (mm)</u>	<u>Type</u>
FD-01	Store Room	100	-	-	Fusible link Fire Damper (FDC) c/w HVAC frame



Access doors:

The Contractor shall install rigid frames access doors in the ductwork for access to the fire dampers for maintenance. In total, the Contractor shall allow for the following access doors in ductwork:

- 1no access doors in 125mm diameter ductwork.

Access doors shall be complete with air tight gasket covers designed for easy removal and refitting and be of the type that is complete with a sub-frame for fixing to the duct with a door that can be completely removed from this frame. The door of each access assembly must be secured to the frame with a heavy-duty stainless steel retaining wire.

All doors shall be constructed from galvanised sheet metal and incorporate easy to use hand operated securing devices. Hardware for doors should be heavy-duty type construction with the minimum number of quick release fastening devices suitable for the load shall be used.

Access openings and inspection covers for the inspection and servicing of plant and equipment must be provided in accordance with DW/144. Unless otherwise indicated, access openings and clean out doors for the internal cleaning of ductwork must be provided in accordance with the requirements of TR/19 and must be located and sized as detailed in tables 2, 3 and 4.

The Contractor must ensure that access openings are not obstructed by pipework, cable trays or any other obstacle and that they are fully

accessible for future use.

Where practical, openings must be arranged so that they are accessible from circulation areas to minimise disruption in occupied rooms.



57.08 Internal grilles

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

Supply grilles:

The Contractor shall allow for the supply and installation of the following internal supply air grilles:

SUPPLY AIR GRILLES (TYPE 'PG')					
Ref No.	Qty	Type	Volume (m ³ /s)	Neck Size (mm)	Overall Size (mm)
PG.01 to PG.03	3no	Disc valve as KI 125 supply valve	-	125mm diameter	160mm 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:

The Contractor shall allow for the supply and installation of the following internal extract air grilles:

EXTRACT GRILLES (TYPE 'EG')					
Ref No.	Qty	Type	Volume (m ³ /s)	Neck Size (mm)	Overall Size (mm)
EG.01 to EG.16	16no	Disc valve as KSU exhaust valve	-	125mm diameter	160mm 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.					
					

57.09 External louvres

Supply and install all external louvres as indicated on the drawings.

EXTERNAL EXTRACT LOURVES (TYPES 'EEG')					
Ref No.	Qty	Type	Ductwork connection to louver (mm)	Nominal size of grill (mm)	Overall size of grill (mm)
EEG.08	1no	WL38 rectangular cast external louver with 45° degree blade slope	200mm diameter	262mm high by 262mm wide	307mm high by 307mm wide
EEG.01 to EEG.07, & EEG.09 to EEG.16	15no	WL38 rectangular cast external louver with 45° degree blade slope	150mm diameter	212mm high by 212mm wide	257mm high by 257mm wide
EXTERNAL PASSIVE SUPPLY AIR LOURVES (TYPES 'EPG')					
EPG.01	1no	WL38 rectangular cast external louver with 45° degree blade slope	100mm diameter	212mm high by 212mm wide	257mm high by 257mm wide
EPG.02	1no	WL38 rectangular cast external louver with 45° degree blade slope	200mm diameter	262mm high by 262mm wide	307mm high by 307mm wide

Notes: ○ Louvres shall have a metal aluminium finish. ○ Louvres shall have a stainless steel bird mesh. ○ 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 match the external cladding on the building. 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 a the selected RAL colour which is to be approved by the architect/client. Include for spray painting the grilles as highlighted above. 					

Power coating and spraying of all external louvres:

All louvres shall be spray painted to a RAL colour to match the colours selected by the architect.

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.

57.10 Cooker Hoods

N/A

57.11 Extract fans

General:

Extract fans shall be installed as indicated on the drawings. These fans shall be supplied and installed by the Mechanical Contractor under the provision of this contract.

The Mechanical Contractor shall allow for all necessary accessories and connections. Supply & fit all extract fans as indicated in the drawings.

The Mechanical Contractor shall liaise with the Electrical Contractor for extract fan power supply locations and wiring details for the wall mounted fan controllers.

Extract fans:

The Mechanical Contractor shall allow for the supply and installation of the following extract fans for the toilets:

Ref No.	Location	Type	Duty	CAT No.	Control	Specific fan power
EF.01	WC –	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.02	WC –	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.03	Sluice	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.04	Changing	In-line	450m ³ /hr	TD-		

	Place	Duct Mounted Extract Fan	@ 100Pa	1000/200 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.05	WC -	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.06	Staff WC -	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.07	Staff WC -	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.08	Multi-sensory Room	In-line Duct Mounted Extract Fan	190m ³ /hr	TD 250/100 ECOWATT	By single phase speed controller	
EF.09	WC	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.10	WC	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec

EF.11	WC	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.12	WC	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.13	WC	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.14	WC	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.15	WC	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec
EF.16	WC	In-line Duct Mounted Extract Fan	300m ³ /hr @ 100Pa	TD-500/150 SILENT ECOWATT T	Controlled by remote PIR Sensor as CPFL-S c/w 15 min overrun timer	0.2 W/l/sec

All the extract fans shall adhere to the following specification:

- In-line mixed flow fan with sound-absorbent insulation
- Extremely quiet
- Fan casing manufactured in plastic material
- Fan fitted with flexible rubber seals on the inlet and outlet to absorb vibrations
- Fan fitted with an external connection box
- Fan shall have a body that can be removed without dismantling the adjacent ducting
- Brushless EC motor
- Suitable for single phase supply 230V $\pm$ 15%/50-60Hz
- IP44 rated
- Fan shall have thermal overload protection. Analogue input with terminals in the terminal box to control the fan with 0-10V input signal.
- Operation within ambient air temperatures between -20°C up to +40°C.
- All fans to 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. The Contractor shall ensure that the remote PIR sensor is suitable for the extract fan to be installed.
- All fans to have a run-off-timer incorporated into the fan.
- The Contractor shall allow for supplying fans to suit the ducting installation, layout and sizes.
- **All extract fan must comply with the NZEB/BER assessment. The fan shall have a SFP (Specific Fan Power) of 0.2w/l/s as outlined in Table 6 from TGD Part L.**
- Extract fans to be as supplied by Ventac, Vent Axia, Systemair or equivalent.

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.



Speed Controller for multi-sensory room extract fans:

Extract fan for the multi-sensory room shall be controlled by a single phase speed controller.

57.12 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.



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.

57.13 Heat recovery units

General:

The Contractor shall allow for the supply, installation, testing and commissioning of a number of heat recovery system for the building. All the heat recovery units shall be installed in the wall as shown on the drawings.

The Contractor shall allow for the supply, installation, testing and commissioning of all the heat recovery units as indicated on the drawings. This includes the heat recovery unit (HRU), associated controls, associated works, ductwork, etc.

All heat recovery units shall be supplied, installed and commissioned as part of this contract. Include for the supply and return air filters in the unit.

In total, there are 1no heat recovery units to be supplied and installed as part of this contract. The Contractor shall allow for the supply and installation of the following heat recovery units for the building:

Heat Recovery Unit 01:

Unit & Construction:

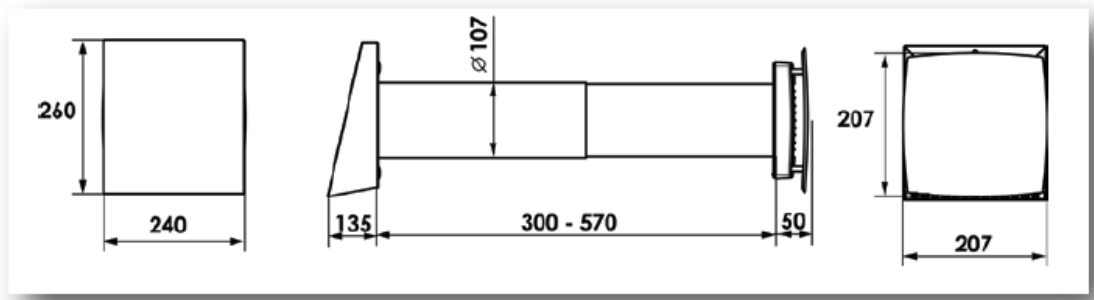
- Number of units: 1no
- Reference: HRU-01
- Model: KERS 25, or equivalent.
- External Grille: VTGF03 Flexible outdoor grille (White)

Main Technical Data:

- Air flow at max speed: 25mc/hr
- Air Exchange: 12.5 mc/hr
- Heat Recovery Efficiency: 90%
- Noise level at max speed: 33db
- Noise level at max speed @3m: 11db
- Temperature working range: -20 / +50
- Electrical power consumption: 5.2W

- Electrical current: 0.031A
- On board filters: 2
- Filter Class EN 779: G3 (F7 as optional)
- Power: 230/1/50 V/ph/Hz
- Protection: IP24

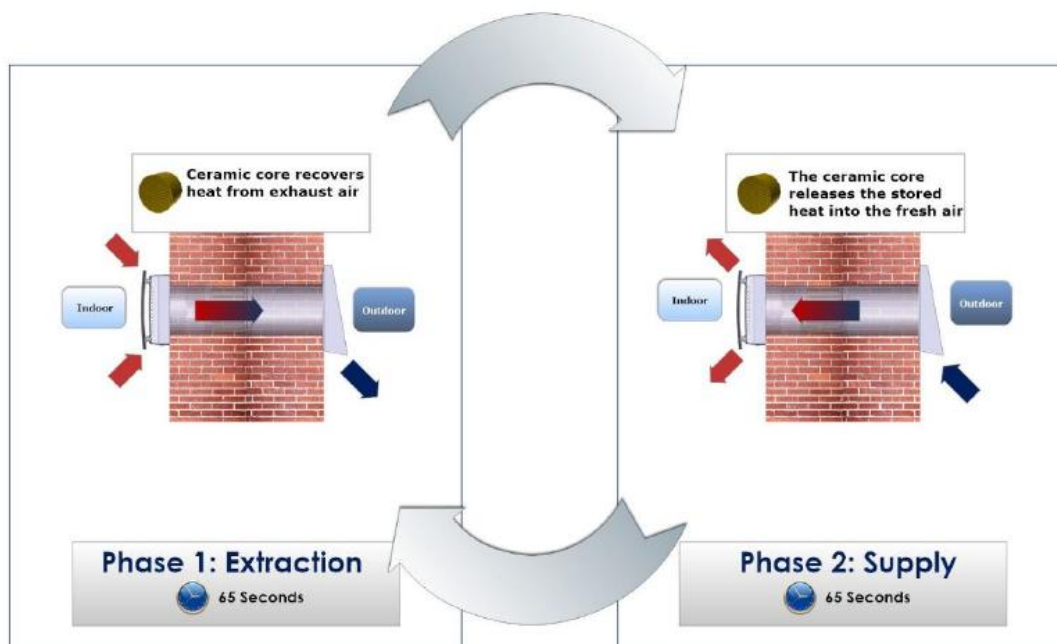
Dimensions:



Running of the unit:

Phase 1: Stale and hot air is extracted from the room. While flowing through the heat exchanger ceramic, heats it. So it moves up to 97% of the thermal energy. In 65 seconds the heat exchanger is heated and the unit switches to the second phase.

Phase 2: The fresh air from the outside flows through the heat exchanger ceramic that heats the air to room temperature. In 65 seconds the ceramic exchanger cools and the units switches to 'Phase 1'.



Heat Recovery Unit 02:

Unit & Construction:

- Number of units: 1no
- Reference: HRU-02
- Model: Systemair Sense SNX 1000

Main Technical Data:

Technical information

		Minimum	Medium	Nominal	Boost
Airflow	m^3/h	500	700	1000	1450
Weight	kg	170			

	Electrical information					
Fan	Fan power	W	31	66	170	492
	SFP	kW/m ³ /s	0,22	0,34	0,61	1,22
Heat.	Preheater power	W	3000			
	Afterheater power	W	3000			
Total	Total electrical power	W	7000			
	Voltage / Frequency	V / Hz	400 / 50			
	Fuse	A	16			
	Power cable	mm ²	5 x 2,5			

Cable size needs to be rechecked with the situation on site

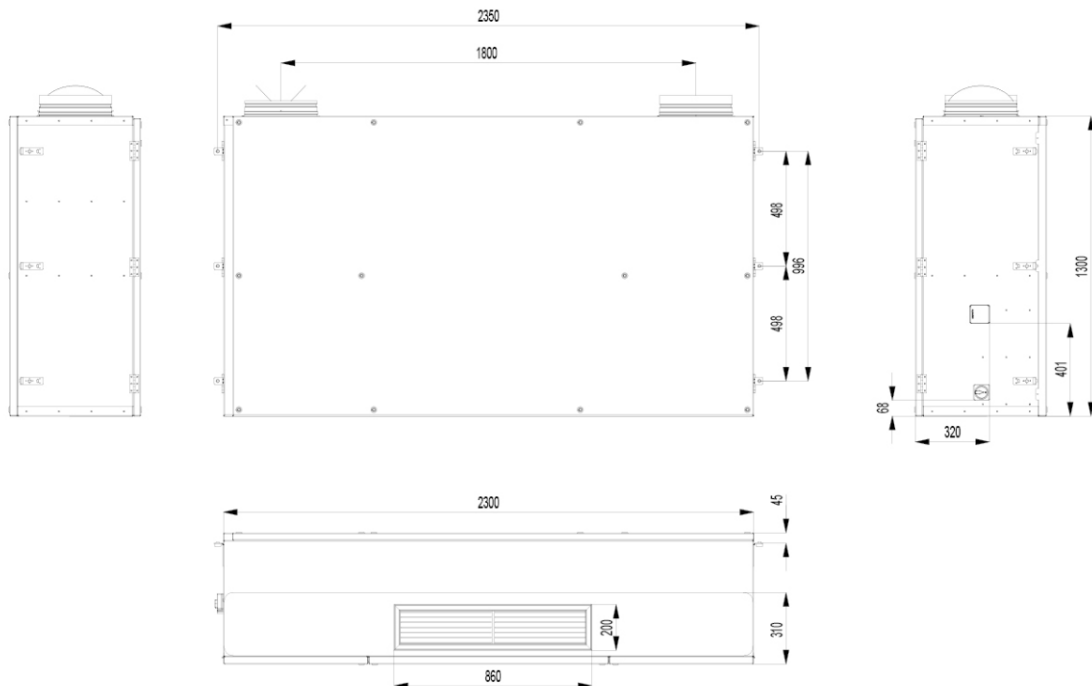
		Heat exchanger information				
Recovery	Outdoor temperature	°C	-12			
	Extract temperature	°C	22			
	Supply temperature	°C	21	21	21	21
	Heat recovery	%	83,5%	80,9%	78,7%	76,8%

Noise information (Q = 1)					
Sound pressure at 1m	<i>dB(A)</i>	17,7	24,5	33,6	43,6
Sound pressure at 3m	<i>dB(A)</i>	10,9	17,7	26,8	36,8

Room conditions like geometry or sound absorption can influence the sound pressure measurements substantially.

Ecodesign		
Unit category	NRVU	
Unit type	BVU	
Drive	Integrated VSD	
Heat recovery type	Recuperative	
$SFP_{int,limit}$	W/(m ³ /s)	1228
SFP_{int}	W/(m ³ /s)	638
$Q_{v,nom}$	m ³ /s	0,278
P_{nom}	kW	0,61
Face velocity	m/s	1,16
Ps internal Supply	Pa	179
Ps internal Extract	Pa	133
dP filter/exchanger Supply	Pa	59/120
dP filter/exchanger Extract	Pa	13/120
Supply Fan efficiency	50,9%	
Extract fan efficiency	46,9%	
External Leakage	1,0%	
Internal Leakage	1,0%	
Temperature ratio	78,7%	
ErP compliance	2018	

Dimensions:



Functional Diagram:

Functional diagram

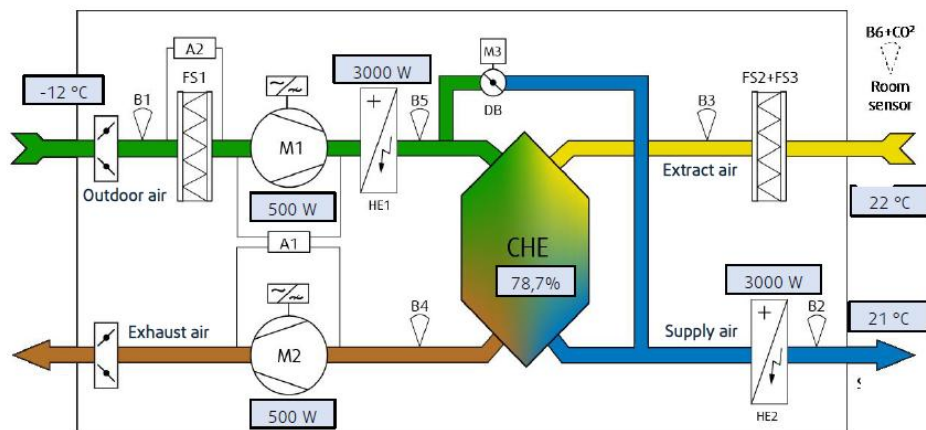


Chart shows conditions met at nominal airflow.

57.14 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.

57.15 Commissioning

The Contractor shall allow for commissioning the entire ventilation once all works are completed within the building. The 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.

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:** 6kg Dry Powder
- **Type C:** 2kg CO₂
- **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.

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 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 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 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

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.

- 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.



Unit A6, M4 Business Park, Maynooth Road, Celbridge, Co. Kildare, W23 VFY7.
Tel: 01-6274103
www.galileoenergy.ie

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.