Construction & Engineering Services Ltd

Mechanical Specification

Bedford College

Shuttleworth College

PSDS3b & HoR Fit Out Projects

Date:	October 30, 2023	**Revision:**	T00
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Prepared For:	Mark Eustace	**Of:**	Bedford College

Revision History:

Date	Section	Revision
2023-10-30	All	For Tender

Contents

Introduction

This Mechanical Services Installation Specification is divided into the following sections:

1. **General Conditions:** Description of the site, nature of contract and how the project shall be managed by the contractor.
2. **Mechanical Services Scope of Works:** Description of the project works and specific installation details where these vary from the materials and workmanship specification.

All deviations from the requirements of this document shall be stated in the bid documentation. In the absence of such a statement, it shall be understood that all requirements of this specification are fulfilled without exception.

This document shall be read in conjunction with the tender drawings, selection data, schedules, lists, contractual documentation, letters, and any other information issued with or as an addendum to this tender package.

The tender documentation is a Stage 4 design, the selected contractor is responsible to develop this information into a complete Stage 5 fully coordinated working design package for approval by the client's representative.

The project and associated tender packages will be divided into the following packages:

- Public Sector Decarbonisation Scheme phase 3b - Halls of Residence and Student Common Room
- Halls of Residence fit out
- Public Sector Decarbonisation Scheme phase 3b – Heat network infrastructure and associated upgrades

General Conditions

A10 – General Particulars

Project Name:

Shuttleworth College PSDS3b and Halls of Residence Fit Out

Client:

Bedford College

Engineer:

Panda CES Ltd

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A11 – Tender and Contract Documents

The tender documents with respects the mechanical systems are detailed on the latest revision of Document Register 02-15 DR-M-TXX

A12 – The Site / Existing Building

Site Address:

Shuttleworth College
Old Warden Park
Biggleswade
SG18 9DX

The project is spread across multiple locations on the Shuttleworth College campus some parts of which have heritage status and includes but is not limited to the following elements:

- Air Source Heat Pump Compound and associated Plant Room
- Below-ground heat network distribution infrastructure to the Halls of Residence, Student Common Room, Russell Hall Building, Sports Hall and Learning Resource Centre
- Hot water production and storage for the Halls of Residence, Student Common Room, Russell Hall Building and Sports Hall
- Hot and cold water distribution to the Halls of Residence, Student Common Room and Russell Hall Building
- Space heating systems in the Halls of Residence, Student Common Room and Russell Hall Building
- Ventilation systems in the Sports Hall and Lecture Theatre
- New heating terminals in the Learning Resource Centre
- Heating connections to various air handling units

A13 – Description of the Works and Common Design Criteria

The mechanical building services works include but are not limited to:

- Installation of two Air Source Heat Pumps that will be free issued by the client
- Installation of two thermal stores that will be free issued by the client
- Supply, delivery, installation and commissioning of the Low Carbon Heating system, associated underground infrastructure and field components such as heat interface units and the like
- Supply, delivery, installation and commissioning of the Halls of Residence and Student Common Room Heating systems
- Supply, delivery, installation and commissioning of the Halls of Residence and Student Common Room hot & cold water systems and associated fixtures
- Supply, delivery, installation and commissioning of the Russell Hall Building heating system
- Supply, delivery, installation and commissioning of the Sports Hall heating/ventilation system
- Installation and commissioning of one heat recovery air processing unit that will be free issued by the client
- Supply, delivery, installation and commissioning of the Russell Hall Building Restaurant and Lecture Theatre ventilation systems
- Supply, delivery, installation and commissioning of the Halls of Residence, Student Common Room and Russell Hall Building boosted cold water system
- Supply, delivery, installation and commissioning of various additions and alterations to the existing heating and hot water systems

The mechanical building services works include the following:

- Demolition, removal from site and responsible disposal of all services, pipes, ducts, equipment, machinery, containment, supports, electrical & controls systems, plinths & bases and any other items that are already or become redundant as a result of the works
- Removal of all tees and dead-legs identified during the works from hot & cold water systems
- Creating of all rectangular penetrations with both dimensions less than or equal to 200mm and round penetrations with a diameter of less than or equal to 200mm

The mechanical building services works do not include the following:

- Construction of the Air Source Heat Pump Compound and Low Carbon Heating Plant Room
- Groundworks associated with the works
- Demolition and making good of building elements other than the penetrations described above

- Removal, replacement, repair and making good of furnishings and finishes

The works shall be carried out in accordance with the British standards relevant at the time of tender, the materials and workmanship standards detailed in this specification, terms and conditions of the main contract, main contract program, layout drawings, single line diagrams, building information model, schedules, and lists.

All equipment, plant, materials, and specialist systems installed under this contract shall be as detail ed on the drawings, schedules and specifications. Where no manufacturer has been listed for items being supplied, the Contactor shall select one of their choosing, however, it must comply with the requirements of the specifications and standards listed in this document and be approved by the client's engineer.

This contract will be undertaken on a full Design and Build Basis and therefore the contractor is fully responsible for applying due diligence to the tender design, developing the design from the current stage to completion and for all specialist sub-contractor designs required.

The contractor shall allow within the tender costs to design, supply, install and commission the mechanical building services and provide full construction issue drawings and specifications for approval by the client's engineer before commencing the works.

The following specialist designs shall be allowed for within the mechanical works:

1. Heating and Ventilation Control Systems
2. Low carbon heating system controls
3. Underfloor heating systems

The Contractor shall employ the listed specialists below to assist in the execution of the works:

Heating & Ventilation Controls

Genius Hub
Alasdair Woodbridge
0121 667 8000
07800 546 750
ajw@geniushub.co.uk

Low Carbon Heating System Controls

AES Control Systems
Karl Anzelmo
07519-327404
KarlAnzelmo@aescontrols.co.uk

Air Source Heat Pumps

To be confirmed by the client

Thermal Store

To be confirmed by the client

Air Conditioning & Heat Interface Units

Daikin

Jeton Haxhia

07968 755 643

Jeton Haxhia <haxhia.j@daikin.co.uk>

Underfloor Heating Systems

Contínal UK

Harry King

0333 800 1750

harry.king@continal.co.uk

Air Handling Units

Systemair UK

Nicola Page

07855-388485

nicola.page@systemair.co.uk

Fan Convectors

Jaga

Steve Charles

07778 709155

SCharles@jaga.co.uk

Direct Buried Pre-insulated Piping System

To be confirmed by the client

Heat Recovery Air Processing Units

Nilan

Maurice Falvey

+353 (0)87 9798361

maurice@nilan.ie

Common Mechanical Design Criteria

Thermal Comfort

Minimum Internal Temperature in occupied spaces: 21˚C
Setback Internal Temperature in unoccupied spaces: 16°C
Maximum Internal Temperature of occupied spaces with mechanical cooling: 24˚C
Humidity will not be controlled
Other areas as per CIBSE Guide A, table 1.5 or BB101 if relevant

Air Quality

Occupied spaces (other than workshops) with mechanical ventilation: 8L/s/person
Workshops with mechanical ventilation: 2.5L/s/m2
Minimum Air Filtration: CIBSE Guide A, table 1.5 - Grade G4
Spaces with purge ventilation: CIBSE AM 10
Spaces with Mechanical Extract

Toilet: 15 L/s/WC
Shower: 15 L/s/Shower
Cooking Equipment: IGEM UP 11
Photocopiers/Printers: 20 L/s/machine
Other Spaces: CIBSE Guide A, table 1.5 or BB101 if relevant

Acoustic Comfort

General Teaching & Office Areas: NR35
Wellbeing & Calm Areas: NR30
Seminar Rooms / Lecture Theatres: NR30
Other Spaces: CIBSE Guide A, table 1.5 or BB101 if relevant

Occupancy Control

Occupancy based control of heating, cooling and ventilation systems in all occupied spaces other than Residence Rooms

External Noise Conditions

Noise emissions limit: Not to exceed 5 dBA less than the measured typical

Background noise level (NSR, LA90, 15min (dB)) applied to both day and night conditions

A20 – The Contract/Sub-contract

Refer to the main contract documents issued for contract details

A31 - Provision, Content and use of Documents

Design Software

The contractor shall develop the construction phase drawings in electronic (dwg) format using the current architectural layout. As-built drawings shall be provided to the client as part of the O&M information upon completion of the project. The drawing outputs issued by the contractor (construction and as-built) shall be issued in pdf and dwg formats.

Contractors Obligations

The contractor is responsible for providing the following content or documentation as part of the project construction:

1. Develop the Stage 4 Tender Design into a fully coordinated Stage 5 Construction Documentation package
2. Check the provision for and accuracy of the builder's work information issued prior to the award of the contract
3. Detail the final or supplementary builders work information based on manufacturers or sub-contractors design or co-ordination information and provide fully dimensioned drawings
4. Detail all access requirements, including access in false ceilings and ducts, for maintenance & cleaning and provide fully dimensioned and annotated drawings
5. Ensure adequate drains, vents and pipework fall gradients are provided
6. Locate and provide detailed design for all brackets and supports to include support steelwork
7. Locate and provide detailed design for all expansion anchors and guides. Provide calculations to support load and thrust designs
8. Ensure suitable access to all valve, damper and plant locations for easy access of maintenance personnel
9. Undertake design check of all final fan and pump selections based on the co-ordinated installation drawing system resistances
10. Calculate system water capacities and quantity of chemical additives required based on co-ordinated installation drawings
11. Prepare detailed electrical wiring diagrams of all equipment supplied showing all interconnections between equipment to enable all wiring installations to be undertaken

12. Design and select the sound attenuation equipment to satisfy the performance requirements detailed within the specification and the spatial allowances made within the tender drawings
13. Ensure the acoustic design or modifications of equipment is undertaken to achieve the performance requirements detailed in the specification. All stated noise levels shall be achieved with all plant operating
14. Design and select all anti-vibration mountings to ensure vibration is not carried over to the building structure; vibration from equipment shall be imperceptible
15. Ensure adequate provision and suitable location of test points, control sensors, detectors, thermostats, and gauges providing necessary pipework pockets
16. Ensure sizes indicated on the detailed design information are not invalidated by the selection of alternative routes during co-ordination or selection of alternative manufacturer's equipment
17. Make recommendation/advise on all platforms, access covers, gratings and ladders required for suitable access for maintenance
18. Design and size refrigeration pipework as required
19. Ensure all alternative proposals including value engineering exercises are fully designed before submitting for approval
20. Note and advise the main contractor of all acoustic and fire stopping required to facilitate the works
21. Any changes to the detailed design drawings and information required as part of a variation or change from specification post contract award shall be undertaken by the contractor and information issued to the CA for approval/comment
22. Design, supply and install all rectangular builders work openings with both dimensions less than or equal to 200mm and all round builders work openings with a diameter of less than or equal to 200mm

The Main Contractor shall be responsible for providing the following content or documentation as part of the construction phase of the project:

1. Design, supply and install all platforms, access covers, gratings and ladders required for suitable access for maintenance
2. Design and undertake all acoustic and fire stopping required to facilitate the works
3. Design, supply and install all rectangular builders work openings with one or more dimensions greater than 200mm and all round builders work openings with a diameter of greater than 200mm

Drawing Definitions

The definitions of technical terms associated with The Engineering services installations are those included in:

- CIBSE, IOP and BSRIA Technical Publications
- Loss Prevention Council - Rules for Automatic Sprinkler Installations
- BS 7671 - Requirements for Electrical Installations (IEE Wiring Regulations)
- British Standards, including Codes of Practice
- Associated Statutory Acts

Where used in the documentation the following definitions apply:

- Duct: An enclosed space specifically intended for the distribution of services, with direct access for personnel
- Trench: A covered horizontal service space in the floor or ground with access from above
- Cavity: A space enclosed within the elements of a building within which services are installed, e.g. the space between ceiling and floor above. See Building Regulations.
- Service Areas: Includes areas within a building with limited finishes such as loading bays, car parks etc
- Concealed Services: Includes installations within ducts, trenches or cavities
- Exposed Services: Includes installations within plant rooms, outdoors or unprotected within service or occupied areas
- System: System means all equipment, accessories, controls, supports and ancillary items, including supply, installation, connection, testing, commissioning and setting to work necessary for that section of the Works to function
- Services: Services means the inclusion of one or more systems
- Tender Drawings: Drawings listed in the latest revision of 02-06-DIN-M-XX

  The Stage 4 Tender Drawings show the engineering design and layout of each mechanical building service from which coordination and installation are feasible.
- Sketch Drawings: Line diagrams and layouts indicating basic proposals, location of main items of plant, routes of main pipes, air ducts and cable runs in such detail as to illustrate the incorporation of The Engineering Services within the Project as a whole
- Schematic Drawings (Flow Diagrams): A line diagram describing the interconnection of components in a complex system

  The main features of a schematic drawing are as follows:
  - A two dimensional layout drawing with divisions to show the distribution of the system between building levels. Or an isometric style layout indicating the

distribution of systems across individual floor levels. The drawing is not necessarily constructed to scale. Include all functional components which make up the system, i.e. plant items, pumps, fans, valves, strainers, terminals, electrical switchgear, distribution and components.

- Symbols and line conventions in accordance with BS EN ISO 11091 Recommendations for symbols and other graphic conventions
- Label the drawing with appropriate pipe, duct and cable sizes where these are not shown elsewhere
- Indicate components which have a sensing and control function and show the links between them, e.g. building management systems, fire alarms and HV controls
- Identify the major components indicated on the schematic drawing so that their whereabouts in specification and on other drawings can be easily determined
- Commissioning specification
- Include all data essential to testing and commissioning including volumetric flow rates, design total pressure losses at equipment, locations of dampers, valves and flow measuring stations, electrical fault levels, current ratings, short circuit capacities and tripping times

- Detailed Design Drawing: A drawing showing the intended locations of plant items and service routes in such detail as to indicate the design intent

  The main features of detailed design drawings should be as follows:

  - Plan layouts to a scale of at least 1:50
  - Plant areas to a scale of at least 1:25 and accompanied by cross-sections
  - The drawing will not indicate the precise position of services, but it should be feasible to install the services within the general routes indicated. It should be possible to produce co-ordination drawings or installation drawings without major re-routeing of the services
  - Represent pipework by single line layouts
  - Represent ductwork by double line layouts
  - Indicate on the drawing the space available for major service routing in both horizontal and vertical planes
- Co-ordination Drawing: A drawing showing the inter-relationship of two or more engineering services and their relation to the structure and building fabric.

  The main features of a co-ordination drawing are as follows:

  - Plan layouts to a scale of at least 1:50, accompanied by cross-sections to a scale of at least 1:25 for all congested areas

- A spatially co-ordinated drawing, i.e. no physical clashes between the system components when installed at the scaled-off positions shown on the drawing. Provide dimensions in areas where tolerances are minimal
- Make allowance for the service at its widest point for spaces between pipe and duct runs. Allow for insulation, standard fitting dimensions and joint widths on the drawing
- Make allowance for those plant items specified by the designer and identified in the design specification
- Make allowance for installation working space and space to facilitate commissioning and maintenance
- Indicate positions of main fixing points and supports where they have significance to the structural design
- Arrange the services so that it is possible to demonstrate a feasible sequence of installation
- Support the drawing with individual services drawings for clarity
- Plantroom layouts to a scale of at least 1:25, accompanied by cross-sections and elevations to a scale of at least 1:25

- Installation Drawing: A drawing based on the detailed drawing or co-ordination drawing with the primary purpose of defining that information needed by the tradesmen on site to install the works.

  The main features of installation drawings are as follows:

  - Plan layouts to a scale of at least 1:50, accompanied by cross-sections to a scale of at least 1:25 for all congested areas
  - A spatially co-ordinated drawing, i.e. no physical clashes between the system components when installed at the scaled-off positions shown on the drawing
  - Make allowance for inclusion of all supports and fixings necessary to install the works
  - Make allowance for the service at its widest point for spaces between pipe and duct runs. Allow for insulation, standard fitting dimensions and joint widths on the drawing
  - Make allowance for installation details provided from shop drawings
  - Make allowance for installation working space; space to facilitate commissioning and space to allow on-going operation and maintenance in accordance with the relevant health and safety requirements
  - Make allowance for plant and equipment including those which are chosen as alternatives to the designers specified option

  - Provide dimensions where the positioning of services is considered to be important enough not to leave to the tradesmen onsite
  - Plantroom layouts to a scale of at least 1:25, accompanied by cross-sections and elevations to a scale of at least 1:25

- Installation Wiring Diagram: Drawing showing the interconnection of electric components, panels etc in accordance with the design intent indicated in the schematic drawings and incorporating the details provided on manufacturer's certified drawings.

  Installation wiring diagrams include but are not limited to:
  - Maximum electrical loading for each supply cable
  - Cable termination facilities
  - Cable identification and all terminal numbers
- Shop Drawings: Drawing prepared by a fabricator or supplier unique to the project. Including supplier's drawings for ductwork, pre-fabricated pipework, sprinkler systems, control and switchgear panels and associated internal wiring.
- Manufacturers Drawings: Drawing provided by a manufacturer or supplier to indicate a typical representation of the product, components or plant items to be supplied for a particular project
- Manufacturers Certified Drawings: Drawing provided by a manufacturer or supplier to indicate details of the product, components or plant items and which the manufacturer or supplier guarantees the supplied equipment will comply with.
- Record Drawings: Drawing showing the building and services installations as installed at the date of practical completion.

  The main features of the record drawings should be as follows:
  - Provide a record of the locations of all the systems and components installed including pumps, fans, valves, strainers, terminals, electrical switchgear, distribution and components
  - Use a scale not less than that of the installation drawings
  - Have marked on the drawings the positions of access points for operating and maintenance purposes
  - The drawings should not be dimensioned unless the inclusion of a dimension is considered necessary for location
- Builders Work Drawing - Design stage: A drawing to show the provisions required to accommodate the services which significantly affect the design of the building structure, fabric and external works.

  Also drawings (and schedules) of work to be carried out by building trade, and required to be costed at the design stage eg. plant bases

- Builders Work Drawing - Installation stage: Drawing to show requirements for building works necessary to facilitate the installation of The Engineering services (other than where it is appropriate to mark out on site)
- Controls Logic Diagrams: Diagrams, drawings and/or schematic details of all control components and instruments showing the layout with each item uniquely identified together with a description of the controls operation and details of the associated interlocking
- Switchgear, Starter and Control Instrumentation panel drawings: Drawings showing the construction and internal wiring diagrams of the starters, panels and/or other devices
- As Installed (as-built) Drawings: Drawings/records retained on site to record the progress of and any site modifications to the Works including any changes to software
    - Plantroom Schedules & Schematics: Frame the following under clear Perspex and hang in each plant room and any other appropriate location
    - Schematic drawings of circuit layouts showing identification and duties of equipment, numbers and locations, controls and circuits.
    - Valve schedules in the form of printed sheets showing the number, type, location, application/service and symbol, and normal operating position of each valve.
    - Control schematics.
    - Location of mechanical and electrical plant and equipment items.
    - First aid instructions for treatment of persons after electric shock.
    - Location of isolating switch for electricity supply.
    - Emergency operating procedures and telephone numbers for emergency call out service applicable to any system or item of plant and equipment.
    - All other items required under Statutory or other regulations.

Drawing issuing responsibilities are following table:

Drawing Type	Engineer	Contractor
Sketch Drawings	✓	✓
Schematic Drawings	✓	✓
Detailed Design Drawing		✓
Co-ordination Drawing		✓
Installation Drawing		✓
Installation Wiring Diagram		✓
Shop Drawings		✓
Manufacturers Drawings		✓
Manufacturers Certified Drawings		✓
Record Drawings		✓
Builders Work Drawing - Design stage	✓	
Builders Work Drawing - Installation stage		✓
Controls Logic Diagrams		✓

Switchgear, Starter and Control Instrumentation panel drawings		✓
As Installed Drawings		✓
Plantroom Schedules & Schematics		✓

A32 – Management of The Works

The Engineer is providing a Clerk of the Works service to the client as part of this project to provide a collaborative arrangement to help with on-site co-ordination, installation quality, compliance with specification and effective commissioning of all MECHANICAL AND ELECTRICAL systems. To provide this service effectively collaborative working and communication with all trades regardless of contractual commitments is required. The Clerk of Works will make unannounced visits during the works and shall be given unimpeded and unsupervised access to all aspects of the works without prior notice or consent by the Main Contractor, Mechanical Contractor or any of their Sub-contractors.

Where the main contractor appoints a combined Mechanical & Electrical contractor to undertake the works detailed in this specification, the Mechanical Contractor shall appoint a contracts manager to co-ordinate all MECHANICAL AND ELECTRICAL trades and be the Specific Point of Contact (SPOC) for The Engineer during the works. No intermediary from the main contractor will be permitted under this arrangement.

Where the main contractor appoints separate Mechanical, Electrical and Plumbing contractors to undertake the works detailed in this specification, the main contractor shall appoint a competent technical services manager to co-ordinate all MECHANICAL AND ELECTRICAL trades and be the Specific Point of Contact (SPOC) for The Engineer during the works.

The Engineer reserves the right to communicate (not instruct) directly with all trades working on any element of this project regardless of any contractual arrangements, any attempts by the main contractor to limit communication is not permitted. The Engineer may request at any point for a direct representative from any trade to attend a design team meeting.

A33 – Quality Standards and Control

All works shall be carried out in accordance with the British Standards relevant at the time of tender, the materials and workmanship standards detailed in this specification, terms and conditions of the main contract, main contract program, layout drawings, single line diagrams, building information model, schedules, and lists.

In addition, the contractor shall have in place their own quality standards and control system which shall be applied to all works before offering systems for inspection/handover to The Engineer.

The Engineer reserves the right to request a copy of the contractor's quality standards (such as method statements, system installation check lists, commissioning checklists, pre-commissioning checklists, close out certificates, works sheets etc) and quality control systems prior to inspecting any works.

A35 – Specific Limitations on Method/Sequence/Timing

The contractor shall ensure all systems are installed in a timely sequence and do not impose additional requirements on other trades that could have reasonably been avoided if a suitable sequence of work had been followed.

No claim for contract variations will be accepted for consequences associated with out of sequence working.

All contractors should be aware of their legal commitments to use all reasonable endeavours to minimise the cost implications for all other trades resulting from out of sequence working.

A36 - Facilities and Temporary Works/Services

No facilities or temporary works/services are anticipated in connection with the mechanical aspects of this project.

The Main Contractor may have other requirements in order to comply with the Health and Safety requirements of the project and these will need to be detailed by the main contractor under separate cover to the Mechanical Contractor.

A37 – Operation & Maintenance of the Finished Building

The Mechanical Contractor shall allow for all Planned and Preventative Maintenance to fully comply with the SFG20 maintenance standard and the requirements of the product manufacturers recommendations for all mechanical systems installed under this contract for the first 12 months after the date of practical completion. This will ensure that no defects arising within the first 12 months can be attributed to the client not undertaking the necessary maintenance.

The contractor shall provide two hard copies of an Operating and Maintenance manual for all mechanical systems installed in the project to include but not be limited to:

1. Description of Operation
2. Schedules
3. Record Drawings (Printed at full size)

4. Commissioning & Testing Documentation
5. SFG20 compliant maintenance routines and project specific PPM schedule
6. Quotations for post project maintenance
7. Manufacturers O&M information (product specific only to equipment installed, not generic and not a catalogue)
8. USB drive with all O&M documentation separated into relevant folders

The contractor shall also provide framed Plantroom Schedules & Schematics fixed within plantroom spaces.

A38 – Health & Safety

The Principal Contractor for the project is responsible for the effective management of health, safety, and welfare throughout all stages of the works in harmony with the current Construction Design Management (CDM) regulations.

A53 - Works by Statutory Authorities/Undertakers

There are no utilities or works by Statutory Authorities required as part of this project.

A54 – Provisional Work Items

The following Provisional Sums are to be allowed within the tender return:

1. None

A55 – Dayworks

No daywork items are anticipated at this stage of the project, the contractor is to identify the dayworks rate for the following trades as part of the tender return:

- Contracts Manager
- Electrician
- Fire Alarm Engineer
- Security Engineer
- Controls Engineer
- Data Network Engineer
- Plumber

- Pipe Fitter
- Air Conditioning Engineer
- Ductwork Fitter
- Insulation Fitter
- Commissioning Engineer
- Controls Engineer
- Apprentice/Non-Skilled Tradesmen

A64 – General Conditions for the Building Services Contract

Refer to the main contract documents

C10 – Removal of Systems

All mechanical and electrical systems, components and equipment made redundant prior to or by the works shall be completely removed and disposed of.

C14 – Building Services Survey

The contractor is advised to visit site as part of the tender process.

The contractor shall allow for all survey costs within the tender necessary to familiarise themselves with the operation of all mechanical systems serving the project area, to include the infrastructure serving these systems that is located outside the project area.

The contractor is to familiarise themselves with all points of isolation to ensure quick response if any problems arise with any of the mechanical systems.

The contractor is to report any deviations, discrepancies, foreseeable problems, or concerns well in advance of the works.

C20 – Demolition

All systems made redundant prior to or by these works shall be completely removed leaving no legacy equipment, wiring, pipework, support systems, equipment plinths, structural steel supports etc.

Unless otherwise agreed, demolishing of branch line/s associated with a piping system that is being retained includes removing redundant tees and replacing with straight pipe to match existing leaving no dead legs.

C90 – Alterations/Spot Items

The contractor shall allow for all isolations, system drain downs, re-fills and inhibitor top up required to facilitate this work and care and attention shall be given to communication with the site management team.

The contractor shall allow for all venting and checking of pressurisation unit settings associated with these works to prevent nuisance alarms.

Mechanical Services Scope of Works

N13 – Sanitary Appliances/Fittings

Description

The Mechanical Contractor is responsible for the procurement, installation, testing and commissioning of suitable and effective sanitary appliances and fittings that meet the practical needs of the client as indicated in the tender documents listed in the latest revision of Document Register 02-15 DR-M-TXX.

In addition to the above, the Mechanical Contractor is responsible for the procurement, installation, testing and commissioning of the following items that are selected and specified by the Architect:

- Kitchen sinks
- Cleaner sinks
- Wash basins
- Water closet & cistern assemblies
- Shower trays, mixer taps and associated accessories
- Kitchen and cooking appliances

Power supplies and control components for electronic sensor taps are located in lockable cabinets below the wash basin they serve. Lockable cabinets below was basins are specified by the Architect and procured by the Mechanical Contractor.

New hand basins and kitchen sinks along with the associated tapware and drainage connections are being installed throughout the Halls of Residence as part of the fit out project.

Workmanship & Materials

Sanitary appliances and fittings are to be installed, tested and commissioned in harmony with all applicable codes, regulations, standards and manufacturer's instructions in an aesthetically pleasing way and to the satisfaction of the Architect and Clarke of Works.

Specified materials and components where no equal or equivalent substitution is permitted are identified on the mechanical and architectural drawings and in the mechanical equipment and material and architectural specifications.

Unspecified components shall be selected by the Mechanical Contractor and submitted for review and approval by The Architect and Engineer.

Refer to the materials and equipment specification document for further information.

R11 – Foul Drainage Above Ground

System Description

The Mechanical Contractor is responsible for the Stage 5 design, procurement, installation, testing, commissioning and certifying of effective above ground drainage systems that meet the practical needs of the client as indicated in the tender documents listed in the latest revision of Document Register 02-15 DR-M-TXX.

New hand basins and kitchen sinks installed as part of the Halls of Residence fit out project will be connected to the existing vertical drainage stacks.

Condensate drains, overflows, relief valve discharges and the like associated with systems and equipment will be installed as part of the works and are to be piped to suitable and safe discharge locations.

Workmanship & Materials

Above ground foul drainage systems are designed, installed, tested and certified in accordance with the manufacturer's instructions, current editions of The Building Regulations, BS EN 12056, CIBSE Guide G, The CIHPE Design Guide and all other applicable guidance, codes & standards and in an aesthetically pleasing way to the satisfaction of the Clarke of Works.

Specified materials and components where no equal or equivalent substitution is permitted are identified on the mechanical drawing, specifications and schedules.

Unspecified components shall be selected by the Mechanical Contractor and submitted for review and approval by The Engineer.

Refer to the materials and equipment specification document for further information.

S12 – Hot & Cold Water

System Description

The Mechanical Contractor is responsible for the Stage 5 design, procurement, installation, testing, flushing, sanitising, commissioning and certifying of suitable and effective hot & cold water systems that meet the practical needs of the client as indicated in the tender documents listed in the latest revision of Document Register 02-15 DR-M-TXX.

The existing gravity cold water storage tanks located above the courtyard entrance and on the first floor of the Russell Hall Building are to be decommissioned, removed and replaced with a storage tank and inverter driven booster pump arrangement located in the former Halls of Residence Boiler Room that will supply cold water to the Halls of residence, Student Common Room and Russell Hall Building by means of new underground barrier pipes. The new cold water storage tank will be supplied from the existing below-ground mains cold water service.

New cold water systems will be installed throughout the Halls of Residence and Student Common Room. Existing cold water systems in the Courtyard buildings, Russell Hall Building and Sports Hall will be re-connected to the new boosted cold water service in such a way that all existing points of use continue to function as previously.

The existing water heaters located in the Halls of Residence Boiler Room will be decommissioned, removed and replaced with heat interface units (connected to the heat network) that will supply new hot water systems in the Halls of residence and Student Common Room by means of new underground pre-insulated pipes.

New heat interface units (connected to the heat network) will be installed in the Sports Hall and Russell Hall Building. Existing hot water systems in the Russell Hall Building and Sports Hall will be re-connected to the new heat interfaces in such a way that all existing points of use continue to function as previously.

The Laundry Boiler Room hot water production, storage and distribution system will be expanded to accommodate all points of use in the Courtyard buildings previously supplied from the Halls of Residence Boiler Room hot water system. This aspect of the project will require a detailed contractor survey and design.

Hot water points of use are generally fitted with fail-safe thermostatic mixing devices for scald protection.

Boosted cold water supplies to heat interface units are fitted with electro-magnetic water conditioners to minimize the build-up of scale heating surfaces.

Hot and cold water services are insulated in accordance with the current editions of The Building Regulations and BS 5422

The contents and flow direction of hot and cold water pipes are identified in accordance with the current edition of BS 1710

Underground hot and cold water pipes are identified with BS EN 12613 detectable warning marker tape

Hot and cold water flow rates to fixtures are to be limited as indicated below:

- Showers: 0.10L/s
- Wash Basins: 0.08L/s
- WC Cisterns: 0.10L/s
- Kitchen Sink Taps: 0.10L/s
- Cleaner Sink Taps: 0.12L/s

Workmanship & Materials

Hot and cold water systems are designed, installed, tested, flushed, sanitised, commissioned and certified in accordance with the current editions of The Building Regulations, The Water Regulations & Local Bylaws, BS EN 806, BS EN 1717, HSE ACoP L8, CIBSE Guide G, The CIHPE Design Guide, BESA TR70 and the BESA Guide To Good Practice: Supports & Fixings and all other applicable guidance, codes & standards and manufacturer's instructions in an aesthetically pleasing way and to the satisfaction of the Clarke of Works.

All components that come into contact with hot and cold water services are WRAS approved

Specified materials and components where no equal or equivalent substitution is permitted are identified on the mechanical drawings and in the mechanical equipment and material specifications.

Unspecified components shall be selected by the Mechanical Contractor and submitted for review and approval by The Engineer.

Refer to the materials and equipment specification document for further information.

T31 – Low Temperature Hot Water Heating

System Description

The Mechanical Contractor is responsible for the Stage 5 design, procurement, installation, testing, flushing, chemical cleaning, chemical dosing and commissioning of suitable and effective low temperature hot water heating systems that meet the practical needs of the client as indicated in the tender documents listed in the latest revision of Document Register 02-15 DR-M-TXX.

Two air source heat pumps located in the Air Source Heat Pump Compound will supply low temperature heating water to the two thermal stores located in the adjacent Plant Room. The system pump cascade will deliver low temperature heating water to the underground heat network at design flow and return temperatures of 45°C and 37°C respectively.

The air source heat pumps and thermal stores will be procured and free issued to the Mechanical Contractor by the client. The Mechanical Contractor will be fully responsible for the correct positioning, mounting, connection and all other aspects of the air source heat pump and thermal store installations. Commissioning of the thermal stores will be carried out by the relevant specialist/s at the Mechanical Contractor's expense whereas commissioning of the air source heat pumps will be carried out by the manufacturer at the client's expense.

New heat interface units located in the former Halls of Residence Boiler Room, Russell Hall Building and Sports Hall will utilize the heat network to produce and store hot water for domestic use.

Heat emitters are designed to maintain an indoor temperature of 21°C in the occupied spaces down to an outdoor temperature is -4.0°C.

New underfloor heating systems will be installed throughout the Halls of Residence whereas new panel radiators will be installed in the Student Common Room. A combination of new radiators and fan convectors will be installed in the Russell Hall Building and existing heat emitters in the Learning Resource Centre will be replaced with new fan convectors.

Underfloor heating in the Halls of Residence will be with a Continal over-floor system installed on top of the existing concrete sub-floor. This will require demolition of the existing screed, repair of the sub-floor to create a flat level surface and in some cases, application of a self-levelling compound to suit the floor finish being used. This aspect of the project will require close cooperation between the trades and diligent application of the manufacturer's instructions.

Hydronic heating coils in the Sports Hall, Lecture Theatre and Learning Resource Centre ventilation systems will be supplied with low temperature heating water from the heat network.

The Laundry Boiler Room heating system will be expanded to accommodate all heat emitters in the Courtyard buildings previously supplied from the Halls of Residence Boiler Room heating system. This aspect of the project will require a detailed contractor survey and design.

Low temperature heating water services are insulated in accordance with the current editions of The Building Regulations and BS 5422.

The contents and flow direction of low temperature heating water pipes are identified in accordance with the current edition of BS 1710.

Underground low temperature heating water pipes are identified with BS EN 12613 detectable warning marker tape.

Workmanship & Materials

Hydronic heating systems are designed, installed, tested, flushed, cleaned, treated and commissioned in accordance with the current editions of The Building Regulations, CIBSE Guide B1, The CIHPE Design Guide, BESA TR70 and the BESA Guide To Good Practice: Supports & Fixings, CIBSE Commissioning Guide CCW and all other applicable guidance, codes & standards and manufacturer's instructions in an aesthetically pleasing way and to the satisfaction of the Clarke of Works.

Specified materials and components where no equal or equivalent substitution is permitted are identified on the mechanical drawings and in the mechanical equipment and material specifications.

Unspecified components shall be selected by the Mechanical Contractor and submitted for review and approval by The Engineer.

Refer to the materials and equipment specification document for further information.

U10 – General Ventilation

System Description

The Mechanical Contractor is responsible for the Stage 5 design, procurement, installation, testing and commissioning of suitable and effective general ventilation systems that meet the practical needs of the client as indicated in the tender documents listed in the latest revision of Document Register 02-15 DR-M-TXX.

The Mechanical Contractor is also responsible to procure, install, test, label and certify fire dampers and fire/smoke dampers in all locations where a duct passes through a fire rated floor or wall partition as defined in the fire strategy documents and to the satisfaction of the Fire Engineer and Clarke of Works.

High level ductwork with jet supply diffusers and a low level extract grille will be installed in the Sports Hall to facilitate ventilation, heating and cooling of the space by a new outdoor heat recovery air handling unit located on a concrete pad at the rear of the building.

High level supply and extract ductwork with associated grilles and diffusers will be installed in the Russell Hall Building Restaurant and Lecture Theatre to facilitate ventilation, heating and cooling of the spaces by a common heat recovery air handling unit located on the Main Entrance mezzanine.

The Russell Hall Building Lecture Theatre and Restaurant heat recovery air handling unit will be procured and free issued to the Mechanical Contractor by the client. The Mechanical Contractor will be fully responsible for the correct positioning, mounting, connection and all other aspects of the heat recovery air handling unit installation. Commissioning of the heat recovery air handling unit will be carried out by the relevant specialist/s at the Mechanical Contractor's expense.

Ventilation ductwork is to be insulated in accordance with the current editions of The Building Regulations and BS 5422.

The contents and flow direction of ventilation ducts are to be identified in accordance with the current edition of BS 1710.

Workmanship & Materials

Ventilation systems and the associated ductwork are designed, installed, tested and commissioned in accordance with the current editions of The Building Regulations, BESA DW144, DW145, DW172, TR19; CIBSE Guide B2, The CIHPE Design Guide, DFE BB101, CIBSE Commissioning Guide CCA and all other applicable guidance, codes & standards and manufacturer's instructions in an aesthetically pleasing way and to the satisfaction of the Clarke of Works.

Specified materials and components where no equal or equivalent substitution is permitted are identified on the mechanical drawings and in the mechanical equipment and material specifications.

Unspecified components shall be selected by the Mechanical Contractor and submitted for review and approval by The Engineer.

Refer to the materials and equipment specification document for further information.

U60 – Air Conditioning Systems

System Description

The Mechanical Contractor is responsible for the Stage 5 design, procurement, installation, testing, commissioning and certifying of suitable and effective air-conditioning systems that meet the practical needs of the client as indicated in the tender documents listed in the latest revision of Document Register 02-15 DR-M-TXX.

The Mechanical Contractor is also responsible to prepare and submit asphyxiation and flammability risk assessments for all relevant spaces for review and approval by The Engineer.

Direct Expansion overdoor curtain heaters will be installed in the Russell Hall Building Main Entrance. The associated outdoor unit/s will be installed adjacent to the North wall of the Lecture Theatre.

Workmanship & Materials

Air-conditioning and refrigeration systems are designed, installed, tested, commissioned and certified in accordance with the current editions of The Building Regulations, BS EN 378-2, CIBSE Guide B3, BESA TR70 and the BESA Guide To Good Practice: Supports & Fixings, CIBSE Commissioning Guide CCR and all other applicable guidance, codes & standards and manufacturer's instructions in an aesthetically pleasing way and to the satisfaction of the Clarke of Works.

Specified materials and components where no equal or equivalent substitution is permitted are identified on the mechanical drawings and in the mechanical equipment and material specifications.

Unspecified components shall be selected by the Mechanical Contractor and submitted for review and approval by The Engineer.

Refer to the materials and equipment specification document for further information.

W60 – Controls

System Description

The Mechanical Contractor is responsible for the Stage 5 design, procurement, installation, testing and commissioning of suitable and effective control systems that meet the practical needs of the client as indicated in the tender documents listed in the latest revision of Document Register 02-15 DR-M-TXX.

The Mechanical Contractor is responsible to procure, install, programme, commission and document a control system by Genius Hub with the following functions:

- Schedule and occupancy based on/off control of the heat emitters, air-conditioning systems and air handling units
- Temperature control and frost protection of spaces with heating and/or cooling
- Provision for end user override of heat emitters and air-conditioning systems in occupied spaces
- Demand based on/off control of the low carbon heating system
- Scheduled on/off control of the heat interface units
- Control valve and system pump exercise routine outside of the heating season

The Mechanical Contractor is also responsible to install, programme, commission and document a control system by AES Controls Systems with the following functions:

- Enable/Disable of the heating system by summer/winter switch
- Enable/Disable of up to three air source heat pumps and the system pump cascade by any one of the following:
    - 7-day programable time schedule
    - Genius Hub control system heat demand signal
    - Frost protection (2-stage)
- Sequencing and staging of up to three air source heat pumps based on the thermal store upper and lower temperatures
- Fault monitoring with email notification for the air source heat pumps, system pumps, water treatment system, pressurisation unit and heat network flow temperature
- System pump exercise routine outside of the heating season based on a Genius Hub control system request
- Plant diagram displaying the following information:
    - Heating system operating state
    - Air source heat pump operating states and duty points (feedback)
    - System pump operating states and duty points (feedback)
    - Thermal store upper and lower temperatures
    - Heat network flow and return temperatures
    - Fault status

The Mechanical Contractor is further responsible to install, programme, commission and document the factory supplied/installed controls for the following systems and equipment:

- Pumps and pumps cascades
- Pressurisation units
- Water treatment systems
- Heat interface units
- Air handling units
- Heat Recovery Air Processing units
- Mechanical Heat Recovery Ventilation Units
- Fans
- Heating terminals
- Underfloor heating systems
- Air-conditioning terminals & systems
- Cold water booster pumps
- Electromagnetic water conditioners

- Leak detection systems
- Water hygiene systems

Workmanship & Materials

Control systems are to be installed, tested and commissioned in harmony with all applicable codes, regulations, standards and manufacturer's instructions in an aesthetically pleasing way and to the satisfaction of the Clarke of Works.

Refer to the materials and equipment specification document and specialist designs for further information.