

Mechanical Services Technical Specification

AC Replacement Works – Tamworth building

College of Policing
Gleeds Building Surveying Ltd
NTBS4073

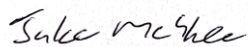
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Document author	Jake McGhee	Grade	Building Services Engineer
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Signature



Contributors	Gareth Jones		
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Approved by	Adam Nickerson	Grade	Project Director
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Signature

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1

Preamble

1 Preamble

THIS SECTION IS TO BE READ IN CONJUNCTION WITH THE MAIN CONTRACT PRELIMINARIES, AND ALL OTHER SECTIONS OF THIS SPECIFICATION. WHERE ANY CONFLICT OCCURS THE MAIN CONTRACT PRELIMINARIES SHALL TAKE PRECEDENCE.

GLEEDS TAKE NO LIABILITY FOR THE DESIGN, SUITABILITY AND PERFORMANCE OF EXISTING SERVICES & SYSTEMS AND IS WHOLLY RELIANT ON THE INFORMATION PROVIDED BY THE CLIENT AND THEIR AS BUILT INFORMATION; GLEEDS HAVE NOT UNDERTAKEN INTRUSIVE SURVEYS OF M&E SERVICES AND CAN ONLY RELY ON LIMITED VISUAL INSPECTION WHERE ACCESS WAS MADE AVAILABLE BY THE CLIENT. WHERE DISCREPANCIES ARE FOUND DURING INSTALLATION BETWEEN ORIGINAL "AS BUILT" INFORMATION, THEN THESE SHOULD BE BROUGHT TO THE ATTENTION OF THE LEAD DESIGNER / CA FOR FURTHER INSTRUCTION IMMEDIATELY AND NO LONGER THAN 5 DAYS, ELSE THIS WILL NEGATE ANY CLAIM BY THE CONTRACTOR, CLIENT AND OTHER PERSONS RELIANT ON SUCH TO MAKE A CLAIM FOR LOSS, TIME AND EXPENSE, MATERIALS, PLANT OHP AGAINST THE PROJECT OR GLEEDS. GLEEDS DESIGNS ARE BASED ON ACCURATE ARCHITECTURAL LAYOUTS AGREED BY THE CLIENT AND PROVIDED BY OTHERS CONSULTANTS/ LEAD DESIGNERS. OCCUPANCY AND USE FACTORS ARE AS PER THOSE PROVIDED BY THE LEAD ARCHITECT/ DESIGNER AND CLIENT. SHOULD THESE FACTORS VARY THEN GLEEDS ACCEPT NO LIABILITY FOR LOSS OF PERFORMANCE OF SUCH ASSOCIATED SYSTEM.

1.1 Project Particulars

For project particulars see main contract preliminaries.

1.2 Definitions

Electrical Contractor – Where this term is used within the specification it shall be taken as the contractor completing the electrical installation works as detailed in this specification and associated drawings etc. Depending upon the type of contract the term Sub-Service Contractor shall equally refer to the Service Contractor or Building Services sub-contractor.

Mechanical Contractor – Where this term is used within the specification it shall be taken as the contractor completing the mechanical installation works as detailed in this specification and associated drawing etc. Depending upon the type of contract the term Sub - Service Contractor shall equally refer to the Service Contractor or Building Services sub-contractor.

Specialist – Refers to a specialist contractor employed by the Building Services Contractor, Service Contractor or the Service Contractor to complete a part of the works on their behalf, the Building Services Contractor, Service Contractor or the Service Contractor shall be fully responsible for all works undertaken by the specialist.

Services Contractor – Where this term is used it shall refer equally to the Service Contractor and Service Contractor completing the electrical and/or electrical installation works as detailed in this specification and associated drawings etc. Depending upon the type of contract the term Services Contractor shall equally refer to the Building Services Sub-contractor, Service Contractor or Service Contractor.

Main Contractor – Where this term is used within the specification it shall be taken as the contractor completing the overall contract for the client as detailed in the main contract specification and associated drawings etc. Depending upon the type of contract this shall equally refer to the Builder, Principal contractor or the Mechanical, Electrical or Service Contractor if they are the Main Contractor for the project.

Engineer – Refers to a representative of Gleeds.

Contract Administrator – Refers to representative of the company administering the project as defined in the Main Contract preliminaries.

The term "Supervising Officer" has been used throughout these documents and shall mean the person or persons whom the employer has appointed to act as his representative for the execution of the project.

The Supervising Officer shall be the Project Manager, unless stated otherwise.

1.3 Design Documents

1.3.1 Mechanical Services Design Documents

Document Title	Reference	Revision
NTBS4073-GLE-TA-GF-DR-M-2000	Tamworth Ground Floor Existing AC Stripout Drawing	T01
NTBS4073-GLE-TA-01-DR-M-2001	Tamworth Ground Floor Existing AC Stripout Drawing	T01
NTBS4073-GLE-TA-GF-DR-M-2002	Tamworth Ground Floor Proposed AC Layout	T01
NTBS4073-GLE-TA-01-DR-M-2003	Tamworth First Floor Proposed AC Layout	T01
NTBS4010-TA-M01	Mechanical Services Tamworth Technical Specification	T01
NTBS4010-M02	Mechanical Services General Specification	T01

1.4 Provisions Required by the Services Contractor in Constructing the Contract Works

1.4.1 Meetings

The contractor shall be required to attend such meetings as detailed within the specification, and as a minimum:

- Pre-Contract meeting
- Pre-Start meeting
- Design Review Meetings
- Fortnightly Progress Meetings
- Pre-completion snagging
- Handover meeting

Dependent on programme and availability it is possible that some meetings may combined. This shall be entirely at the discretion of the supervising officer.

1.4.2 Supervision

The Services contract shall allow for keeping on the site, throughout the duration of the Services contract period and until the work is completed to the satisfaction of the Supervising Officer, a competent Engineer whose name shall have been communicated in writing to the Supervising Officer. This representative shall supervise and superintend the carrying out of the works on the site, prepare progress schedules and programme's and ensure full exchange of information with other trades and shall be permanently available during the working hours on the site and shall attend all meetings on the site when requested. The site representative shall be fully authorised and qualified to accept written instructions from the Supervising Officer via the Main Contractor, and issue instructions on behalf of the Services Contractor, and shall keep a diary recording the day-to-day progress of the work and the details of all the instructions received. This diary shall be at the disposal of the Supervising Officer.

If, in the opinion of the Supervising Officer, the degree of site supervision is inadequate, he shall instruct the Main Contractor and Services contractor, who shall immediately rectify this matter to the satisfaction of the Supervising Officer.

The Supervising Officer and/or Main Contractor shall be at liberty (by notice in writing to the Services contractor), to object to any representative or persons employed by the Services contractor, in the execution of or otherwise about the works, who shall, in the opinion of the Supervising Officer misconduct himself or be incompetent or negligent, and the Services contractor shall remove such persons from the works forthwith.

1.4.3 Staff

The Services contractor shall supply all the necessary labour, both skilled and unskilled, required to carry out the Contract and during the execution of the Contract, shall observe those conditions of employment which have been agreed between the Employer's Federation and the Trade Unions concerned to apply to the place and circumstances in which these works are to be carried out.

Additional nett overtime costs shall only be permitted as extra when specifically authorised by the Supervising Officer in writing for special or emergency purposes. Overtime working for any purpose necessary for normal building organisation, such as that necessary to keep to programme, encouragement or working to provide continuity of working in certain trades, or to facilitate trade waiting on trade, etc., shall not be regarded as special or emergency purposes.

1.4.4 Work Area

The Services contractor shall take all precautions necessary to restrict the area of his works to the immediate vicinity of the work involved under his Services contract and shall prevent his workmen from straying beyond the boundaries of such works.

1.4.5 Planning

Co-operate with the Main Contractor in planning the construction of the Services contract works before the work commences.

Prepare a schedule detailing all items of plant and equipment with their true delivery period which he considers should be brought to the attention of the Main Contractor in the preparation of this main programme.

Liaise with the Supervising Officer and Main Contractor, providing them with a detailed program confirming when Client supply items if any are required for installation.

Advise the Main Contractor in sufficient time to allow access to be provided for the installation of large items of plant and equipment or long lengths of pipework, ductwork or cable, etc.

1.4.6 Statutory Undertakings

The Services Contractor will be responsible for programming, co-ordinating and progressing the involvement of the statutory undertakings and other Authorities in the works.

The Services Contractor shall provide all necessary information so required by the Main Contractor in respect of the statutory undertakings and other authorities related to the construction works.

The Services Contractor shall, allow for full attendance on the statutory undertaking and other Authorities and shall assist their Engineers on site to the full.

1.4.7 Roads

All necessary temporary roads, tracks, crossings and hard-standings will be provided free of charge by the Main Contractor.

1.4.8 Buildings and Security Measures

Provide, as necessary, temporary sheds, offices, other temporary buildings and security measures for your own exclusive use and clear away everything on completion.

The Services contractor shall allow for moving the site accommodation from time to time as may be requested by the Main Contractor, subject to the confines of the site. Storage area for the Services contractor's materials, plant, etc., shall be provided free by the Main Contractor. Suitable mess rooms and sanitary accommodation will be provided, free of charge, by the Main Contractor for all persons employed on the works all in compliance with the current Statutory Regulations and the Code of Welfare conditions.

1.4.9 Telephones/Facsimile/Computer

Provide, as necessary, temporary telephone, facsimile and computer facilities for your own exclusive use. Pay all charges.

1.4.10 Water, Lighting, Electrical Power and Fuel

The Main Contractor will supply water, lighting, electric power and fuel in accordance with the Contract Preliminaries.

The Services contractor is to assure himself that all the necessary electric supplies are available for the Services contract works.

1.4.11 Plant

- i) The Services contractor shall include in his contract price for the provision of all tools, implements, instruments, cutting and bending machinery, etc.
- ii) The Services contractor shall provide all special machinery and all tackle, tools and other equipment required for the execution of his work and will be held responsible for such equipment when on site.
- iii) Unless otherwise advised, all tools, etc., shall be suitable for operation on 110V 50Hz supply.

1.4.12 Local Authorities Requirements

The Services contractor shall comply with and give all notices required by any Act of Parliament, regulations or by-laws of any local authority, public services, company or authority who may have any jurisdiction with regard to the work or whose systems, the same, are or will be connected, and he shall pay and indemnify the Employer against any fees or charges legally demandable under such an Act of Parliament, regulations or by-laws in respect of the works. No extra charge will be allowed due to failure to allow for this requirement.

Where the requirements of any water or electricity authority call for the submission to them of any component part of the works for approval, testing, stamping or certifying, the Services contractor shall, at his own expense, submit and deliver any such component part to the place required by such Authority.

After such component part has been satisfactorily approved, tested, stamped or certified, the Services Contractor shall return it to the site for incorporation into the works. Any expense incurred shall be paid by the Services Contractor.

1.4.13 Inspection and Testing at Works

The Services contractor shall provide all assistance, labour, materials, power, fuel, stores, apparatus and properly calibrated and certified instruments for carrying out the necessary works, and shall allow in his Tender Sum for all costs in this regard.

The Supervising Officer shall be entitled at all times during the manufacture to inspect, examine and test on the Services contractor's premises the material and workmanship of all plant to be supplied under the Services contract and, if part of the said plant is being manufactured on other premises, the Services contractor shall obtain for the Supervising Officer permission to inspect, examine and test as if the said plant were being manufactured on the Services contractor's premises. Such inspection, examination or testing, if made, shall not release the Services contractor from any obligation under the Services contract.

The Services contractor shall give the Supervising Officer two weeks written notice of the date on and the place at which any plant will be ready for testing as provided in the Services contract and unless the Supervising Officer shall attend at the place so named within ten days of the date which the Services contractor has stated in his notice, the Services contractor may proceed with the tests which shall be deemed to have been made in the Supervising Officer's presence and shall forthwith forward to the Supervising Officer, duly certified, copies of the test reading.

In the event of the plant not so passing the tests, the Employer shall be at liberty to deduct from the Services contract price all reasonable expenses incurred by him or the Main Contractor in repeating the tests.

1.4.14 Connecting to Existing Services

Give seven days' notice to the Supervising Officer of your intention to connect into or isolate any of the existing services and await his approval for so doing.

Include for all overtime and other additional payments necessary to ensure that the interruptions to existing services are carried out within the minimum possible inconvenience. Work without pause until the services are back to normal.

1.4.15 Operation of Plant, etc.

Prior to practical completion ensure that working plant is doing so correctly. Provide your own skilled personnel to attend the plant etc., while working, together with such specialist personnel as are necessary for each circumstance.

1.4.16 Damage Due to Inclement Weather

The Services contractor shall take all such measures and precautions deemed necessary for the protection of the works forming the Services contract and shall make good free of charge to the Employer or his assigns such damage, defects or faults which shall appear during the progress of the works due to inclement weather, frost, etc.

1.4.17 Practical Completion

Before the Services contract works are included in a Certificate of Practical Completion, the Services contract works, or such part as is referred to in the Certificate, shall be complete. The completion shall include setting to work, testing and commissioning, including proving the performance is in accordance with the Specification, of all items included in the Certificate, and full adjustment and balancing, in as far as is possible without the building being occupied or the system being subject to a full climatic cycle, subject to the approval of the Supervising Officer.

Unless otherwise agreed the whole or any part of the sub contract works will only be included in a Certificate of Practical Completion when you have issued to the Supervising Officer required number of sets of Operating Manuals and Record Drawings as detailed later in this document.

After the installation has been shown to meet the commissioning requirements, the Supervising Officer may call for further operation of the plant in evaluating the performance of the installation. Be prepared to operate the plant, the cost of which will be reimbursed.

Include in your Tender for all additional works and expenditure necessary as a consequence of phased completion and handover.

1.4.18 Training of Employer's Personnel

The Services contractor shall provide experienced personnel to instruct the Employer's personnel in the operation, maintenance and servicing of all the installation. Give instructions for a period of one week before the issue of the Certificate of Practical Completion.

The services contractor shall, at a time to be agreed prior to Completion or Completion of Section as defined in the Main Contract Preliminaries, instruct the Employer's representative in the use and correct operation of the contract works and shall satisfy himself that such staff are capable of taking over the installation. During this period of instruction, the services contractor shall be responsible for the correct operation and maintenance of the installation.

The training shall take place prior to completion and during the system reliability trial with all systems fully operational. The services contractor shall allow for a minimum of five days training for two representatives. All two representatives will attend each day of training. The services contractor shall provide training handout notes and background information to the employer's representative prior to the training period.

Training shall be structured to suit all the relevant building elements (building and its services) and shall include theory, demonstration and hands-on experience in the operation and maintenance of the building. Each training day shall allow for relevant instruction on an elemental basis.

Theoretical training shall be carried out in a suitable quiet room with all necessary visual aids and facilities. A register shall be kept of attendance at each of the training sessions and a certificate shall be issued to all attendees at the end of each training session.

1.4.19 Obligations after Practical Completion

Between the issue of a Certificate of Practical Completion and the Certificate of Making Good Defects relating to the whole or part of the Services Contract works, provide the following:

- 1) A prompt call-back service, available at all times, to attend to any faults.
- 2) Prepare and submit a record of any failure or malfunction of any part of the services contract, the remedial action taken, subsequent re-testing and the results thereof.
- 3) Notify the Main Contractor of any malfunction in, or damage to, the Sub Contract which the Services Contractor can demonstrate had been caused by incorrect operation of the system, vandalism or action of a third party.
- 4) Inform the Main Contractor in writing when all defects are finally rectified so that an inspection may be carried out prior to the issue of the Final Certificate.
- 5) Carry out a final test at the end of the Defects Liability Period to demonstrate to the Supervising Officer

that the Services contract works are operating efficiently and that all components are functioning correctly.

- 6) Carry out all work using competent, trained personnel and except where made necessary by abuse, misuse or negligence by other than the Services contractor, make no change to the Employer.

Notwithstanding the foregoing paragraph, charge to the Employer the nett cost of replacement for life expired disposable parts.

1.5 Information required from the Services Contractor

1.5.1 Generally

Select materials and products capable of attaining the performances specified in the Schedules and ensure that the various components of the systems can be coupled together in a proper manner to provide a workmanlike installation.

Provide Installation Drawings, as detailed later, to demonstrate your solutions to the Supervising Officer.

Provide Builder's Work Drawings, as detailed later, to illustrate your requirements in this respect to the Main Contractor and Supervising Officer.

Respond, in such good time that the Completion of Works will not be delayed, to the directions of the Supervising Officer and assist in integrating the Services contract works into the design of the works as a whole.

The Services contractor must ensure that he is provided, through the Main Contractor, with up-to-date copies of Architectural and Structural detail drawings and with working drawings of other trades where they may affect the Services contractor's own drawings. Site dimensions should be used wherever possible in preference to drawings.

The Supervising Officer will be advised of the cost of the Services contract works by the Quantity Surveyor. Carry out the services entrusted to you with strict regard to the Employer's budget for the project.

Perform your duties in accordance with a programme to be agreed with the Main Contractor and/or Supervising Officer.

1.5.2 Quality Assurance

The Services Contractor shall provide for agreement by the Supervising Officer fully documented Quality Assurance Procedure (QAP) to International or British Standards, prior to commencement of draughting, procurement or installation.

The services contractors QAP must be provided in concert and agreement with the main contract procedures. The QAP must detail specific procedures related to the tendered project and not be generalised.

The QAP shall be provided by the services contractor at tender, its content subject only to the Supervising Office and Main Contractors comment.

1.5.3 Services Contractor to State Objections

In the event of anything described in the Specification or other relevant documents, or shown in the drawings being in the opinion of the Services Contractor, unsuitable or undesirable, or inconsistent with his guarantee and responsibilities under the Services contract, he shall draw the Supervising Officer's attention to such matters at the time of tendering or, in the case of matters arising out of documents, or in the case of instructions issued

after the time of tendering, immediately on receipt of such documents or instructions and prior to the commencement of any part of works affected thereby.

1.5.4 Integration

Co-operate with the Main Contractor in planning the installation before the work commences. Take particular care to ensure that there is no obstruction of electrical services positions, cable routes, switch positions, mechanical services, pipework, access points and plumbing, etc. Arrange services in ducts so that the services are readily accessible for maintenance.

The routes of services and the approximate position of the equipment and the apparatus are shown on the Tender Drawings. Attend such meetings as are necessary to enable you to provide the Installation Drawings which the Supervising Officer requires to process.

The meetings will be called and be under the direction of the Supervising Officer. The object of the meetings will be:

- i) To establish the inter-relationship of services in such confined spaces as ceiling voids, ducts and plantrooms;
- ii) To allow adequate space for maintenance and access purposes;
- iii) To assist in the proper provision of Builder's Work Drawings.

1.5.5 Installation Drawings

Prepare, agree with the Supervising Officer and supply for issue all detailed Installation Drawings (including wiring diagrams and builders work drawings) required to enable the Services contract works to be integrated into the design of the works as a whole before installation is commenced.

Drawings provided by the Services Contractor shall be drawn to commonly recognised scales on A0 or A1 sheets. In addition to the project title, the Architect's and Consulting Engineer's name and address, a unique drawing number, drawing title, scale and date shall be entered in the title block, together with full cross-reference details to the related drawings.

All drawings shall be produced and presented in print form and on computer disk with files in DXF format (unless agreed otherwise)

All drawings shall have independent layers of information in accordance with International or British Standards. All layers shall be displayed 'on screen' in different colours.

The Services Contractor shall verify the accuracy of all dimensions abstracted from the drawings, including verifying the accuracy by taking dimensions on site, in the preparation of any construction drawings by the Services Contractor and before the relevant works proceeds.

All drawings, schedules and other information provided by manufacturers, suppliers or approved specialist Services Contractors shall be checked by the Services Contractor who shall ensure that all requirements of the design installation and working drawings/documents have been incorporated prior to submission.

Inform the Supervising Officer before changing any component or detail of installation shown on the Tender Drawings or described elsewhere in these documents. At the time notify the Supervising Officer of the total effect of these changes, including the design parameters of the system and their effect on power requirements, cable sizes, performance or rotating machines and ductwork or pipework resistance, etc.

The installation drawings must also clearly show withdrawal space required for dismantling of plant and access space which must be kept clear of obstruction.

Builder's work drawings shall form part of the installation drawings and shall show the sizes and locations of all foundations, bases, plinths, sumps, chases, holes, etc, required and shall be based on certified manufacturers drawings.

The drawings shall be clear and concise in detail to enable building works to be carried out without misunderstanding.

The scale of these drawings shall be 1:50 or, where necessary 1:20. Ductwork shop drawings shall be to a scale of not less than 1:50 and in congested areas, not less than 1:20, and shall indicate the length of each duct section, the internal dimensions of the bare sheet steel, dimensions of bends and fittings, location of stiffeners and supports and shall be dimensionally located the ducts in relation to the supporting or any adjacent structure.

In addition, the location and size of all equipment, grilles, diffusers, access panels, dampers, test points, penetrations and associating fittings for automatic controls and instrumentation, etc., shall be shown.

Switchgear, starter control and instrument panel drawings shall show the construction, the external and internal layout of panels, and wiring diagrams comprising internal wiring diagrams, for the complete systems in the panels. The drawing shall also show all pipework and capillary connections from the panels to external equipment.

Manufacturer's equipment drawings shall show the precise details of each and every item they will be providing and shall highlight all dimensions and particular requirements necessary for the correct installation and maintenance of their equipment.

Specific installation drawings may with the prior specific and express written permission of the Supervising Officer omit minor details such as conduit provided that a method statement rigorously covers the installation intent. This permission will not be unreasonably withheld but will not be given where either Client operation or visual appearance is affected nor where details are needed for following trades.

The services contractor shall submit such drawings as the Supervising Officer may reasonably require at any stage of the Services contract.

Supply four copies of each drawing for inspection by the Supervising Officer and, if required, four copies of each subsequent amendment. When agreement has been reached, issue further copies of the drawings as follows:

- | | | |
|---|---|------------|
| i) For the Supervising Officer | - | 4 copies * |
| ii) For the Main Contractor | - | 6 copies * |
| which includes one copy by the means of which the Main Contractor will instruct the Services contractor | | |

* unless agreed otherwise

Issue copies of drawings to those of your suppliers and Services contractor's affected by the drawings.

You may use any of the Tender Drawings to meet the requirements of this clause. Clearly mark them as Installation Drawings and accept full responsibility for them as such.

Allow in your programme for the preparation and obtaining approval of drawings, plus time to make any necessary amendments.

1.5.6 Definition of Approval

Understand that whenever you submit information to the Supervising Officer for approval, such approval will be approval in principle only and will not, in any way invalidate your responsibility for ensuring the accuracy and suitability of the information in accordance with requirements specified elsewhere.

The Supervising Officer will approve the overall layout of plant and equipment, ducting, pipework, cabling, trunking, conduit, etc., shown on the Installation Drawings, and their general location, as well as the type and size of these items, in so far as they conform to the Tender Drawings.

The exact position in the works of the above items relative to grid lines, floors, beams, ceilings, walls and other structural/finishes items, and any other services is your responsibility and the Supervising Officer's approval does not absolve you from the necessity of checking these items with the Main Contractor and other Services contractor's.

Note also that approval of drawings will not relieve you of your responsibility for complying with the Specification.

When submitting any drawings, the Services contractor shall advise the Supervising Officer if, in order to avoid delay in the completion of the works, early approval is necessary. All detailed drawings submitted for approval shall be to a reasonable scale and the Supervising Officer's decision as to what constitutes a reasonable scale shall be final.

1.5.7 Drawing Approval Categories

A co-ordinating consultant will be identified by the Supervising Officer for each specialist sub-contractor.

In addition to the co-ordinating consultant, fabrication drawings will be commented on by other consultants as considered appropriate by the Supervising Officer.

Two sets of drawings shall be issued to each commenting consultant.

The co-ordinating consultant will arrange receipt of other consultant's comments and transfer these to a single set of Services contractor's drawings to be returned to the Main Contractor within 15 working days (or less by special arrangement).

Drawings may be returned direct to the specialist sub-contractors by agreement in writing with the Services contractor and Main Contractor. Copies of correspondence covering return of drawings will be copied to the Main Contractor or Services contractor in either case.

Installation drawings will be returned under one of three following categories.

Document Commenting

Status	Description
A	Contractor to proceed with the works in accordance with the design documents
B	Contractor to proceed with the works in accordance with the comments, the document shall be amended to take on board such comments
C	Contractor to resubmit documents incorporating comments made. NO works to be carried out.

The co-ordinated, returned drawings will incorporate the most onerous classification awarded by any consultant making comment.

Services Contractor only entitled to be paid in respect of such work where it has been executed in accordance with designs marked A or B.

Engineers comments shall not relieve the Services Contractor of any of their design or co-ordination responsibility for the services installations.

1.5.8 "As Installed" Record Prints

Throughout the execution of the Services contract works, keep on the site a complete set of up-to-date prints and schedules marked with "As Installed" details. Make these prints available at any time to the Supervising Officer or his representative.

If, in the event, upon completion of the works, of it being discovered that, the Services contractor shall have failed to comply with this requirement and it becomes necessary for the Supervising Officer to examine or trace through installed services in order to update the "As Installed" drawings, the cost of this work will be time charged and debited to the retention monies being held on the Contract.

1.5.9 "As Installed" Drawings and Diagrams

Unless otherwise agreed, the Services contract works, or any part thereof, will only be included in a Certificate of Practical Completion when you have issued to the Supervising Officer the final "As Installed" Drawings and Diagrams. These shall consist of two paper copies and a dwg computer disk.

You may purchase copy negatives or dwg computer disks where appropriate of the Tender Drawings from the Consultant. Amend these to bring them into line with the works as fixed and then submit them to the Supervising Officer.

Before the above mentioned final issue, send two prints of the "As Installed" drawings and diagrams to the Supervising Officer for approval of format and general content. Allow 14 days for approving.

Include on the "As Installed" Drawings and Diagrams the following in as far as they are the subject of the Services contractor works. The general content and layout of the drawing shall be as that required for the "Installation Drawings".

- i) The location, including level if buried, of Public Authority supplies provided within the Services contract, whether carried out by the Services contractor or by the appropriate Authority together with the points of origin and termination, size and materials of pipes, line pressure and/or other relevant information.
- ii) The layout, location and extent of all piped services showing pipe sizes throughout, together with all valves for regulation, isolation and other purposes, shown numbered in accordance with the actual installation.
- iii) The layout, location and extent of all air ducts, including those formed in builder's work or otherwise outside this Services contract but forming part of the system, showing all dampers and other equipment, acoustic attenuators, grilles, diffusers or other terminal components. Each duct and each terminal component shall be marked with its size and the air quantity flowing, as actually measured after approved regulation of the system or as computed by the addition of such measured quantities.
- iv) Single line and schematic wiring diagrams for the whole of the Services contract works showing all terminal references and cable sizes.
- v) The layout, location and extent of all electrical plant, cable, cable tray, cable trunking, conduit, distribution boards, switches, outlets and lighting fittings which form part of the Services contract

works, including dimensioned layouts of all concealed work. Where components are grouped or housed in a cubicle or on a common panel, an exploded arrangement must be incorporated.

- vi) The layout, location and extent of all electrical plant, cable, cable tray, cable trunking, conduit, switches, outlets, terminals and indicators and alarms of all ancillary communication, detection, alarm and control installations which form part of the Services contract works, including dimensioned layouts of all concealed work.
- vii) The location and identity of each room of space housing plant, machinery, distribution boards, draw-in boxes or apparatus.
- viii) The detailed general arrangements, to one-twentieth scale (minimum), of all boiler rooms, machinery spaces, air handling plant, refrigeration plant, tank rooms, switchrooms, meter rooms and other plant spaces, including the location, identity, size, colour coding and details of each piece of plant and equipment.
- ix) The detailed general arrangements, to one-twentieth scale of service subways, ducts, meter rooms or other special sections of the work where, in the opinion of the Supervising Officer, the small scale drawings cannot provide an adequate record.
- x) Manufacturer's drawings showing the general arrangement and assembly of component parts of all machines and any pieces of equipment which may require servicing.
- xi) Flow diagrams indicating the principles of the arrangements and operation of each of the various services as related to central plant, other principal components and zoning of distribution, etc.
- xii) Diagrams illustrating the principles of automatic controls and of instruments, presented in combination with the foregoing or separately, as agreed with the Supervising Officer.
- xiii) Location of all earth tapes, earth electrodes and test points.
- xiv) In conjunction with schedules of location and detail and reference, voltage and wattage of all lighting fittings.
- xv) Comprehensive electrical diagrams or sets of diagrams which shall show size, type and length (to within one meter) of each main and services main cable, together with the measured conductor and earth continuity resistance of each.
- xvi) Manufacturer's internal wiring diagrams for each piece of electrical equipment supplied under the Services contract, together with physical arrangement drawings to locate and identify the component parts.
- xvii) Comprehensive diagrams showing in detail all power wiring and all control wiring and/or pneumatic of other control piping executed within the Services contract by others in accordance with detail provided by the Services contractor, including size and type of conductor or piping used and identifying the terminal points of each.

1.5.10 Operating Manuals

Unless otherwise agreed, issue to the Supervising Officer, four copies of all manuals and operating and maintenance instructions in stiff-backed ring binders together with an electronic copy on CD ROM.

Before the commencement of the commissioning program, send initial Draft Copy to the Supervising Officer for approval of format and general content. Minimum 28 days prior to contract completion.

Include the following information in the operating manuals:

- i) Index
- ii) General description of the installation, equipment used and method of operation of the installation
- iii) Handbooks, maintenance instructions, drawings and spare parts list for all components, plant and equipment used in the Services contract works.
- i) Line diagrams indicating the main features of the plant, drawing attention to the method of setting the controls, switchgear, safety precautions etc.
- ii) Schedule of routine maintenance, complete with list of normal consumables, routine oil and grease points and recommended lubricants.
- iii) Schedule of periodic and preventative maintenance for specialised equipment.
- iv) Schedules of methods of adjustments, typical fault-finding routines.
- v) Schedule of operation and maintenance risk assessment sheets in accordance with the Construction (Design and Management) Regulations 1994.
- vi) Wiring diagrams of plant etc.
- vii) Service manual for all specialised plant, giving all details as listed above.
- viii) Schedule for obtaining and ordering replacement parts.
- ix) Schedules of equipment valves and motors related to the "As Installed" drawings and giving names, addresses, telephone and facsimile numbers of manufacturer, serial number of plant, kilowatt-power electrical supply, performance duties and location within the building.
- x) Description of emergency action which should be taken in the event of a breakdown of equipment. Telephone numbers of essential contacts shall be included.
- xi) Outline design data of plant.
- xvi) Test and performance data.
- xvii) Test Certificates.
- xviii) Schedule of "As Installed" Drawings.

- xix) Legend for colour - coded services.
- xx) Copies of all manufactures guarantees.

In addition, and separate from the Operating Manuals, supply four sets of manufacturer's catalogues relating to specialised plant and equipment.

The requirements and obligations of manufacturers to provide literature as part of the installation record shall form part of plant and equipment orders and such orders shall be considered unfulfilled until literature requirements have been met.

1.5.11 Preparation of Manuals

The manuals shall be encased in A4 size, plastic-covered, loose leaf, four ring binders, with hard covers, each indexed, divided and appropriately cover titled. Drawings larger than A4 shall be folded and accommodated in the binder so that they may be unfolded without being in any way detached from the rings.

Prepare the Operation and Maintenance Manuals in draft as soon as the Installation Drawings are in hand.

Make two temporary manuals with provisional record drawings and preliminary performance data available at commencement of commissioning to enable Employers staff to familiarise themselves with the installation. These should be of the same format as the final manuals with temporary insertions for items which cannot be finalised until the Services Contract is commissioned and performance tested.

The cover shall be printed with the following information:

"Operating and Maintenance Instruction Manual" (Project Name and Service).

Where more than one volume is required, the cover shall also be printed with volume number.

Each section of the manual shall be divided by a stiff divider of the same size as the holder. The divider shall be labelled as to the section of the manual.

All written instructions within the manual shall be typewritten with a margin on the left hand side. The arrangement of the manual shall be as follows:

- A. Index
- B. Description of the Design
- C. Description of the operational routes. The description must include step by step instructions on starting and stopping each plant or system and a fault diagnosis procedure in diagrammatic and tabular form to show the action necessary to correctly identify defective pieces of equipment and the steps to be taken to rectify faults.
- D. Planned maintenance instruction. This section must include step by step instruction on the maintenance of all items of plant. Data shall also be provided for ordering replacements. Full sets of manufacturers maintenance instructions including wiring diagrams, cable schedules, circuit chart. Protection and overload relay settings shall be recorded and calibration charts shall be incorporated. This section shall include a set of drawings of the installation upon which is recorded all plant settings, water flow rates, pump heads and noise level readings as adjusted and measured during the testing commissioning period.
- E. A set of record drawings and Test Certificates. If necessary due to the number of drawings which have to be included in the manual, each drawing shall be photographically reduced to size to suit the manual.

- F. Emergency measures including telephone numbers of the services contractor's emergency staff, names, addresses and telephone numbers of all manufacturers.

1.5.12 Submission of Operation and Maintenance Manuals

The final draft of the Operation and Maintenance Manuals shall be submitted in due time, and in any case not less than four weeks prior to Practical Completion, so that at least one copy of the complete final version is in the possession of the Employer at Practical Completion in order to comply with the Health & Safety at Work Act.

If partial possession is required by the Employer, then the documentation shall also be phased accordingly and so arranged to finally form one comprehensive document.

It shall be the services contractor's responsibility, whenever a successive phase of services contract is handed over, to amend and update the previously issued version of the Operation and Maintenance Manuals, bring it to the appropriate stage of completion and submit same to the Main Contractor in due time to comply with the Health & Safety at Work Act.

1.5.13 Maintenance Contract

The services contractor shall provide a separate quotation for the maintenance of all equipment and systems (pipework, ductwork, cabling, etc.) within his scope of works for a full 12 months' period from the date of completion or completion of section as defined in the Main Contract Preliminaries.

The maintenance to be carried out shall be strictly in accordance with the various manufacturers recommendations and shall be sufficient to ensure that the services operate at optimum efficiency and that the life expectancy of the various items of equipment and system components are in no way compromised.

Contractor to include full service of equipment in accordance with manufacturers recommendations at the end of the 12 month defect period. This is to include documentation of any result changes from commissioning.

1.5.13 Spare Parts and Tools

The Services Contractor shall submit a Schedule of additional spare parts and tools that he recommends should be supplied over and above those consumable spares required up to Practical Completion and for routine Maintenance.

1.5.14 Notice Prior to Covering Works

Any section of the work located below the ground, within trenches, ducts, ceiling voids or other concealed area, must be inspected and approved by the Supervising Officer prior to that section of the work being covered in. Seven days' minimum notice shall be given to the Supervising Officer of intent to cover or enclose the works.

1.6 Responsibilities (Services Co-ordination)

The Services Contractor shall:

- a) Include for all materials etc. as required to provide a complete, fully co-ordinated installation for their services.
- b) Complete co-ordination in conjunction with their Sub Contractors, the Main Contractor, the Services Contractor and the Contract Administrator, both individually and jointly.
- c) Ensure that all services are co-ordinated with the building and any other services present and agree

the sequence and timing of each element of the installation in a manner that maintains the agreed co-ordinated arrangements and programme.

- d) The positions of all equipment and services routes, including trunking, conduit and pipework etc, shall be marked out on site prior to their fixing
- e) Where architect's room layouts are available these shall be used to determine exact locations.
- f) Particular attention shall be paid to ensure that accessories are positioned to suit door openings, fitted furniture, etc.
- g) In heavily serviced areas, all main service routes or corridors and as otherwise specified elsewhere in this document, the Services Contractor shall produce drawings/sketches/details allocating space for all electrical and electrical services and demonstrate that crossover points etc. have been agreed in a manner that allows sufficient access to all maintainable items.
- h) The Services Contractor shall produce co-ordinated ceiling drawings at 1:50 scale, based on architect's ceiling layouts, showing all ceiling mounted electrical and electrical equipment.
- i) All drawings etc. shall be submitted following the requirements for working drawings detailed in this specification.
- j) Liaise with the Contract Administrator, CDM Principal Contractor and CDM Principal Designer with regard to the assessment and reduction of hazard and risk in accordance with the current CDM regulations.
- k) Should aspect ratio changes of ductwork be needed to achieve a fully co-ordinated layout or to allow the systems to fit within available voids / under structural steels, these shall be deemed to have been included within the Services Contractors Tender.
- l) Particular care shall be taken to obtain uniform and tidy arrangements of pumps, valves, switchgear, outlets and ceiling mounted equipment. The precise position of a piece of equipment shall normally be determined as follows: -
 - Single items of equipment which are visually remote from other electrical or electrical equipment shall be erected at the mounting heights stated in the Specification or shown on the drawings.
 - Two or more items of equipment, whether electrical or electrical or both, which are to be erected on the same wall or ceiling, or which will otherwise be visually close to each other, shall be arranged in a neat and symmetrical group. Symmetry of arrangement shall be obtained by horizontal and vertical alignment through the centre lines and not the edges of equipment; for this purpose, the stated mounting heights may, with the Contract Administrator's approval, be varied slightly.
- m) Where necessary, agreement reached with other parties on the positioning of equipment/plant etc., shall be indicated on the Installation Drawings etc. called for in this Specification.

Any disputes shall be referred to the Supervising Officer.

Any section of work found to be covered up without the Sub-Contractor having obtained an acceptance certificate from the Supervising Officer shall be exposed for inspection by the Supervising Officer and the cost of uncovering the works and recovering the works shall be paid by the Sub-contractor.

1.7 Defects Liability

It shall be deemed that the Warranty on the plant shall commence from the issue of the Certificate of Practical Completion, not upon delivery.

Unless otherwise stated, the warranty period shall run for one year from the date of acceptance.

1.8 Retention

There will be a retention to the contract sum to cover rectification works required under the contract. Retention will be set at 5% of the contract sum during the works, dropping to 2.5% at practical completion for the duration of the rectification period. The rectification period shall be set at 12 months.

It shall be deemed that the Warranty on the plant shall commence from the issue of the Certificate of Practical Completion, not upon delivery.

Unless otherwise stated, the warranty period shall run for one year from the date of acceptance.

1.9 Valuation of the Services Contract works

1.9.1 Sub-Letting

State in your Tender names of all firms to whom you propose to sub-let portions of the work. No section of the work shall be assigned or transferred to another company without the prior consent of the Supervising Officer.

1.9.2 Alternative Makes/Delivery Periods

Where a particular manufacturer is specified, alternative makes of equal quality will be considered by the Supervising Officer. However, include in the Tender for the makes specified and give quotation for alternatives separately in an Appendices to the Form of Tender.

The Sub-contractor shall ensure that the dates of deliveries covered by orders placed with manufacturers, suppliers or other Sub-contractors are confirmed at regular periods between the placing of the orders and the date of delivery. To this end, a delivery schedule of all major items must be submitted to the Supervising Officer within 60 days of acceptance of the Sub-contractor's tender.

1.9.3 Builder's Work

The formation of brick or concrete bases for engineering plant, boilers, calorifiers, pumps, switchgear, etc., the building-in of radiator, pipe and cable brackets, the formation of cable trenches, the provision of riddled earth in the trench, both before and after laying, and trench back-filling, the cutting of holes, chasing making good will be carried out free-of-charge by the Main Contractor.

1.9.4 Adjustments to the Sub-Contract Sum

No addition will be made to the Sub-Contract Sum if you have failed to ascertain, before tendering, all the requirements for carrying out the works, which inspection of the site or of the Specification and Tender drawings would have disclosed.

No change will be made to the Sub-Contract Sum unless the variation is authorised by an instruction from the Supervising Officer.

Within 14 days of the date of issue by the Supervising Officer of an instruction varying the content of the Sub-contract works, agree with the Quantity Surveyor the order of value of the variation, submitting documentary support where necessary. Thereafter, proceed diligently, with the Quantity Surveyor to agree the final price for the variation.

Variations shall be valued in accordance with the appropriate Clause of the Contract.

If you require work to be valued on a Daywork basis, the Supervising Officer's permission must be obtained before work commences. Submit two copies of Daywork sheets to the Supervising Officer for examination and signature during the week following the week in which the work is done. Include on the Daywork Sheet the Instruction Number, details of other documentation, the location of the work and the full details of the labour, plant and materials employed.

Include in your Tender for all additional payments for overtime necessary to carry out the Sub-contract works in accordance with these Documents. Where further overtime becomes necessary to overcome problems seek the

Supervising Officer's approval in each specific case to the inclusion of these overtime payments in the Final Sub-Contract Sum. Keep detailed records of the labour involved. Submit to the Supervising Officer for approval and signature during the week following that in which the work is done.

At the time of the settlement of account, and as one of the documents referred to in the Contract Conditions, the Main Contractor will obtain a statement from each of the Sub-Contractor's that the sum and/or credits to be included in respect of such Sub-Contractors are accepted in full and final settlement of their Sub-Contracts.

1.9.5 Valuations for Interim Certificates

At the time of every valuation of the works for Interim Certificates, submit via the Main Contractor, to the Quantity Surveyor a statement showing:

- i) The gross amount (including cash discount and retention) claimed supported by a detailed approximate priced statement of work executed and materials supplied.
- ii) The nett amount received from the Contractor to date excluding Contract charge.

1.9.6 Revision and Variations

Where schemes are subject to revision or instruction, the installation/working drawings, and finally the record drawings, must show the full effect of such revision. Where the scheme revision involves change to the architectural or structural details immediate notice must be given to the Supervising Officer.

Where scheme revisions are required in the main contract works or other sub-contract works due to the sub-contractor's variation or revision then all cost for such revision will be the sub-contractor's responsibility including the design team consultant's costs.

Where drawings are revised and updated during construction these shall be issued to the Supervising Officer for comments on the revision only.

Only if the Sub-contractor can give proof that a significant departure from the intent of the tender drawings has been necessary will a variation be recorded. This will not include normal detail design development relating to inclusion of nor development of, factors within the Sub-contractor's design responsibility.

1.10 Insurance and Indemnification

The Sub-contractor shall include for all insurance other than those for which the Main Contractor is responsible. The Sub-contractor will, in addition, be held responsible for any damage caused to the Main Contract or other Sub-contract works by the execution of this Sub-contract, and the cost of making good any such damage shall be borne by the Sub-contractor.

1.11 Commencement and Completion

The Sub-contractor shall execute his works within the dates described for the Main Contract. The Sub-contractor shall include in his price for any expenses he may incur in completing his works within this programme.

The Sub-contractor's attention is drawn to the fact that his work in his Sub-contract may well entail several visits to the site. No claim in respect of the number of visits to the site or discontinuity of the work will be entertained and the Sub-contractor shall allow in his rates for all extra costs incurred due to this method of working.

The erection programme is to be agreed with the Main Contractor before any materials are delivered to site.

The Sub-contractor, in conjunction with the Main Contractor, will be required to submit a detailed programme of works to the Supervising Officer. The overall time given must comply with the dates already given by the Main Contractor.

1.12 Drying Out

The Main Contractor may, by arrangement with the Sub-contractor wish to run the heating system for drying out the building. The Sub-contractor shall make due allowance in the sequence of his work to provide heat for drying out at the stated date in the Main Contractor's programme. This event will not relieve the Sub-Contractor of his obligation to hand over the installation in good order, nor shall the interim period from the time of commencement of use for drying out to the handover, be considered as constituting any part of the Maintenance Guarantee period hereinafter specified.

1.13 Regulations

1.13.1 General

Materials, products and completed systems in this contract shall comply with the following:

STANDARDS	
Construction (Design and Management) CDM regulations 2015	Current Building Regulations (or Scottish Building Regulations where applicable).
Asbestos at Work Regulations and Amendments	National Joint Utilities Group Publications
Control of Pollution Act	Current Pressure Regulations
Health and Safety at work Act	Current IEE Wiring Regulations (BS7671)
Gas Safety Regulations	Liquid Petroleum Regulations
COSHH Regulations	Electricity at work Regulations
Electricity at work Act	Clean Air Act and Clean Air Regulations.
Insurance Company Requirements	LDSA Fire Safety Code.
H&S Display Screen Regulations	Current Water Regulations
Fgas Regulations	Part L and all second tier documents.
London Building Act and / or Building (Inner London) Regulations where applicable.	Current Disability Discrimination Act and associated guidance notes
Health and Safety Executive ACoP and Guidance – Legionnaires Disease – Control of Legionella	
Installation to meet the requirements of the EHO, Fire Officer and Building Control Officer	
DW/172 Guidance	

The sub-contractor shall notify the Supervising Officer of any revisions or addition to the foregoing as they are published during the installation of the works. The Supervising Officer will give appropriate instructions in each case.

The sub-contractor shall pay all charges made by an Authority approving any part of the sub-contract works.

1.13.2 CDM Regulations

The Construction (Design and Management) Regulations 2015 apply to this project and the sub-contractor shall be fully aware of the duties laid down in these Regulations.

The CDM Principal Designer will collate the pre-construction information and make available to the Principal Contractor for this project, in this case the Main Contractor.

The Principal Contractor will be responsible for the development and implementation of the Construction Phase plan during the construction phase.

The sub-contractor shall ensure he obtains a copy of the Construction Phase Plan and any amendments and ensure that their personnel comply with any construction phase rules as identified in the Plan and have been given suitable training.

The sub-contractor shall ensure that the CDM Principal Designer or Principal Contractor is provided with all the required information including Method Statements.

1.13.3 Pressure Regulation and Compliance

The Services Contractor shall provide all certification/documentation in compliance with the Pressure Equipment Directive (97/23/EC) and all latest amendments.

All equipment installed under this contract and subject to this regulation must be certified and all documentation included within the O & M Manuals.

Failure to provide necessary certification shall render the equipment/system non-functional. The Services Contractor and Main Contractor shall be liable for any subsequent costs associated with the non-compliance.

The entire installation shall comply in full with the pressure regulations the Services Contractor shall include:

- 1) Provision of all safety relief valves and the like.
- 2) Provision of individual pressure test certificate for all components covered by the regulations (type testing is not acceptable).
- 3) Provide (or update an existing when modifying a system) a written scheme of examination in accordance with the regulations, employ a competent person to complete this on the Services Contractors behalf if this cannot be completed in house.

All necessary attendances shall be included by the Services Contractor and for compiling all necessary paperwork required to enable the written scheme of examination to be compiled.

1.13.4 Gas Safety Regulations (Installation and Use)

All natural gas pipework shall be undertaken by a company registered by an approved body. In addition, the installation operatives should be a member of the 'Gas Safe' quality scheme. If the Services Contractor is not registered, this portion of the work shall be sublet to a suitably approved sub-contractor.

1.14 Suitability of Materials and Products

Materials and products shall be supplied to suit the pressures, temperatures voltage and other conditions of use normally expected to apply after the installation is completed and also to withstand the tests specified herein or in any documents referred to herein.

1.15 Ordering Materials and Products

The Sub-contractor shall order the necessary materials and products immediately upon the Supervising Officer instructing the Sub-contract works or any part thereof, to proceed. The Sub-contractor must not delay Practical Completion, or completion of any part of the works, by delays in ordering or delivery of materials and products.

To avoid any possible delays to Practical Completion the Sub-contractor may submit details of alternative manufacturers or types of materials and products for consideration by the Supervising Officer. The Supervising Officer will give appropriate instructions in each case.

1.16 Handling and Storage of Materials and Products

The Sub-contractor shall:

- i) Deliver, off-load, store and transport about the works all materials and products in the manner recommended by their manufacturer.
- ii) Provide adequate safe, covered storage and protection for all new materials and products.
- iii) Store pipework and similar products on properly made racks and adequately support to prevent bending and distortion.
- iv) Close ends of pipework and protect threads by means of purpose made caps.
- v) Store gaskets carefully to avoid damage. Rubber gaskets shall be stored in a cool place, free from draughts or placed in boxes containing powdered chalk and stored in a cool, dry place.
- vi) Protect electrical cables from physical damage and seal ends.

Where materials and products cannot be stored in dry buildings they shall be raised clear of the ground and supported. They shall be protected from damage by frost, water and building work with covers or other appropriate means.

Materials and products must not be stored by placing directly on earth or any other damp or corrosive surface.

Materials and products shall be adequately coated to prevent damage by oxidation, etc., and this coating shall be maintained until ready for final finishing.

1.17 Samples of Materials and Products

At the request of the Supervising Officer, the Sub-contractor shall submit, for examination and approval, samples of materials and products proposed for use in the Sub-contract works.

Samples shall include but not be limited to labelling, luminaires, radiators, valves, grilles, room sensors, socket outlets, switches and like items, particularly where the aesthetic appearance is of prime importance.

Samples shall also be required to demonstrate standard of finish and colour. Approximate or 'similar' colour samples will not be accepted.

Samples approved by the Supervising Officer shall either:

- i) Remain in the possession of the Supervising Officer until the end of the Defects Liability Period or,
- ii) Be embodied in the Sub-contract works.

Where samples are not available, the Sub-contractor shall submit such detailed drawings as the Supervising Officer may require.

1.18 Protection to Fixed and Unfixed Items of Plant

- i) The Sub-contractor is to take all measures necessary to screen and protect all plant, equipment and accessories, whether in storage, in course of erection or erected, from the ingress of dust, moisture or foreign bodies, or from damage or marking by other trades to Practical Completion of the Sub-contract works.

Failure to arrange for such protection will make the Sub-contractor liable for all consequent reinstatement.

- ii) All parts of the installation liable to corrosion are to be properly cleaned and painted with heat resistant and/or corrosion resistant paint at works and a further coat immediately after erection.
- iii) Any plant, equipment and accessories found to be unduly marked by tools or damaged, corroded or distorted by any cause will be rejected by the Supervising Officer and must be replaced by the Sub-contractor at his own expense.
- iv) Final painting or finishing coats will be carried out by the Main Contractor unless otherwise indicated in the Particulars Specification hereinafter.
- v) When final finishes are provided to equipment at Manufacturer's works, all such finishes are to be of an approved material, process and colour and the Sub-contractor shall ensure adequate provision for the protection during transit, storage during and after erection to avoid damage to the finishes. The Sub-contractor shall inspect all paint and equipment immediately on delivery and shall not accept any that are damaged.
- vi) The Supervising Officer must be notified and the damaged works be subject to inspection before remedial work commences.
- vii) The Sub-contractor shall be responsible for the protection of his work during execution, but the Main Contractor shall be responsible for necessary casing and protection after the Sub-contractor's work has been executed.

1.19 Deleterious Materials

Refer to main contract preliminaries.

1.20 Housekeeping and Site Cleanliness

It shall be the Sub-contractor's responsibility to keep his working area clean and tidy at all times and remove all rubbish to a dump or other place on the site on an agreed regular basis.

Prior to any air system being started all of the following must be 'signed off' as being complete by the Supervising Officer.

- i) Temporary protection of air inlet if site conditions require.

- ii) Cleanliness of ductwork.
- iii) Dust sealing of all structural and architectural components within the air stream (floor void and ceiling voids included).

1.21 Condition of Site on Completion

On completion of the contract, the Sub-contractor shall remove from the site all tools and plant used for the execution of the Works together with all rubbish, packing cases and redundant material or equipment, and he shall make good or reimburse for making good any damage to buildings, roads or other parts of the site, where in the opinion of the Main Contractor such damage has been caused by or is the responsibility of the Sub-contractor.

1.22 Tender Drawings and Documents

The Sub-contractor shall treat the details of this Specification and attached documents as confidential and return them to the Supervising Officer after he has prepared his Tender.

1.23 Disagreement

In the event of any disagreement between the parties of the Contract as to the requirements of the Specification, definition of terms or value of works done, the matter shall, in the first place, be decided by the Supervising Officer, and, if such decision be challenged by either of the parties shall be referred to arbitration under the provisions of the signed Contract.

1.24 The Project

The Building Services Consulting Engineer has been appointed by the Employer to act in the following capacity:

- i) To act as the employer's technical adviser on matters relating to the engineering services in the building.
- ii) To identify the Client's requirements in regard to the provision of engineering services in the building.
- iii) To prepare the M&E Detailed Design Drawings & Specification for a Services Contractor to fully install the proposed mechanical, electrical and public health services.
- iv) To represent the employer's interest in the design process and to monitor design decisions.
- v) To inspect and regulate the quality of the materials and workmanship during installation.
- vi) To witness performance testing on completion and recommend acceptance of the installation.
- vii) To identify and seek rectification of defects in materials, workmanship and performance of the Engineering installation.

To fulfil this role, the Consulting Engineer requires the active co-operation of the Contractor. At the commencement of the Design Phase and the Installation Phase it will be necessary to establish how this co-operative working may be put into effect for the benefit of the project.

1.25 Scope of Works (Contractor Design Portion)

The contractor shall provide all CDP elements as listed below:

- Final design, selection, routing and co-ordination of ALL proposed new mechanical services 'as installed' onsite during the proposed Tamworth AC Replacement installation works.
- Mounting/fixing of equipment and plant
- Pipework and System expansion
- Builders Work requirements

The Specification of Design is intended to convey only the desired end result. It is not intended to inhibit the contractor from proposing alternative methods for achieving the same desired results, provided his designs are worked within confines pre-established for services.

The Design Specification covers the criteria for the design of the Mechanical, Electrical, Life Safety and Public Health Service.

1.26 Review for Quality Control

The design of services, the quality of equipment, material and finishes selected shall reflect the quality engineering installations required by the Employer.

Due consideration shall be given particularly to the question of servicing, maintenance and replacement of components or complete plant items.

The contractor shall, during the Design Programme, demonstrate the quality of his design and specification by submitting for comment or review, preliminary or draft specification, calculation data, manufacturer's drawings, quotations and technical literature, or such other information, including samples that may reasonably be necessary.

Such information shall be submitted at the Design Contractor's expense and in good time, so that any possible change arising for quality review does not jeopardise the Design Programme.

1.27 Structural Co-ordination

The contractor shall study fully the limitation of the existing structure, surveyed levels structural beam configurations and new construction levels.

All Mechanical and Electrical Services plant and mounting pads and bases shall be detailed for the Structural Engineer and submitted to him, giving information of dimensions, loading, structural metal support systems and their locations within four (4) weeks of appointment.

1.28 Design Standards

The design of the Mechanical, Electrical, Life Safety and Public Health installations shall comply with Code of Practice and Industry Standards accepted nationally such as:

- i) Local Authority Building Regulations.
- ii) Relevant International and British Standard Specifications and Codes of Practice.
- iii) C.I.B.S.E. Guides.
- iv) H.V.C.A. Specifications.
- v) BSRIA Application Guides
- vi) I.E.S. Codes
- vii) I.P.H.E. Guides and Code of Practice.

- viii) Offices, Shops and Railways Premises Act.
- ix) Other Acts, Bylaws, Regulations or Statutes that may be cited by Controlling or Regulating Bodies and Authorities as part of their Approvals and consents.

As soon as is practical, meetings shall be arranged by the Sub-Contractor with all Regulating Bodies whose consent is necessary before the works can proceed.

IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN ALL NECESSARY APPROVALS REQUIRED FROM THE VARIOUS REGULATING BODIES.

1.29 Documentation to be Provided by Services Contractor

1.29.1 Formats Required for Any Information Issued

The Services Contractor shall include for all information issued to the client and design team to be provided in the following electronic formats: -

Required Formats	
Description of Document	Format Required For Issue. (all format versions shall be the latest version generally available at time of issue)
Drawings, to be issued in both of these formats concurrently:	AutoCAD drawings in .dwg format for all drawings. PDF, without any restrictions on printing, copying, searching etc (applies to all PDF's described below.)
Document issue sheets, RFIs etc.	PDF
Output from calculation, modelling or part L software. To be issued in both of these formats concurrently:	ZIP compressed file of calculation input files with all information necessary to allow others to run the same calculations. PDF of any output / summary reports with sufficient information to allow results to be viewed and commented on by all parties.
Manufacturer's instructions, certificates, warranties etc.	PDF, original from manufacturer where available, else colour scanned in version by Services Contractor.
Commissioning Results	PDF generally until final versions agreed then issue in PDF and editable version such as Excel spread sheet.
Certificates etc.	Original signed copy, along with PDF of the same.
H&S O&M manual	Bound printed copies and electronic copy of the same.
Any information / document not already detailed above.	PDF, original from manufacturer / supplier where available, else colour scanned in version by Services Contractor.

The above is in addition to the issue of official / hard copies as required by the contract documents.

PDF documents shall be scanned generally at 300DPI, except drawings where greater resolution is required in order to view the detail.

1.29.2 Installation (Or Working) Drawings

The Tender drawings issued are provided to show primary routes, component order etc. They shall not be used as working or fabrication drawings. The Services Contractor shall develop the tender drawings in order to provide a complete set of working and fabrication drawings for the installation works. The drawings and installed systems shall:

- 1) Include all fittings etc. in order to comply with this specification.
- 2) Be based upon measured site dimensions and under no circumstances shall scaled dimensions from drawings be accepted.
- 3) Include minimum spacing as specified.
- 4) Be fully co-ordinated as detailed elsewhere in this specification.
- 5) Be provided to the following scales:
 - a) Plant rooms, external compounds and the like, risers, electrical switch rooms and cupboards and meter rooms 1:20
 - b) Internal wall elevations for positioning of outlets, components etc. 1:20
 - c) Site distribution, incoming services etc. 1:100 as long as sufficient detail can be shown, else include larger scale details or complete drawing shall be 1:50.
 - d) Details of brackets, supports and any special fixings 1:10
 - e) Manufacturers detail drawings of items of equipment 1:20
 - f) Any drawing not listed above 1:50.
- 6) Be provided in electronic format and:
 - a) The Services Contractor shall agree the number of paper copies to be issued for comment with engineer, for tender purposes assume 6.
 - b) The Services Contractor shall agree the number of paper copies to be issued for construction with engineer, for tender purposes assume 10.
 - c) Manufacture / installation works shall not commence until the drawing has been returned without any outstanding comments from the engineer, all comments shall be addressed prior to final copy being issued for manufacture / installation.

1.29.3 Record Drawings

The Services Contractor shall provide record drawings that are:

- 1) Based upon the installation drawings.
- 2) An accurate record of the actual installation including any deviations from the working drawings that have occurred on site.
- 3) Fully co-ordinated as detailed elsewhere in this specification.
- 4) Indicate the layout identity, size and position of all services installed.
- 5) Provided in electronic format and:
 - a) Services Contractor shall agree the number of paper copies to be issued for comment with the engineer, for tender purposes assume 3.
 - b) Services Contractor shall provide one full set of paper copies for each maintenance manual.

Final sets for each manual shall include:

- Reduced A3 colour copy inserted unfolded in A3 clear plastic wallets, all drawings to be visible without removing from wallets.
- Full size copy folded and inserted into clear plastic wallets.
- CD containing electronic copy in formats described elsewhere in this specification.

1.29.4 Specialist Suppliers Drawings

The Services Contractor shall provide installation/fabrication drawings from all specialist suppliers or manufacturers in accordance with the following:

- 2 prints shall be provided for comment.
- 6 copies of the final drawings are required for construction.
- 4 copies of the record drawings are required for the O & M manuals.

1.29.5 Labels and Charts

Each item of plant and equipment shall bear a metal nameplate giving the maker's name, serial number and relevant performance data. In addition, all items of plant and equipment shall be fitted with a bolted or screwed on engraved plate, having identification marks and number corresponding to the Schedule of Plant and Equipment in the Operation and Maintenance Instructions and stating the description of the plant and its relative number if more than one.

2

Scope of Services

2 General Description

2.1 Scope of Works

The works shall comprise the design, selection, supply, installation and commissioning of new mechanical services, to suit the proposed AC Replacement Works to the Tamworth Building.

THIS IS A PERFORMANCE SPECIFICATION FOR A DESIGN & BUILD CONTRACT. THIS SPECIFICATION DETAILS THE DESIGN PHILOSOPHY FOR THE FURTHER DEVELOPMENT BY THE DESIGN & BUILD CONTRACTOR. IT DOES NOT DETAIL ALL ITEMS OF EQUIPMENT REQUIRED AND DOES NOT REPRESENT THE FINAL DESIGN. THE CONTRACTOR AND THE APPOINTED M&E CONTRACTORS SHALL MAKE SUFFICIENT ALLOWANCE WITHIN THEIR COSTS TO FULLY DESIGN, SUPPLY, INSTALL, TEST AND COMMISSION A FULLY CO-ORDINATED, COMPLETE AND OPERATIONAL SYSTEM IN ACCORDANCE WITH THE EMPLOYERS REQUIREMENTS, GLEEDS SPECIFICATION AND RELEVANT STANDARDS.

Scope of work includes, but is not exclusive to, the following:

- Removal/stripout of existing Tamworth AC Systems to Rooms Classroom I.T.'s, I.T. Classroom, Offices, Reprographics, Classrooms, NARU Office and Operations Centre including existing external condenser, internal cassette units, refrigerant pipework, controls etc. as detailed on drawings NTBS4073-GLE-TA-GF-DR-M-2000 and NTBS4073-GLE-TA-01-DR-M-2001.
- New 2No. VRF AC System to Rooms Classroom I.T.'s, I.T. Classroom, Offices, Reprographics, Classrooms, NARU Office and Operations Centre including 1No. external condenser, 15No. internal units, branch selector box, refrigerant pipework, controls, fixings etc. as detailed on drawings NTBS4073-GLE-TA-GF-DR-M-2002 and NTBS4073-GLE-TA-01-DR-M-2003.
- New above ground drainage as necessary
- All necessary supports and fixings
- Loading and unloading, and storage of materials
- Testing and Commissioning
- Prepare working drawings, builders work requirement drawings and as fitted drawings
- Thermal insulation, identification bands and arrows - valve charts
- Operating and maintenance manuals including system description and fault finding
- User instruction
- Full service of equipment in accordance with manufacturers recommendations at the end of the 12 month defect period. This to include documentation of any result changes from commissioning.

Programme/Out of Hours Working

The contractor shall make due note of the contract programme, and consider the live environment of the site. The contractor shall make due allowance for all out of hours work required to undertake the work within programme, and to ensure all shutdowns/service isolations etc do not have a negative impact on the operation of the facility.

2.2 Design Criteria & Standards

2.2.1 General

The enclosed tender documents are based on the following System Design Criteria.

The Mechanical Sub-Contractor shall review the attached System Design Criteria and ensure that all materials and components provided (where not specified in the enclosed Tender Documents), are compliant.

The Mechanical Sub-Contractor shall especially note the acoustic criteria.

The enclosed designs take into account all necessary acoustic provisions with regards to attenuation. However, the Mechanical Sub-Contractor shall ensure all installation methods and supports for services do not lead to noise generation due to vibration, rattling equipment, etc.

Noise generation due to poor installation methods shall be corrected at the expense of the Mechanical Sub-Contractor. **ACOUSTIC PERFORMANCE IS ONE OF THE KEY CRITERIA ON THIS PROJECT.**

2.2.2 Equipment Design Conditions

The design conditions for equipment shall be:

Description	External Equipment	Internal Equipment
Equipment Temperature Range	-15°C to +35°C	+10°C to +35°C
Equipment Relative Humidity Range	0 to 100% RH	0 to 80% RH

2.2.3 External Ambient Design Conditions

The external ambient design conditions shall be:

Description	Winter	Summer
VRF AC System	-5°C Dry Bulb @ 80% RH	26°C Dry Bulb @ 19°C Wet Bulb

2.2.4 Internal Ambient Design Conditions

The internal design conditions shall be:

Area/ Location	Winter	Summer
Classroom I.T., I.T. Classroom, Office, Reprographics, Classroom, NARU Office and Operations Centre	21°C \pm 2°C @ 40-60% RH	23°C \pm 2°C @ 40-60% RH

2.2.6 Standards Applicable

Provide all materials and works in accordance with the appropriate British Standard or Code of Practice and where no BS or CP is applicable the Agreement Certificate for the particular item.

Comply with all statutory instruments and regulations, relating to the area of the site current at the date of tender.

Comply with all Statutory Obligations arising from current legislation and regulations, together with other requirements, including, but not limited to, the following:

- Relevant British & European Standards
- Water Supply (Water Fittings) Regulations 1999
- Relevant CIBSE design guides / commissioning codes / technical memoranda etc.
- Current Building Regulations
- Institution of Gas Engineers and Gas Board Publications
- BESA (HVCA) Guides & Good Practice Notes
- HSE Prevention of and Control of Legionella Bacteria in Water Approved Code of Practice 2013
- Statutory Obligations
- Non-Domestic Heating Cooling and Ventilation Compliance Guide
- Health and Safety at Work etc. Act 1974
- Management of Health & Safety at Work Regulations 1999
- The Working Time Regulations 1998
- Gas Safety (Management) Regulations 1996
- Gas Safety (Installation and Use) Regulations 1998
- Public Health Acts
- Electricity Acts
- Electricity at Work Regulations 1989
- The Workplace (Health, Safety and Welfare) Regulations 1992
- The Construction (Design and Management) Regulations 2015
- The Health and Safety (Display Screen Equipment) Regulations 1992
- The Control of Substances Hazardous to Health (COSHH) Regulations 2002
- The Control of Substances Hazardous to Health (Amendment) Regulations 2003
- Control of asbestos Regulations 2012
- Personal Protective Equipment at Work Regulations 1992
- The Construction (General Provisions) Regulations 1961
- The Lifting Operations and Lifting Equipment Regulations 1998
- Other relevant Safety Regulations
- Relevant Health Technical Memorandum & Health Building Notes
- Public Utility Company and/or Statutory Authority regulations, specifications, and requirements.
- Client Requirements
- British Standards and Codes of Practice.
- BS 7671 - Requirements for Electrical Installations (IEE Wiring Regulations).
- Insurance Company Requirements.
- LDSA Fire Safety Guides.
- IEC Standards.
- NACOSS Standards
- NSI Standards
- The Factories Clean Air Act
- Design to fully meet the requirements of the local Environment Health Officer, Fire Officer and Building Control Officer

The above standards are continually being updated, with new standards also becoming applicable. The Services Sub- Contractor shall ensure that the specialists / personnel completing the manufacturing / installation works are familiar with the latest standards applicable at Tender and completes all works in accordance with these standards.

Where discrepancy is found between this specification and the relevant standards the Services Sub-Contractor shall obtain written clarification from the engineer prior to submission of tender. Where a discrepancy has not been clarified prior to tender submission the Services Sub-Contractor shall include the most onerous requirements.

The contractor shall carry out all works in a professional and workmanlike manner. The contractor shall include for all works necessary to provide a complete and working installation.

2.2.7 Thermal Insulation

Thermal insulation work shall be fully in accordance with Section 2 of this specification and the relevant section of the following British Standard Specification and Codes of Practice, unless otherwise stated.

Note; thermal insulation shall not commence until the installation (or a section of the installation) has been tested and all joints approved.

Performance Standards: BS 5422, 1990, or latest revision. Material Specifications: BS 3958, Part 3, 1985.

Specification for Thermal Insulating Materials Part 3, metal mesh faced mineral wool mats and mattresses. BS 3958, Part 4, 1982.

Bonded pre-formed mineral wool pipe sections.

Material Testing: BS 875, 1986.
Thermal Insulating properties.

Application Methods: BS CP 3005, 1969.

All Specifications and installation appertaining to Heating System in any type of building should comply with Part L of Building Regulations including all current additions and amendments.

Where it is specified that the pipework, ductwork, fittings or equipment shall be insulated in the Specification, the Contractor shall ensure that the setting out makes due allowance for insulation.

All insulation work shall be carried out by a specialist firm of repute which is a member of the TICA (Thermal Insulation Contractors' Association).

All materials delivered to site shall be new and dry and so maintained throughout the progress of the works. Materials which have been subjected to water dampness will not be allowed.

The Consulting Engineer will not accept poor quality or badly finished work neither will he accept irregularities in the thickness of insulating material or in the material covering. All work shall be left smooth, clean and properly finished.

To ensure that the correct thickness has been applied, the Consulting Engineer reserves the right to cut away any section of insulation to ensure that it is in accordance with the specified thickness and that it is of the correct material.

Any discrepancies discovered or any item of work which is found to be defective or of poor quality shall be removed and new insulation and finishes as specified shall be applied at the Contractor's own expenses.

All insulating materials shall be in close contact with the surface to which it is applied.

Pipework shall be insulated separately and adjacent parallel pipes shall not be married together in one insulation covering.

All insulating material and associated products shall be applied strictly in accordance with the manufacturer's recommendations and instructions and any work failing to comply with these will not be accepted by the Consulting Engineer.

All joints, surfaces, edges and overlaps shall be neatly finished and where possible, overlaps shall be arranged to be on a 'blind' side and also 'water shedding'.

Where allowances have to be made for pipe/duct expansion and/or contraction, insulation shall be finished in a neat and approved manner permitting easy access and disconnection of removable items without disconnection of removable items without disturbing the surrounding insulation.

A complete moisture and vapour seal shall be provided on cold surfaces by vapour barrier jackets, coating or closed cell construction. All vapour barriers shall be continuous and where this is not possible, the vapour barrier shall be returned effectively and sealed to the pipe or duct so as not to allow any ingress of moisture or water vapour.

2.2.8 General Requirements

The Services Sub-Contractor shall be responsible for the supply, installation and commissioning of all necessary building services to suit the building layouts and Client requirements. This section of the Specification details the design standards that the Services Sub-Contractor shall be required to adhere to in the development of the design and installations of the Building Services for the project.

2.2.9 Design Development

The Services Contractor shall be responsible for the production of installation drawings, record drawings, builders work drawings and 'As Fitted' drawings as detailed elsewhere in this Specification.

The Services Contractor shall be responsible for any design work associated with producing builders work drawings and all builders work information associated with the mechanical installations.

The Services Sub-Contractor shall allow for attending any meetings necessary to provide full design and co-ordination of the mechanical installation with all other trades.

The Services Sub-Contractor shall assess all plant room sizes, riser sizes, void depths and service routes ensuring that the Architect and Main Contractor is fully aware of their requirements and can accommodate them.

2.2.10 Design for Accessibility, Maintenance and Replacement

The complete services installation shall be installed to facilitate future maintenance operations as well as future replacement of the service / plant. The details below give minimum standards to be adopted in the design for various items; the list is not exhaustive and does not detract from the designer's obligation to meet current guidance such as the CDM regulations, H&S requirements and Building Regulations etc.

Services plant and equipment shall be installed in dedicated plant areas such as switch rooms, plant rooms, external compounds and the like, in these areas the following shall be provided:

- Where services require frequent inspection / maintenance (i.e. every 0-12 Months).
- Access shall be easy and accomplished via purpose made panels without the need for special tools etc. (except where locking devices are used for safety purposes).
- Access shall be from a level surface without the need for steps or the like.
- Space shall be provided such that any consumable item can be easily removed and replaced without the use of any specialist lifting equipment.
- Access shall not be via ladders, staircases or preferably lifts shall be provided to all plant areas.
- Where services require less frequent inspection / maintenance (i.e. every 1-5 years).
- Access shall be unobstructed by adjacent services / plant.
- Access shall be achieved without the need for specialist plant or machinery.
- Servicing / replacement shall be achievable without dismantling or effecting adjacent systems.
- Where services require infrequent inspection / maintenance and for replacement of complete items of plant:

- A practical and safe method of replacement shall be provided (such as removable louvres and a landing platform) along with suitable location for crane or the like.
- Replacement shall be achieved in a cost effective manner, i.e. without excessive dismantling of the building facade, adjacent plant and services or disruption to the normal operation of the building.
- The works shall be able to be completed in a relatively short period of time (Less than 48 hours).

Distribution of Services shall generally be via service risers, bulkheads and ceiling voids, in these areas the following shall be provided:

- Where services require frequent inspection / maintenance (i.e. every 0-12 Months).
 - Access shall be easy and accomplished via purpose made panels without the need for special tools etc. (except where locking devices are used for safety purposes).
 - Access shall be from a level surface avoiding the need for steps or the like wherever feasible (i.e. avoid routing services above staircases where access would be difficult).
 - Space shall be provided such that any consumable item can be easily removed and replaced without the use of any specialist lifting equipment.
 - Access for cleaning / inspection shall not be obstructed by adjacent services (i.e. do not route cable trays such that they obstruct duct access doors).
- Where services require less frequent inspection / maintenance (i.e. every 1-5 years).
 - Access shall be unobstructed by adjacent services / plant.
 - Servicing / replacement shall be achievable without dismantling or effecting adjacent systems.
- Where services require infrequent inspection / maintenance and for replacement of complete items of plant or systems.
 - A practical and safe method of replacement shall be provided (such as removable bulkheads) along with suitable location for scaffolding or the like.
 - Replacement shall be achieved in a cost effective manner, i.e. without excessive dismantling of the building fabric or damage to finishes, removal of adjacent plant and services or disruption to the normal operation of the building.
 - The works shall be able to be completed in a relatively short period of time (Less than 48 hours). This shall be in a phased manner if necessary.
 - Access shall be achieved from less sensitive spaces where feasible (i.e. from service corridors rather than the main entrance lobby).

Where services are installed in the occupied zone:

- Where services require frequent inspection / maintenance (i.e. every 0-12 Months).
 - Access shall be easy without the need for special tools etc. (except where locking devices are used for safety purposes).
 - Access shall be from a level surface avoiding the need for steps or the like wherever feasible (i.e. avoid locating lights on the landing of staircases where access would be difficult).
 - Replacement shall be achieved without the need to damage the building fabric or finishes.
- Where services require less frequent inspection / maintenance (i.e. every 1-5 years).
 - Access shall be unobstructed by adjacent services / plant.
 - Servicing / replacement shall be achievable without dismantling or effecting adjacent systems or building finishes.
- Where services require infrequent inspection / maintenance and for replacement of complete items of plant or systems.
 - A practical and safe method of replacement shall be provided (such as removable bulkheads) along with suitable location for scaffolding or the like.
 - Replacement shall be achieved in a cost effective manner, i.e. without excessive dismantling of the

building fabric or damage to finishes, removal of adjacent plant and services or disruption to the normal operation of the building.

- The works shall be able to be completed in a relatively short period of time (Less than 4 hours). This shall be in a phased manner if necessary.
- Access shall be achieved from less sensitive spaces where feasible (i.e. from service corridors rather than the main entrance lobby).

Details of access for maintenance / replacement shall be provided in a design statement during the design process for comment and the agreed philosophies included in the O&M manuals upon completion of the works.

The Contractor should ensure that all equipment procured weighing over 20kg is supplied complete with proprietary lifting eyes.

2.2.11 Fire Precautions

The contractor shall make due allowance for the inclusion of all necessary fire/smoke dampers, pipe/fire sleeves and the like where services pass through fire compartments and floors.

The Building Services Design Engineer(s) shall ensure all items are included to comply with Building Control, Client Insurance, site Fire Officer and Fire Department requirements.

2.2.12 Building Regulations Part M and DDA Compliance

Building Regulations Part M has several recommendations for the construction of new or alterations and extensions to non-domestic buildings. The Client should confirm early on in the design process any site/project specific requirements which shall need to be incorporated within the design of the building services to ensure these are included for.

The location and detailing of all wall mounted switches and controls shall take into account ease of operation, height, and distance from corners, visibility and unobstructed access.

The operation of switches, sockets and controls should not require the simultaneous use of both hands. Large switch pads are recommended.

Large push pads - Large Push Pads are easier to operate and locate and should be available in public areas. The Disabled Living Foundation states a wide large push pad is one that can be operated by use of a fist or even an elbow. MK provides wide rocker switches in its Logic Plus and a number of its decorative ranges that can be operated in this way.

Totally flush or recessed controls shall be avoided, as these are not accessible to people with limited dexterity.

Colour and tonal contrast shall be used to ensure controls are distinguishable from their background. A coloured back drop on outlets mounted on walls, skirting trunking or dado trunking could provide a solution.

Contrast - "Controls that contrast visually with their surroundings are more convenient for visually impaired people". Part M states that switches outlets and controls will satisfy the regulation if there is a contrast of 30% Light Reflective Value (LRV) between a front plate and wall. White has an LRV of 100, and black 0. MK has developed switches and sockets with graphite front plates for contrast to walls with an LRV of 70 or more i.e. white / cream. MK's Prestige Plus Compact and Power Link Plus are available in Charcoal to provide contrast with white accessories.

Consideration shall also be given to the use of tactile buttons and controls. These should be embossed and not engraved.

2.3 Removal of Redundant Items

The contractor shall isolate, make safe, disconnect, remove from site and make good any building fabric holes, all redundant items.

The contractor shall make himself familiar with the existing building and the required M&E strip out works, proposed M&E modification/installation works and ensure suitable allowance is included within his tender for all removal works. Full access will be provided to the contractor to familiarize himself with the existing installation, no claim shall be accepted based on lack of information.

2.4 Mechanical Installations (Overview)

The works shall comprise the design, selection, supply, installation and commissioning of new mechanical services, to suit the proposed AC Replacement Works to the Tamworth Building

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Scope of work includes, but is not exclusive to, the following:

- New 2No. VRF AC Systems to Rooms Classroom I.T.'s, I.T. Classroom, Offices, Reprographics, Classrooms, NARU Office and Operations Centre including 2No. external condensers, 15No. internal units, branch selector box, refrigerant pipework, controls, fixings etc. as detailed on drawings NTBS4073-GLE-TA-GF-DR-M-2002 and NTBS4073-GLE-TA-01-DR-M-2003.
- New above ground drainage as necessary
- All necessary supports and fixings
- Loading and unloading, and storage of materials
- Testing and Commissioning
- Prepare working drawings, builders work requirement drawings and as fitted drawings
- Thermal insulation, identification bands and arrows - valve charts
- Operating and maintenance manuals including system description and fault finding
- User instruction
- Full service of equipment in accordance with manufacturers recommendations at the end of the 12 month defect period. This to include documentation of any result changes from commissioning.

2.5 VRF Heating & Cooling

2.5.1 Description of Works

The Mechanical Contractor shall design, select, install, test and fully commission all proposed Air Conditioning services associated with the replacement AC systems to Rooms Classroom I.T.'s, I.T. Classroom, Offices, Reprographics, Classrooms, NARU Office and Operations Centre as per Gleeds M&E design drawings.

For tendering purposes, all tendering Contractors shall price for new/replacement AC Systems based on the design detailed. The works shall be generally as detailed on the design drawings, and shall generally comprise of the following:

- The installation of 11No. internal high level mounted '4 way blow' cassette type units, to provide heating/cooling provision to the Classroom I.T.'s, I.T. Classroom, Office, Classrooms, NARU Office and Operations Centre.
- The installation of 4No. internal wall mounted AC units, to provide heating/cooling provision to the Offices and Reprographics.
- Installation of 2No. floor standing VRF external condensers to supply the new internal AC systems, with the new external condensers to be mounted upon the existing concrete base close to the WC's.
- The installation of VRF refrigerant pipework connecting between the proposed external condenser(s) and internal units.
- The installation of wall mounted controllers, one controller per room served by the new AC system, 15No. in total (to serve rooms Classroom I.T.'s, I.T. Classroom, Offices, Reprographics, Classrooms, NARU Office and Operations Centre) c/w timeclock, temperature setpoint control etc.
- Testing, balancing, and commissioning of all systems.
- Production of 'As Fitted' drawings and Operation and Maintenance Manuals.

2.5.2 Internal Cassette Units

The internal '4-way blow' cassette units shall generally be as detailed on the design drawings, and as follows:

The Mechanical Sub-Contractor shall install, test and commission 11No. internal '4-way blow' cassette units mounted at high level within the Classroom I.T.'s, I.T. Classroom, Office, Classrooms, NARU Office and Operations Centre.

The proposed 11No. internal AC Units shall also be linked to 11No. local dedicated wall mounted controllers, as per Gleeds Tender drawings, to provide timeclock, setpoint, internal room temperature information/feedback to the internal units.

The new internal AC Units shall be installed in accordance with the Manufacturer's recommendations and shall be fully commissioned by the Manufacturer. The Mechanical Sub-Contractor must ensure that the Manufacturer allows for commissioning.

2.5.3 Internal Wall Mounted AC Units

The internal Wall Mounted AC Units shall generally be as detailed on the design drawings, and as follows:

The Mechanical Sub-Contractor shall install, test and commission 4No. internal Wall Mounted AC Units mounted at high level within the offices and reprographics.

The proposed 4No. internal Wall Mounted AC Units shall also be linked to 4No. local dedicated wall mounted controllers, as per Gleeds Tender drawings, to provide timeclock, setpoint, internal room

temperature information/feedback to the internal units.

The new internal Wall Mounted AC Units shall be installed in accordance with the Manufacturer's recommendations and shall be fully commissioned by the Manufacturer. The Mechanical Sub-Contractor must ensure that the Manufacturer allows for commissioning.

2.5.4 External Condenser

The External Condensers shall generally be as detailed on the design drawings, and as follows:

The Mechanical Sub-Contractor shall install, test and commission 2No. floor standing VRF external condensers to supply the new internal AC systems, with the new external condensers to be mounted upon the existing concrete base close to the WC's.

Condensers shall be installed in accordance with the Manufacturer's recommendations and shall be fully commissioned by the Manufacturer. The Mechanical Sub-Contractor must ensure that the Manufacturer allows for commissioning.

The new AC System shall be supplied by Easy Air Conditioning (or equal and approved).

Contact: Mark Chattwood (Easy Airconditioning)
 Telephone: 01217463500
 Email: markchattwood@easyairconditioning.com
 Address: 262-264 Baldwins Lane,
 Birmingham

2.5.5 Refrigeration Pipework

Supply, install, test and commission all interconnecting refrigeration pipework between the outdoor unit(s) and the connected indoor units.

The pipework installation, charging, testing and commissioning should be carried out by REFCOM registered refrigeration engineers, who shall be fully trained in the safe handling of refrigerants and CITB trained in brazing techniques.

The installation shall be fully in accordance with British Standard BSEN 378: 2000 Parts 2-3, and the manufacturer's design and installation instructions.

The Installation Company should be approved installers of the manufacturer chosen, whose installation engineers should have attended the relevant Manufacturers' courses. If required, proof of compliance may be requested before commencing works.

All pipework installations are to be carried out in refrigerant quality soft or half hard drawn copper tubing to BS2871 Part 2:1972, and complete with the appropriate Refnet headers and Refnet joints.

Longest possible lengths of copper pipe should be utilised to minimise joints on site, appropriate refrigeration installation tools must be utilized to avoid the use of elbows. Oxygen free dry nitrogen must be in the system during brazing (no cold brazing is allowed).

Pipework is to be properly and tidily fixed and supported at a minimum of 2 metre center, and where required should be run on galvanized trays. All pipework to be tagged with ID number (condensing unit ref) at 3 metre intervals.

Pipe supports should not restrict expansion or contraction of the pipe and restraint must not be applied to Refnet joints or headers.

All pipework (suction, discharge and liquid) to be insulated with slip on close cell elastomeric pipe insulation (as manufactured by Armaflex or equal and approved), fire rated to Class "O" Building Regulations 1985, with a wall thickness of not less than 13mm. Insulation must be protected when exposed to atmosphere by special paint or covered by an enclosure.

All joints, after pressure and leak testing, are to be properly glued and/or taped, to provide a complete seal to prevent condensation, and should be clearly marked (yellow tape) for ease of identification.

After installation of pipework, prior to connection to the condensing units, sealing of insulation joints and starting of equipment, pipework should be pressure tested using oxygen free dry nitrogen to 38 kg/cm² (550 psi), held for 24 hours and checked for leaks. Condensing units should be connected, and the system should be vacuumed/dehydrated to (-752mmHg) and held at that setting for one hour (minimum) to four hours, depending on pipe length. All the above works should be carried out before electrical connection is made to the fan coil units.

The additional refrigerant (HFC410A) charge must be calculated and weighed to accommodate the actual installed and measured length of pipework, all in accordance with the Manufacturer's recommendations and Instruction SiE-52.

The charging should be carried out with an appropriate charging station, and under the supervision of the Manufacturer.

2.5.6 Control Wiring

The AC Installation Engineers/ Mechanical Sub-Contractor shall be responsible for the inter-connecting control wiring between the indoor and outdoor units. This work shall be co-ordinated with the Electrical Sub-Contractor with regard to the routing of both cables and cable support systems.

All control wiring is to be carried out in 2-core 0.5mm² - 1.5mm² PVC non-screened CY flexible control cabling to BS6141 and BS6500 (to comply with CE Regulations 1995) colour coded and separately marked at 3 metre intervals for ease of identification and maintenance.

2.5.7 Power Wiring

The Electrical Sub-Contractor shall provide power wiring to each new condenser unit and internal units requiring power supplies.

If the fan coil unit power is derived from the condenser unit, this wiring shall be provided by AC Installation Engineers/Mechanical Sub-Contractor.

2.5.8 Equipment Maintenance & Warranty

The Mechanical Sub-Contractor shall ensure the AC Installation Engineers are a Samsung AC Approved Installer offering a multi-year extended parts warranty.

The Mechanical Sub-Contractor shall include for a one-year maintenance contract on the complete installation, with guaranteed maximum 24 hour response time. The Mechanical Sub-Contractor shall ensure that the warranty and maintenance contract he provides is underwritten by the Air Conditioning Equipment Supplier and shall provide to the Employer documentary evidence of the same.

The maintenance contract, which must be in place within three months of project completion, shall include for all works necessary to ensure that the five-year equipment warranty underwritten by the Equipment Provider is not invalidated, and shall provide documentary evidence to this effect.

2.5.9 Testing & Commissioning

All testing and commissioning shall be carried out as to ensure full compliance with this Specification and the Equipment Suppliers requirements.

2.6 Above Ground Drainage

2.6.1 Description of Works

The Mechanical Contractor shall include for design, supply, installation and testing of any new drainage systems, as required. The complete installation shall be in full compliance with BS EN 12056.

The new drainage systems shall collect condensate drains in strategically located new/existing gravity soil and waste stacks which connect to the underground drainage system.

Where condensate discharge lines must connect to a soil vent pipe, provide a dry, sealed trap to prevent odours passing back up the drain lines.

2.7 Builders Work

The contractor shall allow to undertake all necessary builders work (and produce builders work drawings) as required to facilitate the works described within the specification and associated drawings. Builders work shall include but not be limited to:

- M&E Services Holes
- Plant Bases
- Making good of building fabric.
- Cleaning, painting etc.

3

Summary of Tender

3 Summary of Tender

3.1 General

The Tenderer is required to insert, under each sub-heading, the sums required for the erection of work described within the Specification and contained on the Tender Drawings.

The sums included shall contain all costs and expenses which may be required in, and for, the erection of the work described, together with all risks, liabilities and obligations set forth and implied on the Contract Documents.

Where special risk liabilities and obligations cannot be dealt with, as above, then the cost thereof is to be separately stated by the Tenderers.

3.2 Tender Summary

The prices inserted by the Tenderer in this Summary shall be fixed Price in accordance with the Contract Particulars and shall be fully inclusive of all obligations contained within the Tender Documents for the complete Mechanical and Electrical Services Installation.

An associated cost shall be inserted for each item listed, failure to fully complete this tender sum analysis shall deem the tender return non-compliant.

Removal of existing Tamworth building VRF AC Systems and install of new Tamworth Building VRF AC systems (inc. 2No. external units, 15No. internal units, pipework, controls etc.)	
Builders Work	
New above ground drainage	
Working Drawings	
Commissioning & Testing	
Operation & Maintenance Manuals	
Record Drawings	
Building User Guide	
Service at end of 12 month rectification period	
Other	

TOTAL TENDER SUM EXCLUSIVE OF VAT £ Signed

Company

Address

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Tel Date

