Mayor's Office for Policing and Crime

Holborn Police Station Space Planning Refurbishment

Mechanical Engineering Services Specification – Stage E

October 2014

7/5204

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Specification Origin

	Name	Signature	Date
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Checked	M Powers		31/10/14
Approved	M Powers		31/10/14

T1	7th September 2014	Stage D Issue
T2	31st October 2014	Stage E Issue

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SECTION 1 - PROJECT DIRECTORY

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Mayor's Office for Policing and Crime

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1.5 SITE CONTACT:

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SECTION 2 - GENERAL INFORMATION

2.1 INTRODUCTION

This Particular Specification relates to the provision of modifications to the existing mechanical services installations serving the Holborn Police Station office spaces. The outlined changes are to suit the proposed architectural changes to the building.

This specification and tender drawings are issued as Stage E of the Mechanical services design.

The mechanical sub-contractor shall use, as the basis of their tender, the materials and equipment specified in this document.

The mechanical sub-contractor shall carry out full intrusive surveys, particularly of the ceiling voids and risers. The mechanical sub-contractor shall use the information gained during the survey to determine suitable positions for all connections to the existing services and confirm the extent of the existing services which may be retained, reused or relocated as appropriate. For tender purposes, the contractor shall include for the provision of all new services, as indicated on the Stage E Tender drawings.

The mechanical sub-contractor shall highlight any assumptions made in the preparation of the estimates/tender with the tender return form.

This specification shall be read in conjunction with the Clancy Consulting, architectural, electrical and structural drawings and specifications and all other drawings/ relevant information in connection with this scheme.

2.2 DRAWINGS

The mechanical sub-contractor shall include within his tender for the following drawings,

2.2.1 Co-ordinated Installation Drawings

These shall be fully co-ordinated with all other services and the building structure. The mechanical sub-contractor shall assume the role of lead services co-ordinator, responsible for setting out all of the mechanical, electrical, public health and data cabling, in conjunction with information supplied by other specialists.

2.2.2 Builder's Work Drawings

These shall include detailed setting out of all holes, bases, trenches, or any other works that will be carried out by the main contractor to facilitate the mechanical services installation. The mechanical sub-contractor shall allow to attend meetings with the main contractor and other sub-contractors, as required. Final builders work information shall only be agreed after production of the co-ordinated installation drawings.

2.2.3 Manufacturer's 'Shop' Drawings

The mechanical sub-contractor shall supply all specialist/ bespoke manufacturer's shop drawings for the installations. These shall include but not be limited to,

a) Ventilation Ductwork Drawings

b) Refrigeration specialist's Drawings.

2.2.4 As Fitted Drawings

Prior to completion of the project the mechanical sub-contractor shall submit detailed and accurate 'As Fitted' Drawings. These shall include

a) Positions of all Plant and equipment,
b) Pipework runs, including the positions of all valves
c) Ductwork runs, including the positions of all volume control and fire dampers and access doors.
d) Positions of all control items, including thermostats, all sensors (temperature, air/ water flow, CO_2), pressure switches, valve and damper actuators, gas safety equipment, etc.

A set of 'As Fitted' drawings shall be contained within the Project Operating and Maintenance manuals. An electronic copy of all As Fitted drawings shall also be supplied in PDF and DWG formats.

2.3 OPERATING AND MAINTENANCE MANUALS

At the completion of the project, the mechanical sub-contractor shall produce detailed Operating and Maintenance Manuals, including all information necessary for the client to operate and maintain the systems as installed,

The manuals shall contain the following information,

i. Index
ii. List of Key Contacts including telephone numbers and addresses
iii. Schedule of Equipment including manufacturer's details.
iv. Operating Procedures including Start / Shut Down
v. Emergency Procedures
vi. Maintenance Schedules including Legionella checks and preventative measures
vii. BMS/ Controls Schedules
viii. Manufacturer's Literature.
ix. Test and Commissioning Records. Copies of final signed off documents required.
x. Complete set of As Fitted drawings.

2.4 DISCREPANCIES

In the event of discrepancies between the drawings and specification or any ambiguity in proposals, the matter is to be referred in writing to the engineer. No variation in the tender price shall be considered due to failure to remark such errors or incorrect interpretation of the tender documentation.

2.5 MANUFACTURERS

All Tenders MUST be based on equipment detailed on the drawings and specification. Should the utilisation of alternative equipment (of equal or greater quality and technical standards) be suggested by the Contractor, details shall be completed within the tender

return for consideration by the Contract Administrator. Alternative equipment shall not require additional work to that specified and must provide a saving or negligible cost difference. Note that submission of any alternatives does not constitute an agreement to use and shall be subject to approval which, if deemed inferior, shall be rejected in favour of the original specification. Any proposals for alternative manufacturers shall be provided with add/omit costs; the tender submitted shall be fully compliant and shall not contain alternative suppliers.

Where alternatives are proposed, the onus shall be firmly on the mechcontractor to provide sufficient information to the CA for consideration, including any technical literature, approval certificates, test reports, working samples, design calculations etc. as required. All information shall be submitted timeously to allow for sufficient time to assess all the relevant data.

The employer shall under no circumstances be liable to pay for any equipment other than specified unless prior written permission has been obtained from the Contract Administrator/Engineer. Should non-approved materials be installed, the engineer reserves the right to insist such items are removed and replaced as specified, with all costs borne solely by the Contractor.

2.6 SITE VISIT

A site visit shall be deemed to have been undertaken during the tender period to gain knowledge of the layout, accessibility, restrictions and conditions affecting labour, access arrangements, delivery and storage of materials etc., and allow for all staging, scaffolding, tools, storage and accommodation etc., required for the proper and safe execution of the Contract.

Any claims or abortive work arising from lack of knowledge of the above shall be disallowed.

Site visits shall be arranged via the CA.

2.7 CONSTRUCTION ISSUE DOCUMENTATION

Upon acceptance of a tender, the contractor shall be required to produce installation drawings and manufacturer's drawings for comment by the CA. These drawing shall be fully co-ordinated with the building and all other services by the contractor.

These drawings shall be updated at the contractors expense with variations and modifications as required from time to time during the contract to ensure that a set of fully co-ordinated all inclusive installation drawings are available for use on site at all times.

2.8 HEALTH AND SAFETY / CDM REQUIREMENTS

Ensure full compliance with all relevant Health and Safety legislation, provide all necessary documentation and information required by the Construction Design and Management Regulations 2007 and be fully aware of any statutory obligations. Prior to commencement on site, the contractor shall liaise with the Planning Supervisor to obtain full details of the Pre-Construction Health and Safety file.

2.9 SCHEDULE OF RATES

The contractor shall provide within 5 days of request by the CA a quantified and priced schedule of rates. The schedule of rates price shall align with the submitted tender value and this Quantified Schedule of Rates shall be used to price all variations on the project.

2.10 CO-ORDINATION

Tender drawings give indicative locations only and details of components are not to be inferred. The arrangements shown on the tender drawings are intended to indicate the layout to be generally adhered to, but the actual routes of services shall be such as to ensure the neatest possible arrangement and to suit the contractor's preferred installation requirements.

The Contractor shall co-ordinate all works on site and produced a complete set of fully co-ordinated, dimensioned, installation drawings which details the entire works, its setting out and its co-ordination with the building and other services.

Abortive work which arises as a direct result of lack of co-ordination shall not be accepted as an extra to the contract and all costs associated with this shall be borne by the contractor.

2.11 SITE SUPERVISION

The Contractor shall provide all necessary labour required to complete the works; all operatives shall be suitably qualified with appropriate recognised trade qualifications in terms of grade standards to facilitate the competent execution of each specific element of the Works.

A competent supervisor to oversee the works shall be appointed, and any instructions given to this role by the Contract Administrator are deemed to have been given to the Contractor. Supervision by the Employers Clerk of Works (or other party) shall not relieve the Contractor from this obligation.

SECTION 3 - SCOPE OF WORKS

3.01 GENERAL

The Performance Specification outlines the extent of the mechanical services requirements for the refurbishment of 1st, 2nd floors and tower floors of Holborn Police Station.

This Specification of Mechanical Requirements relates to the, supply, installation, testing and commissioning of all new mechanical services and associated controls required for the works.

The works shall comprise the whole of the labour and unless otherwise indicated, all materials necessary to form a complete installation, and such tests, adjustments and commissioning as are prescribed and as may otherwise be required to give a complete working installation. Works shall include, but not be restricted to, the design, supply, installation, commissioning and setting to work of the following:

- Above Ground Drainage Installation
- LPHW Heating Installation
- Chilled Water Cooling System
- Hot & Cold Water Services Installation
- Modifications to Gas System
- Mechanical Ventilation Installations
- BMS Automatic Controls and associated wiring Installation
- Thermal Insulation
- Testing, Balancing & Commissioning
- O & M Manuals
- Notification of all builders work requirements, to the main contractor

The following services comprise the minimum works (but not limited to):

- Provision of Working Drawings.
- Provision of Coordinated Installation Drawings.
- Coordination and liaison with the project team, main contractor, designers and other sub-contractors.
- Coordination of the mechanical services with all other services, building fabric and structure.
- Provision of builders work information relating to the Mechanical Services, including drawings.
- Operation and Maintenance Manuals for all Mechanical Services
- Record Drawings.
- Testing and Commissioning.
- Completed CIBSE TM31 Building Log Book

Documentation

The mechanical sub-contractor shall submit for approval/comment 3 copies of the following drawings showing compliance with the design & installation requirements:

- Dimensioned general arrangement plans of all floors, sections and elevations showing mechanical and electrical services layouts
- M&E Service layouts/reflected ceiling plans for all floors

- Ancillary Areas (Offices, Meeting, Reception, Toilets) room M&E layouts and internal sections
- Plant room M&E layouts and internal sections
- Fire strategy layouts

3.02 DESIGN CRITERIA

Design Parameters

The design of the mechanical engineering services installation has been based on the following criteria.

External Design Conditions: -

Summer External Ambient:	As existing design for plant.
Winter External Ambient:	As existing design for plant.

Internal Design Conditions: -

Open plan offices	Winter: 21^{o}C ± 2^{o}C Summer: 25^{o}C ± 2^{o}C
Open Breakout Space	Winter: 21^{o}C ± 2^{o}C Summer: 25^{o}C ± 2^{o}C
Kitchenette/Breakout	Winter: 21^{o}C ± 2^{o}C
Meeting Rooms	Winter: 21oC ± 2oC Summer: 25^{o}C ± 2^{o}C
Stairs	Winter: 18^{o}C ± 2^{o}C
Corridors	Winter: 18^{p}C ± 2^{o}C
Cleaner's Store	Winter: 16^{o}C ± 2^{o}C
WC's/Shower	Winter: 18^{o}C ± 2^{o}C

Noise Levels:

Open plan offices	NR38 (CIBSE)
Offices	NR38 (CIBSE)
Seminar Rooms	NR35 (CIBSE)
Training Rooms	NR35 (CIBSE)
WC	NR40 (CIBSE)
Stairs	NR40 (CIBSE)
Cleaner's Store	NR40 (CIBSE)
WC's/Shower	NR40 (CIBSE)

Ventilation Systems:-

Mechanical ventilation to be utilised ,for all enclosed rooms and deep plan areas.

Open plan offices	10 litre/s per person

Offices	10 litre/s per person
Seminar Rooms	10 litre/s per person
Training Rooms	10 litre/s per person
Stairs	10 litre/s per person
Corridors	10 litre/s per person
Cleaner's Store	6 air changes per hour
WC's/Shower	10 air changes per hour

Building Occupancy Levels:-

Open plan offices	Desk layouts as noted on architects layouts
Offices	Desk layouts as noted on architects layouts
Seminar Rooms	Desk layouts as noted on architects layouts
Training Rooms	Desk layouts as noted on architects layouts

Hot and Cold Water Systems:-

Cold Water usage: Base on BS EN 806 / BS 8558 loading units

Hot Water usage: Base on BS EN 806 / BS 8558 loading units
60°C distribution temperature and
43°C via thermostatic mixer at basins

3.03 COMPLIANCE WITH STANDARDS

Install the Mechanical Services Installation in compliance with but not limited to:

- Thames Water Plc, Workplace Design Standards
- British Standards and Codes of Practice.
- Design Guides and Technical Memoranda published by the Chartered Institution of Building Services Engineers
- Design Guides and Technical Memoranda published by the American Society of Heating Refrigeration & Air Conditioning Engineers
- BS.7671 (Regulations for Electrical Installations, 17th Edition published by the Institution of Electrical Engineers) – Current Edition and incorporating all amendments.
- The Electricity Supply Regulations 1988.
- Health and Safety at Works etc. Act
- Requirements of the Fire Officer and the Building Control Officer.
- Factories Acts
- The Asbestos Regulations
- The Fire Precautions Act
- The Control of Pollution Act
- Environmental Protection Act
- Health and Safety Executive Guidance Notes
- Electricity at Work Act 1983
- Licensing Authority
- Workplace (Health, Safety and Welfare) Regulations 1992.
- Guide to Fire Precautions in existing places of entertainment and like premises.
- Construction, Design and Management Regulations
- HEVAC Equipment Manufacturers Design/Operating/Installation Instructions

3.04 STRIP OUT WORKS

The mechanical sub-contractor shall remove all redundant services, generally as indicated on the scheme drawings. These shall include the following,

a) Existing gas boilers 2&3, including all local LTHW Heating, Gas and Oil pipework. It should be noted that Boiler N^{o} 1 is being replaced under a separate contract before commencement of these works and shall be kept in operation during the course of the works, and new isolating valves shall be fitted to facilitate this. The existing boilers are one piece steel boilers and due to limited access they will need to be dismantled/ cut up in situ, prior to removal.
b) Boiler Flues
c) Natural Gas Pipework
d) Oil pipework local to the boilers.
e) Redundant 1st and 2nd Floor Fan Coil Units and Radiators
f) LTHW Heating Pipework
g) Chilled Water Pipework
h) Condensate Pipework
i) Electric Water Heaters
j) Hot and Cold Water Pipework
k) Drainage Pipework.
l) Ventilation ductwork.
m) Redundant BMS System
n) Electrical installation.

The existing burners are dual fuel, primarily operating on natural gas with the facility to change over to oil fed, however the oil lines have been isolated and de-commissioned with the existing boilers now only operating on natural gas. The oil lines and tanks are to remain de-commissioned and natural gas only shall be the fuel source. The oil tanks and main pipework are to remain in situ, with only local oil pipework being removed.

The mechanical sub-contractor shall undertake a full and detailed survey to ascertain the least disruptive method of removal of all equipment, and shall submit a detailed Method Statement clearly indicating the methods and programme for removal.

The mechanical sub-contractor shall remove all redundant equipment to be disposed of within skips at ground floor level. The skips are to be provided by the main contractor, who will meet all costs associated with their removal from site. If the equipment is too large to be placed in skips, e.g. boilers, the mechanical sub-contractor shall allow the costs for direct removal from site including disposal costs levied by the local authority.

3.05 LPHW HEATING SYSTEM

3.05.1 General

This section of the works shall consist of the supply, installation and commissioning of the following,

- New boilers 2&3 within the basement plant room, as direct replacement of the existing, which have failed and need replacing.
- 1st and 2nd existing fan coil systems shall be modified/ replaced as required, to suit new meeting room layouts.
- 12th floor, existing radiators shall be reconfigured and added to, as required, to suit the new and reconfigured meeting room layouts.
- 10th floor, existing radiators shall be reconfigured as required to suit the new and reconfigured floor plans.

The details of the above are indicated on the tender drawings.

3.05.2 LTHW Heating Boilers

The mechanical sub-contractor shall allow to supply, install and commission 2 No. new floor standing new high efficiency gas fired boilers (N°'s 2&3). The boilers shall be of sectional type to ensure they can be accessed into the basement plant room.

The replacement of Boiler N°1 with associated remedial works is to be carried out under a separate contract by others, before this contract commences. For ease of maintenance the new boilers shall be of the same type supplied by the same manufacturer as Boiler N°1.

The outputs from the boilers shall be as follows,

Boiler N°2 620kw
Boiler N°3 150kw

The boilers shall be selected to meet the above outputs based on the following parameters,

System Flow temperature	90°C
System Return Temperature	70°C
System Operating Static Pressure	5.5 Bar

Each boiler shall be fitted with a gas 'pressure jet' burner, suitable for an inlet pressure of 20mBar. Each burner shall be of 2 stage type as manufactured by 'Riello' or equal and approved

The boilers shall be fitted with the following fittings and mountings

- Safety Valve with discharge to low level.
- Thermometer
- Drain Valve
- Isolating Valves

The boiler installation shall be configured to suit the schematic provided and the manufacturer's installation instructions and shall fully comply with the requirements of BS6644:2011.

Boiler headers will remain the same with local flow and return connections renewed together, with new isolation valves and commissioning sets.

The boilers shall be complete with all BMS facility to allow the boilers to connect to the on-site BMS system.
Prior to commencement of the works, the mechanical sub-contractor shall check the working condition and flow rates l/s of the primary heating pumps to make sure the flow rates are to the boiler manufacturer's recommendation. If these are not in accordance with their requirements it shall be highlighted to the contract administrator/ main contractor, to enable a solution to be agreed.

3.05.3 Boiler Flues

The boiler flues are to be removed and new seals installed and replaced, as necessary. The tenderer shall employ a specialist flue installer to carry out these works and in addition shall check the condition of the existing brick chimney.

A provisional sum is allowed for cleaning, if necessary.

3.05.4 Boiler Room Ventilation

It is assumed the existing boiler house combustion air ventilation will be re-installed to low level, to meet current regulations, as part of the No. 1 boiler replacement, by others.

The boilers shall be configured to suit the schematic provided and the manufacturer's installation instructions.

Provision shall be made for alterations to the existing Combustion air to the boiler house.

3.05.5 Thermometers

Temperature gauges shall be provided to all main flow and return circuit mains and also on the main primary flow and return to the boilers, as indicated on the tender drawings.

3.05.6 Pressure Gauges

Pressure gauges shall be provided either side of all pumps, as indicated on the tender drawings.

3.05.7 Radiators

New pressed steel panel radiators shall be provided in the positions as indicated on the tender drawings. All radiators shall be fixed to the building fabric on proprietary brackets. Each radiator shall be fitted with a thermostatic control valve on the flow connection, lockshield valve on the return connection and a manual air vent.

Radiator valves shall be Drayton 1/2" Angle TRV4 Code ref 07 05 153/156 and associated Drayton 15mm Angle lockshield with white cap 07 05 900 or equal and approved.

The radiators within the disabled areas are to be of LST pattern, fitted with a suitable casing to limit the surface temperature to 43^{o}C. The LST radiators shall be fitted with a

thermostatic radiator valve, with an adjustable head protruding from the casing, on the flow connection, lockshield valve on the return and manual air vent.

3.05.8 Pipework & Fittings

Pipework and fittings shall be as detailed within the separate materials and workmanship specification.

3.05.9 Valves

Valves shall be installed in the positions to allow the correct isolation and regulation of the system, measuring stations to be fitted to allow commissioning water flow rates to be confirmed. Valves shall be as detailed within the separate materials and workmanship specification..

3.05.10 Air Vents and Drains

Air Vents shall be provided at all high points and drains at all low points as detailed within the separate materials and workmanship specification.

3.05.11 Test Points

Binder type test points shall be provided on final fan coil unit flow/return connections, as detailed within the separate materials and workmanship specification.

3.05.12 Pressure Testing

Pipework shall be subjected to a pressure test as detailed within the separate materials and workmanship specification. Isolate the existing system when pressure testing the new sections of pipework installation.

3.05.13 Labelling

Identification and labelling shall be as detailed with the separate materials and workmanship specification.

3.05.14 Pipework Supports

Pipework (and particularly valves) shall be adequately supported as detailed in the separate materials and workmanship specification.

3.05.15 Sleeves

Sleeves shall be provided as detailed in the separate materials and workmanship specification.

3.05.16 Painting

Painting shall be undertaken as detailed within the separate materials and workmanship specification.

3.05.17 Flushing Out and Cleaning Systems

Flushing Out and Cleaning Systems shall be undertaken as detailed within the separate materials and workmanship specification.

3.05.18 Flexible Connections

Flexible couplings shall be provided on both suction and delivery connections to pumps and on final connections to door heaters and shall be stainless steel. Flexible couplings shall be suitable for the pressure and temperature operating conditions of the system.

3.05.19 Water Treatment and Chemical Dosing Pot

A pre- validation check is to be carried out by a specialist water treatment company to remove water samples of the Heating system and check for levels of water treatment and levels of possible corrosion.

Allow flushing both locally and to the possibly to the entire Heating system (provisional sum), as this is sometimes a major contributing factor to boiler tube pitting or fracturing being experienced on the existing boilers.

The LPHW heating system shall have a corrosion inhibitor added to the system to suit the boiler manufacturer's recommendations as detailed within the separate materials and workmanship specification.

Water treatment shall be supplied by Fernox Manufacturing Company Ltd, or Sentinel Grace Dearborn Ltd. The dilution of the water treatment inhibitor shall be in accordance with the chemical supplier's recommendations.

A new chemical dosing pot is to be provided to allow the addition of the chemical treatment to the system as detailed in the separate materials and workmanship specification.

3.05.20 Insulation

All distribution pipework apart from final low level connections to radiators is to be thermally insulated to BS 5422. All insulation shall be either bore coated phenolic or elastomeric nitrile materials. Fibrous insulation such as fibreglass or rock wool is not acceptable except where required for fire safety reasons and on valves

All heating pipework shall be insulated and pipework within plant rooms, external or exposed to view at high level shall have white PIB finish applied.

All insulation to be as detailed in the separate materials and workmanship specification.

3.06 COMFORT COOLING

3.06.1 General

This section of the works shall consist of the supply, installation and commissioning of the following,

- New Fan Coil Units to new 1st and 2nd floor Meeting Rooms, including chilled water and condensate pipework..
- DX Cooling to new AHU Cooling Coils.

All of the above are indicated on the tender drawings.

3.06.2 1st and 2nd Floor Meeting Rooms

New 4 pipe fan coil units including chilled water pipework shall be installed at 1st and 2nd floor levels to suit the new Meeting Room layouts, as indicated on the tender drawings.

Each fan coil unit shall be of the vertical chassis type to be mounted in a builder's perimeter enclosure, except for units 2/14 and 2/15 which shall be cased models. Each fan coil unit shall be complete with a fan, heating and cooling coils and a condensate drain pan.

The drain pan from each unit shall have a fall to the outlet and shall be connected to a common gravity condensate drainage system.

The fan coil units shall be selected to meet the heating and cooling capacities indicated on the tender drawings, based on the following LTHW Heating and Chilled Water temperatures.

LTHW Heating	90°C(F)/70°C(R)
Chilled Water	6°C(F)/12°C(R)

The fan coil units shall be capable of operating at a maximum static pressure of 5.5Barg.

Each fan coil unit shall be provided with a 4 port temperature control valve, as described in Section 3.10.

3.06.3 Condensate Pipework

A gravity condensate pipework system shall be provided, to run at low level within the perimeter builders work casing. This shall be connected to the existing system. All pipework shall be rum in UPVC or equivalent to match the existing, and shall maintain a minimum continuous fall of 1:100. The condensate drainage system shall connect into the building foul drainage system through a 'waterless' trap.

3.06.4 Cooling to new fresh air handling plant

DX cooling condensers and associated fridge lines and controls shall be provided to the new fresh air handling plant serving the 1st and 2nd floor areas. These shall be sited

adjacent AHU's 1 & 2 on the 1st and 2nd Floor external roofs, as indicated on the tender drawings.

Each condensing unit shall be provided with capacity control in compliance with the manufacturer's recommendations, to achieve the most accurate method of control.

Each outdoor unit shall be mounted on 'Roof Pro' or equivalent proprietary supports.

3.06.5 Pipework & Fittings

Pipework and fittings shall be as detailed within the separate materials and workmanship specification.

3.06.6 Valves

Valves shall be installed in the positions to allow the correct isolation and regulation of the system, measuring stations to be fitted to allow commissioning water flow rates to be confirmed. Valves shall be as detailed within the separate materials and workmanship specification..

3.06.7 Air Vents and Drains

Air Vents shall be provided at all high points and drains at all low points as detailed within the separate materials and workmanship specification..

3.06.8 Test Points

Binder type test points shall be provided on final fan coil unit flow/return connections, as detailed within the separate materials and workmanship specification..

3.06.9 Pressure Testing

Pipework shall be subjected to a pressure test as detailed within the separate materials and workmanship specification. Isolate the existing system when pressure testing the new sections of pipework installation.

3.06.10 Labelling

Identification and labelling shall be as detailed with the separate materials and workmanship specification.

3.06.11 Pipework Supports

Pipework (and particularly valves) shall be adequately supported as detailed in the separate materials and workmanship specification.

All chilled water pipework supports shall include a timber or phenolic insert to maintain continuous thermal insulation. The inserts shall be of the same thickness as the thermal insulation and shall be wrapped and sealed to maintain a continuous vapour barrier with the insulation, to prevent the possibility of condensation within the insulation.

3.06.12 Sleeves

Sleeves shall be provided as detailed in the separate materials and workmanship specification. All sleeves on chilled water pipework shall be oversized to allow thermal insulation to be applied to the pipework passing through the sleeve.

3.06.13 Painting

Painting shall be undertaken as detailed within the separate materials and workmanship specification.

3.06.14 Flushing Out and Cleaning Systems

Flushing Out and Cleaning Systems shall be undertaken as detailed within the separate materials and workmanship specification.

3.06.15 Flexible Connections

Flexible couplings shall be provided on both suction and delivery connections to pumps and on final connections to door heaters and shall be stainless steel. Flexible couplings shall be suitable for the pressure and temperature operating conditions of the system.

3.06.16 Insulation

All chilled water pipework shall be insulated and pipework within plant rooms, external or exposed to view at high level shall have white PIB finish applied, all as detailed in the separate materials and workmanship specification. All chilled water pipework insulation shall have joints sealed, including through brackets and sleeves to maintain a continuous vapour barrier.

The mechanical sub-contractor shall provide thermal insulation to the existing roof condenser water pipework at 13th floor roof level.

All insulation to be as detailed in the separate materials and workmanship specification.

3.07 HOT & COLD WATER SERVICES INSTALLATION

3.07.1 General

This section of the works shall consist of the supply, installation and commissioning of domestic hot and cold water services installation. The installation shall be as detailed within this specification and shall be complete in all respects.

The hot and cold water services installation shall generally consist of the following:

- New hot and Cold Water Services to the new 2nd floor WC areas.
- Replacement of hot and cold water services to serve refurbished ‘Brew Areas’.

The whole of the water services system will be comply with all the requirements of the Water Supply (Water Fittings) Regulations 1999, BS EN 806, BS 8558 and BS6700 and CIBSE.

Allow for all necessary new hot and cold water connections to Sanitaryware in new toilets at 2nd floor and to kitchenette equipment at all levels, as indicated on tender drawings.

3.07.2 2nd Floor Toilets

The existing pipework serving the two existing toilets at 2nd floor level shall be stripped back to the risers and new distribution pipework, suitably sized to serve the new toilet block at 2nd floor level, is to be piped new from the existing risers.

3.07.3 Refurbishment of Existing 'Brew Areas'

All hot and cold water supplies serving existing brew areas shall be disconnected and stripped back. Existing wall mounted boiler units shall be removed and diposed of. New hot and cold water supplies shall be provided from existing pipework to serve all appliances within refurbished brew areas.

All new and existing brew areas shall have a new Hydroboil hot and chilled water tap supplied and installed as indicated on the tender drawings.

These shall be Zip Hydrotap Compact2 BC120/60+ which delivers 120 cups of filtered boiling water per hour and 60 glasses of filtered chilled water per hour, and has a satin chrome finish - or equal and approved.

3.07.02 Pipework

Pipework and fittings shall be as detailed within the separate materials and workmanship specification.

Where pipework is exposed within toilet areas it will have chrome plated finish with matching fittings and brackets.

3.06.03 Valves

Valves shall be installed to allow the correct isolation and regulation of the system. Valves shall be as detailed within the separate materials and workmanship specification.

All domestic hot and cold water outlets shall include a ball-o- fix service valve.
In addition to the above items, include all necessary double check valves, non-return valves and Reduced Pressure Zone (RPZ) valves, which may be required to comply with water bylaws.

3.06.04 Air Vents and Drains

Air Vents shall be provided at all high points and drains at all low points as detailed within the separate materials and workmanship specification.

3.06.05 Pressure Testing

Pipework shall be subjected to a pressure test as detailed within the separate materials and workmanship specification.

3.06.06 Labelling

Identification and labelling shall be as detailed within the separate materials and workmanship specification.

3.06.07 Pipework Supports

Pipework shall be adequately supported as detailed in the separate materials and workmanship specification.

All cold water pipework supports shall include a timber or phenolic insert to maintain continuous thermal insulation. The inserts shall be of the same thickness as the thermal insulation and shall be wrapped and sealed to maintain a continuous vapour barrier with the insulation, to prevent the possibility of condensation within the insulation.

3.06.08 Sleeves

Sleeves shall be provided at penetration of all walls and floors. All sleeves on cold water pipework shall be oversized to allow thermal insulation to be applied to the pipework passing through the sleeve.

3.06.09 Flushing Out and Chlorination

Flushing Out and Chlorination shall be undertaken in accordance with BS 6700.

The mechanical sub-contractor shall employ the services of a specialist water treatment company to chlorinate the domestic hot and cold water services systems and to this end, the mechanical sub-contractor shall include for the installation of chlorination points. The pipework shall be flushed out prior to being sterilised in strict accordance with BS6700.

Chlorination points shall be installed within the water pipework distribution system to enable this exercise to be completed.

The mechanical services sub-contractor shall allow for taking two sets of water samples, one set immediately after sterilisation and one set immediately prior to handover. Copies of test certificates shall be included within the O & M Manuals.

3.06.10 Point of Termination

Each item of sanitaryware shall be provided with hot and cold water services as appropriate, but with the minimum sizes as detailed below:

Sinks and Wash Hand Basins	-	Hot and Cold (15mm diameter)
W.C's	-	Cold (15mm diameter)
Showers	-	Hot & Cold (15mm diameter)

The final connections to all sanitaryware shall be carried by the mechanical sub-contractor.

All exposed pipework to be installed using chrome plated copper.

3.06.11 Flow Restrictors

All connections to wash hand basins, showers and sinks shall be complete with flow regulation devices (water/energy saving).

The flow regulation devices are to be supplied pre-set to discharge recommended maximum (litres/minute) flow rates, as manufactured by Robert Pearson and Company, Tel: 01985 850954 or equal/approved.

3.06.12 HWS Blending Valves (Except Cleaner's sink)

Supply and install hot water blending valves to restrict water outlet temperatures to 43^{o}C in toilet areas (hand wash basins, showers). Blending valves shall be thermostatic controlled and factory set. Hot water blending valves shall always fail safe and comply with TM3 specification. The hot water blending valves shall be complete with integral check valves and strainers. Mixing valves to be supplied with a chrome finish.

Hot water to cleaner's sink and brew area sinks shall be at 60oC.

The contractor shall supply and install Horne 15 type as manufactured by The Horne Engineering Co Ltd, Tel: 01505 321455 or equal/approved.

3.06.13 Urinal & WC Flush Unit

Automatic mains operated urinal flushing control device shall be installed in on the cold water supply to the urinal cistern within the new 2nd floor male toilet. The device shall consist of a solenoid valve installed in the cold water pipework, which shall be controlled via a demand activated passive infra-red detector with variable delay period. The detector shall be a recessed unit on the suspended ceiling. The mechanical services sub-contractor shall supply and install all interconnecting wiring between the PIR detector and solenoid valve.

The urinal flush unit shall be as manufactured by Robert Pearson and Company, Tel: 01985 850954, or equal/approved.

3.07.14 Thermal Insulation

All pipework within voids will be thermally insulated to BS 5422. All cold water pipework insulation shall have joints sealed, including through brackets and sleeves to maintain a continuous vapour barrier.

All insulation to be as detailed in the separate materials and workmanship specification.

3.07.15 Log Book

The Mechanical contractor shall allow for provision of risk assessment, schematic and log book. Liaise with the clients Water Manager and agree who will be employed to deliver this requirement.

3.08 ABOVE GROUND DRAINAGE INSTALLATION

This section of the works shall consist of the supply, installation and commissioning of the above ground drainage installations to serve all outlets within the proposed office.

The mechanical services contractor shall supply, install, test and commission new above ground drainage for.

- New 2nd floor WC's.
- 1st floor, 3rd floor and all existing new or refurbished tower floor kitchenettes (brew areas). Waste from one of the new kitchenettes at 1st floor level shall be pumped to avoid dropping into the Ground floor areas, which shall be occupied throughout the duration.

The scope of works associated with this service shall comprise the following:-

- Connect to existing building drainage system (Cast Iron/PVC) as appropriate. Existing riser stacks are Cast Iron.
- Supply and install all rising soil and vent pipework systems to all areas.
- Provide all necessary vent pipes to atmosphere and stub stacks with proprietary air admittance valves in accordance with the building regulations and structural engineer's advice.
- All final trapped connections to sanitaryware/appliances shall be included

A suitable drainage system shall be supplied to adequately drain from all positions, with the drainage being free-flowing and disposal of waste water being quick and effective. The drainage system shall be vented to atmosphere at high level as appropriate.

Foul drainage from the toilets and staff areas, condensate drains from air conditioning units shall be connected to stack systems or directly into the below slab network.

Above Ground Drainage

A system of UPVC above ground drainage shall be provided in accordance with BS EN 12056.

The following connections shall be made to the various items of sanitaryware & equipment: -

Wash Hand Basin	-	32mm dia	c/w (75mm seal) bottle trap.
WC	-	100mm dia	c/w (50mm seal) P trap.
Shower	-	40mm dia	c/w (75mm seal) running trap.
Sink	-	40mm dia	c/w (75mm seal) S trap.
Washing Machine	-	40mm dia	c/w upright stand pipe

Dishwasher Machine - 40mm dia c/w upright standpipe.

Vertical stacks shall be provided, where required, within the building to accept new branch connections.

The drainage system shall incorporate a fire collar at crossing of a fire compartment.

Where it is necessary to provide horizontal offsets in the drainage, these must be provided in the drainage stacks. At each offset, a 50mm dia secondary ventilating pipe shall be provided.

The ventilating pipe shall also be fire stopped at each floor level and each apartment compartment.

Automatic air vents and access points shall be provided where excessively long branch connections are made and where changes in direction occur.

All offsets in the stack shall incorporate two 45deg bends to achieve a long radius bend equivalent. Access points shall be incorporated into the above ground drainage system at each floor level and on offset bends in the ceiling voids at each level.

3.09 SANITARYWARE

This section of the works shall consist of the installation of “Free issue” sanitaryware and commissioning of the sanitaryware installations in all refurbished areas. The fittings shall be supplied by the man contractor as detailed on the sanitaryware schedule issued by the Architect, schedule N13, and as shown on tender drawings and shall be complete in all respects.

3.10 GAS INSTALLATION

3.10.1 General

The works covered by this section includes for the connection of the new boilers to the existing gas header and provision of a new gas safety system.

3.10.2 Connection of new Boilers

The existing gas header is located at the rear of the boilers, and the mechanical sub-contractor shall connect to the header to supply the new boilers 2&3, as indicated on the drawings.

3.10.3 New Gas Safety System

A new gas safety system shall be provided for the boiler installation. A new 125mm solenoid valve shall be fitted in the existing gas supply pipework in the boiler room, in the position indicated on the drawings.

The valve will be activated by the following:-

- Heat detectors/ thermal fusible links located above each boiler (3 No)

- Knock-off button fitted adjacent to each exit door from the boiler room.
- Fire Alarm system.

The system shall be controlled through the BMS system.

The mechanical sub-contractor shall allow to shut the existing gas supply to allow the contents to purged prior to the commencement of the works.
After the installation, the main is to be purged with nitrogen, prior to the systems being reactivated.

3.10.4 Pipework & Fittings

Pipework and fittings shall be as detailed within the separate materials and workmanship specification.

3.10.5 Valves

Valves shall be installed in the positions to allow the correct isolation and regulation of the system, measuring stations to be fitted to allow commissioning water flow rates to be confirmed. Valves shall be as detailed within the separate materials and workmanship specification..

3.10.6 Pressure Testing

Pipework shall be subjected to a pressure test as detailed within the separate materials and workmanship specification. Isolate the existing system when pressure testing the new sections of pipework installation.

3.10.8 Labelling

Identification and labelling shall be as detailed with the separate materials and workmanship specification.

3.10.9 Pipework Supports

Pipework (and particularly valves) shall be adequately supported as detailed in the separate materials and workmanship specification.

3.10.10 Painting

Painting shall be undertaken as detailed within the separate materials and workmanship specification.

3.10.11 Compliances

All of the installation shall fully comply with the requirements of the Institute of Gas Engineers with all operatives being qualified to the required standard set out by Gas Safe.

3.11 MECHANICAL VENTILATION INSTALLATION

3.11.1 General

This section of the works shall consist of the supply, installation and commissioning of mechanical supply and extract ventilation systems.

The installation shall comprise of ductwork, fittings, attenuators, grilles etc. The installation shall be as detailed within this specification and as indicated on tender drawings and shall be complete in all respects.

Reference shall be made to the Y19 of this Performance Specification.

3.11.2 General Ventilation Systems

The Mechanical Services Contractor shall allow for the supply, installation and commissioning of a mechanical supply and extract ventilation systems ensuring that the ventilation installations provided shall satisfy all the requirements of the design criteria above, current CIBSE guides, building regulations and building controls requirements.

Allowance shall be made for all installations necessary to comply with these requirements and any other statutory requirements.

The Mechanical Services Contractor shall ensure that the overall noise level of the plant and equipment is not transmitted to the building either by airborne sound or by vibration through the structure or distribution system. Similarly intake and exhaust grilles and diffusers shall not cause nuisance and noise break out to the adjacent environment.

All penetrations including sizes shall be advised by the Mechanical Services Contractor to the architect/main contractor for inclusion within the external elevation drawings and any other construction drawing necessary.

The Mechanical Services Contractor shall ensure adequate maintenance can be achieved to the fans and systems. All necessary fire dampers, back draft dampers, connections to air bricks/louvres, couplers, brackets, flexible connections etc shall be included to provide a complete and functional system.

The Mechanical Services Contractor shall supply as free issue fan controls to the Electrical Services Contractor who shall install all wiring and power supplies as per the 17th Edition wiring regulations and manufacturer's instructions.

All duct work and extract ventilation shall be installed to comply with HVAC DW144.

3.11.3 1st and 2nd Floor Fresh air Ventilation

Supply and extract ventilation (as required to meet increased occupancy levels) is to be provided to the new 1st and 2nd floor refurbished areas by a mixture of existing services and new packaged heat recovery air handling units located on the external roof areas, as indicated on the tender drawings. The new units shall be controlled via the BMS.

The tendering party shall allow for a heat recovery unit that includes either a thermal wheel or heat exchanger system with a minimum efficiency of 70%. Suitable units shall be selected for the application based on the following duties:

AHU 1: Supply – 1.48 m³/s @ 550Pa
Extract – 1.51 m³/s @ 550Pa

AHU 2: Supply – 0.12 m³/s @ 150Pa
Extract – 0.12 m³/s @ 150Pa

The total combined specific fan power for the heat recovery units (the total of both the supply and extract fans) shall not exceed 2.0 W/l/s.

The units shall be come c/w supply and extract filters, automatic summer bypass, integral minimum and maximum infinitely variable speed controls, run on timer and facia mounted failure indication. The unit shall have low energy, high efficiency a.c. fan/motor assemblies with sealed for life bearings.

Each AHU shall be complete with an electric heater battery which shall raise the temperature of the supply air to the designated set point after the air has passed through the heat recovery section. The heater shall be factory fitted and pre-wired to an integral closed loop thyristor control. When the unit is switched off, the fan shall continue to run to dissipate heat from the electric heater battery before stopping.

The system shall have frost protection which shall, at temperatures below 4 degrees C, operate the heater battery and only start the fan when the temperature at the filter has risen above the designated set point.

DX cooling shall be included on each AHU to temper supply air during the summer months. Condensers and associated fridge lines and controls shall be provided to the new fresh air handling plant serving the 1st and 2nd floor areas. These shall be sited adjacent AHU's 1 & 2 on the 1st and 2nd Floor external roofs, as indicated on the tender drawings.

Each condensing unit shall be provided with capacity control in compliance with the manufacturer's recommendations, to achieve the most accurate method of control.

Attenuation is to be provided integral to the units in order to ensure noise levels outlined in this specification are achieved. Where necessary, inline duct attenuators will be provided.

At second floor level, ductwork shall be routed across the flat roof and shall be supported utilising big foot bracketary and supports. Duct branches shall drop through holes made within the slab and connect onto ceiling diffusers complete with top connection boxes and volume control dampers.

At first floor level, ductwork shall be exposed at high level within the offices spaces to high level diffusers via branches off the main ducts or grilles located in the side of the ductwork – see tender drawings. At the south end of the office, ductwork shall be installed tight to the slab and above the existing lighting trunking. Ductwork shall off-set down where necessary in order to avoid high level steelwork.

Generally all ductwork (supply and extract) at 1st floor level shall be exposed at high level within internal office spaces and shall be insulated and provided with a white PIB finish.

All ductwork routed externally shall be insulated throughout and shall be adequately weatherproofed utilising PIB sheeting.

All internal exposed ductwork, grilles and diffusers are to be powder coated in a colour to be determined and approved by the Architect and Contract Administrator.

All external plant and equipment shall be mounted using big foot bracketary and supports.

3.11.4 Tower Floor Ventilation

Existing ventilation systems within the tower floors at levels 3, 4, 5, 6, 7, 8, 9, 10 and 11 shall remain as existing. These units (two per floor) are capable of providing the required increased fresh air loads, as they are sized for provision of cooling via the ducted systems.

In order to facilitate the existing central extract system, louvre face ceiling diffusers shall be provided throughout within the suspended ceilings as indicated on the tender drawings.

At 12th floor, this level is to be partitioned into meeting rooms, and some minor duct modifications are required to suit.

3.11.5 Extract Ventilation

The Mechanical Services Contractor shall allow for the supply, installation and commissioning of extract ventilation systems within the following spaces:

- 2nd floor new WC's – New roof mounted twin extract fan fully ducted to grilles within the ceiling voids. Door transfer grilles to be provided within doors to male, female and accessible WC's for make-up air.

  The fan shall be complete with integral controller and, as a minimum, shall have the following functions: auto change over on fan failure, auto duty share every 12 hours of run time, integral frequency inverter / speed controller, integral adjustable run-on timer, volt free run and failure /status indication.

- Kitchenettes – Existing in the tower shall have new extract grilles located within the ceiling voids directly over to facilitate the existing central extract system.

- Freezer room 4th floor – duct from main M&E riser to be provided complete with bellmouth entry, volume control damper and fire damper. Extract to be via eggcrate grille within suspended ceiling and door transfer grille for make-up air.

3.11.6 Central Extract Investigation

The existing extract system for the tower block utilises the main M&E riser as a stack effect zone, with a single large extract fan located at level 13 roof ducted to the brick raiser at the top.

There is speculation with regard to the effectiveness of this system. The contractor shall employ a commissioning / air balancing specialist to measure the extract flow rates achieved on each tower block floor. The results shall be compiled within a report and submitted to the design team for review. This exercise shall be carried out prior to the commencement of any works.

3.11.7 Repair of Existing Duct Insulation

The contractor shall allow for repair of the insulation on existing ductwork routed across the second floor flat roof. If necessary, the existing insulation shall be removed and replaced in its entirety to ensure that all ductwork is covered from the AHU outlet until the point in which the ductwork penetrates the roof.

3.11.8 Ductwork

All ductwork shall be manufactured and installed in accordance with HVCA DW/144 Specification and the separate materials and workmanship specification.

All 90° rectangular / square shall be complete with turning veins in order to limit system resistance.

3.11.9 Ductwork Classification

Ductwork shall be classed as Low Pressure Class A in accordance with HVCA DW 144 Specification.

3.11.10 Flexible Ductwork

Flexible ductwork shall be installed as indicated on the drawings and shall be as detailed in the separate materials and workmanship specification..

Flexible ductwork shall be installed on the connections to all grilles and diffusers and shall be kept to a minimum.

3.11.11 Hangers & Supports

Hangers and Supports shall be in accordance with HVCA DW 144 Specification.

All ductwork shall be adequately supported from the building structure. No ductwork or grilles shall take any support from the suspended ceiling.

3.11.12 Access Openings

Access panels shall be provided within the ductwork system to facilitate inspection, cleaning and access to all items of equipment.

Access openings shall be provided in accordance with HVCA DW 144 Specification.

3.11.13 Test Holes

Test holes shall be provided in accordance with HVCA DW 144 Specification.

3.11.14 Fire Dampers

Fire dampers shall be installed within the ductwork systems wherever ducts pass through fire barriers. Access panels shall be provided either side. Fire dampers shall be as existing installed and in accordance with HVCA DW 144 Specification and the separate materials and workmanship specification.

All too fully comply with the requirements of the Building Regulations and fire compartments within the Building.

3.11.15 Identification of Ductwork

Identification and labelling shall be as detailed in the separate materials and workmanship specification and in accordance with HVCA DW 144 Specification.

3.11.16 Air Leakage Testing

Air leakage testing shall be as detailed in the separate materials and workmanship specification and in accordance with HVCA DW 144 Specification.

3.11.17 Acoustic Attenuators

Duct mounted attenuators shall be supplied and installed on the inlet and discharge of all fans and air handling units to meet the Design Criteria internal/external noise levels.

3.11.18 Grilles, Diffusers and Louvres

In all the refurbished areas, louvre face diffusers incorporating opposed blade dampers and plenum boxes shall be supplied and installed within the ceiling zone to provide a good distribution of fresh supply and room extract air. The diffusers shall be finished to a stove enamel colour to be agreed with the Contract Administrator.

Grilles and Diffusers shall be as manufactured by Gilberts, Senior Moducel, GDL Ltd, equal/approved.

3.11.19 Volume Control Dampers

Volume control dampers (VCD) shall be installed within the ductwork system as indicated to aid the correct regulation and air balancing of the systems. Volume control dampers shall be as detailed in the separate materials and workmanship specification and in accordance with HVCA DW 144 Specification.

3.12 BMS AUTOMATIC CONTROLS INSTALLATION

3.12.1 General

This section of the works shall comprise the supply and commissioning of the automatic controls system. The installation shall be complete in all respects. Reference shall be made to Y Ref's of this Performance Specification.

3.12.2 BMS System Overview.

The Mechanical Services Contractor shall allow for the supply and installation and commissioning of a comprehensive Building Management System, to control and monitor the engineering services systems:

a) New Boiler Plant
b) New Supply and extract ventilation at 1st and 2nd floor levels via new packaged AHU.
c) New heating and cooling fan coil units at 1st and 2nd floor to suit new space planning layouts.
d) New toilet extract system at 2nd floor level.
e) Provide new gas safety system
f) Upgrade existing BMS controllers to all floor levels to meet current Trend availability.

3.12.3 Site Survey

Prior to undertaking any works, the BMS specialist shall carry out a detailed survey to establish the current condition of the existing BMS installation and its suitability to interface with current Trend products. If it is deemed that the system is not compatible with current technology, all of the existing outstations/ controllers shall be replaced.

3.12.4 Scope of Works

The following works shall be included;

a) New Boiler Plant

The control system serving the existing boilers shall be modified to suit the new replacement boilers. The new boilers shall be provided with an integral control panel. The BMS shall be compatible with the control panel, and shall monitor all alarm functions and shall provide an optimised start and fixed time stop signal.

The boilers shall be not be energised until the water flow in the primary flow loop has been proved. If this requires additional flow switches these shall be provided and fitted into the common flow loop circuit.

New common flow temperature sensors shall be provided as indicated on the tender drawings.

b) New Supply and Extract Ventilation

A new packaged air handling unit is to be provided on the 2nd floor roof, to provide additional fresh air to the 1st and 2nd floor office spaces. The unit shall be complete with an on board control panel fully wired to control the timing, temperature, frost protection and air flow requirements of the unit. The control panel shall be complete with Trend controller and shall be linked to the site BMS control system.

c) New Fan Coil Units

New BMS outstation shall be provided for each new fan coil unit or group of fan coil units located in a single room, deemed feasible by the BMS specialist.

The majority of the new fan coil units are to be located in Meeting Rooms, which will have intermittent occupation. To realise an energy saving, the fan coil units shall be switched off when the rooms are not in occupation. Each room shall have a PIR occupancy detector to establish whether the room is in use or not.

To prevent the internal temperatures falling outside acceptable limits, if the internal temperature drops below 18^{o}C or rises above 25^{o}C, the fan coils shall be re-energised until these temperatures are achieved.

All fan coil units are fitted with LTHW Heating and Chilled Water cooling coils.

Four port modulating control valves shall be provided, selected to meet the required water flow rate with a maximum valve authority of 0.5.

A room mounted temperature sensor shall be fitted within the individual rooms.

The controller shall also be capable of automatic adjustment of fan speed and this shall be set up at medium speed.

d) New Toilet Extract System

A new twin fan toilet extract unit shall be provided on the 2nd floor roof serving the new toilets at 2nd floor level. This shall be linked to the site BMS system via a new control panel (position to be confirmed).
The panel shall control the timing and auto switch over of the fans in the event of failure. Fault lights and alarms shall indicate if any fans fail.

e) New Gas Safety System

A new gas safety system shall be provided, as indicated in Section 3.10.3

The system shall comprise a new 125mm gas solenoid valve to be closed in the event of a fire being sensed in the boiler room by dedicated heat detectors located above each of the boilers and emergency knock off buttons fitted adjacent to the exit doors.

The valve shall also close in the event of activation of the building fire alarm system.

f) Replacement of Existing Controllers

If deemed to be obsolete, all controllers shall be replaced. These shall include all existing fan coil units and central heating, chilled water and ventilation plant.

The suitability of the existing connected detectors, valves, damper motors or other connected control devices shall be determined. If these are found to not be compatible with the new controllers, this shall be highlighted to the main contractor/ contract administrator for further instruction.

3.12.5 Principal features

The principal features of this system shall be as follows:

- Energy efficient site operation
- Temperature control
- Time control
- Monitoring
- Adjustment
- Energy Metering (Part L2B)
- Fire Alarm Link
- Common Fault Alarms

All the engineering systems shall be replicated upon the graphical head-end provided with full colour animated graphics for the plant and systems. These shall display the operation of the plant and environmental conditions and may be accessed via an approved operator.

All systems shall continue to operate independently of each other with override facilities via the PC head end.

3.12.6 Responsibilities

A Trend Building Management System (BMS) shall be supplied, configured and commissioned directly by a Trend controls House.

The original installation was undertaken by the following company,

Ashdown Integrated Systems Limited, Castle Court, 41 London Road, Reigate, RH2 9RJ. T- (0)1737 735044

It is essential that there is a minimum of disruption to the existing installation during the works and therefore it is recommended that the mechanical sub-contractor approaches this company to provide a cost for the BMS installation, due to their familiarity with the existing system

The BMS Specialist shall be responsible for the following,

- The complete supply, configuration, documentation and commissioning of the BMS including all hardware, software and supply of all connected sensors and actuators.
- Manufacture, and commissioning of the Motor Control Panels.
- Controls wiring including the provision of conduit and trunking.
- Power wiring between the motor control panels and pumps, motors etc.

The tender drawings/specification produced by Clancy Consulting Ltd, show the design intent.

Points Schedules:

The BMS tenderer shall provide a points schedule showing each proposed connected point to the system. The points shall be arranged as schedules showing the points allocated on a plant-by-plant basis, the controller specification(s) selected, I/O capacity supplied and the spare I/O available for future use. Any points schedule supplied with this specification shall be considered as supporting information only. The BMS specialist shall be responsible for ensuring the correct allocation of points required for meeting the performance specification.

BMS Sub-contractor :-

The controls specialist shall include for the electrical installation associated with the BMS system, as included in the following list: -

- Power wiring from the Distribution Boards/Control Panels/out-stations to plant and equipment
- Controls wiring from the Boards/ Panels/out-stations to all ancillary control items and equipment forming part of the BMS
- Suitable secondary containment systems associated with the automatic control system
- Testing and inspection of the completed installation
- Installed to latest IEE regulations, including supplementary earth bonding

The BMS specialist shall provide prior to commencement of the work, installation control schematic wiring drawings for comment/approval for the complete BMS system.

The BMS specialist shall be responsible for the complete installation of the Building Management System including satisfactory commissioning, testing and certification of all works to provide the full packaged contract.

3.12.7 Training

Upon completion, the BMS specialist shall carryout on-site client training / demonstrations in the operation of the building management control system. This demonstration shall be video recorded by the Main Contractor to disk for future reference and shall also be provided in the form of written instructions by the BMS specialist. All alarm features shall be identified and clear instructions shall be provided on how to operate all the engineering systems in the unlikely event that the BMS is disenabled.

3.12.8 System Handover

The BMS specialist shall ensure the following are completed prior to practical completion:

- All password/PIN numbers/access codes, levels and operators recorded.
- Disk copies of all system and data files supplied
- Proprietary software licences, manuals and disks
- All equipment access keys
- Any snagging to be documented and agreed date determined for clearance.

- Complete set of O&M manuals including a full set of 'As Fitted' control schematic drawings for the complete system with any agreed amendments/additions required to be documented and a target date for the completion agreed.
- Training/Instruction of engineers and operators
- BMS specialist Technical Help desk and emergency contact numbers

3.13 THERMAL INSULATION

3.13.1 General

This section of the works shall consist of the application of thermal insulation to the mechanical services installation. The installation shall be complete in all respects. Reference shall be made to Y50 of this Performance Specification.

3.13.2 Application

Insulation Application shall be as detailed in the separate materials and workmanship specification.

3.13.3 Identification

Insulation Identification shall comply with BS1710 and BS480 as detailed in the separate materials and workmanship specification.

3.13.4 Condensation/Vapour Barrier

All chilled water and cold water services and external services shall have a continuous barrier on the outside of the insulation to vapour seal and prevent condensation.

3.14 TESTING, BALANCING & COMMISSIONING

3.14.1 General

This section of the works shall consist of the testing, setting to work, balancing and commissioning of the mechanical services installations including all water, air and controls systems.

Reference shall be made to the separate materials and workmanship specification.

Commissioning shall be undertaken in accordance with the CIBSE and BSRIA Commissioning Codes of Practice.

Due to there being no "As Fitted" information available, the **whole** of the mechanical services shall be fully air and water balanced before commencement of the alteration works. This is to obtain accurate flow rates of all existing systems before works commence. Reference shall be made to the existing system drawings issued with the tender documentation to establish the extent of the existing systems.

Following this exercise the mechanical contractor shall provide commissioning certification to the designers for checking the new alteration works before commencement.

On completion of the alterations and new works, any systems which have been altered shall be re-balanced and new commissioning data provided.

3.14.2 Results

On completion of the commissioning, a full set of results shall be issued to the Consulting Engineer for approval, and final results/certification shall be included within the O & M documentation

3.14.3 Fuel

Unless otherwise stated in the contract documents fuel, water and electricity for commissioning shall be free of cost to the contract.

3.14.4 Specialist Works

Individual items of plant and equipment shall be commissioned by the equipment manufacturer or respected agent.

3.14.5 Air Distribution Systems

Air distribution systems shall be commissioned in accordance with the CIBSE Commissioning Code 'A'

Results shall be submitted in tabular form giving the following items of information: -

a. Point of Measurement
b. Design Velocity
c. Design Volume
d. Actual Duct Size
e. Average Actual Velocity
f. Average Actual Volume
g. Damper Positions
h. Percentage difference between design and measured results
i. Actual Static Pressure
j. Heating/Cooling On and Off Coil Temperatures
k. Outside Air Temperature
l. Peculiarities
m. Motor Running Current
n. Fan Speed
o. Filter Pressure Drop
p. Motor Voltages
q. Motor Speed

3.14.6 Automatic Controls

Automatic Controls shall be commissioned in accordance with the CIBSE Commissioning Code 'C'

3.14.7 Water Distribution

Water Distribution Systems shall be commissioned in accordance with the CIBSE Commissioning Code 'W'

Results shall be submitted in tabular form giving the following items of information: -

a. Point of Measurement
b. Water Temperature
c. Pressure
d. Pressure Differential Actual
e. Pressure Differential Design
f. Flow Rate Actual
g. Flow Rate Design
h. Outside Air Temperature
i. Room Temperatures
j. Peculiarities
m. Pump Motor Running Current
n. Pump Speed
p. Pump Motor Voltages
q. Pump Motor Speed

3.14.8 Noise Level Readings

During the commissioning, the contractor shall record sound power levels within all rooms with both plant running and plant isolated. The contractor shall allow for sound level to be recorded within 20% of the rooms on the project, to be agreed during commissioning.

3.14.9 Phased Commissioning, Testing & Demonstration

The contractor shall allow for 4 stages of Testing & Commissioning, Demonstration.

Stage 1
All pre-commissioning and installation is complete, BMS controls software complete.

Stage 2
Stage 1 is complete and BMS software has been tested and commissioned.
Mechanical and Electrical systems have been commissioned in part load operation.

Stage 3
Stage 1 & 2 is complete and all BMS graphics and alarms have been proven and commissioned.
All Mechanical and Electrical services commissioning documentation is complete, O&M manuals complete. The Mechanical and Electrical systems are handed over for independent verification.

Stage 4
Stage 3 complete, the Mechanical and Electrical services are to be commissioned/ checked at full load operation at winter and summer season design conditions for independent verification.

3.15 OPERATING AND MAINTENANCE MANUALS

Operating and Maintenance Manuals and as Fitted Drawings shall be provided as detailed in A64 of this Performance Specification.

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3.16 BUILDERSWORK

The mechanical and electrical contractor shall inform the building contractor of all specific requirements at tender stage for builder's work.

For example (and not limited to);

- Concrete support plinths, steelwork section plinths
- Service trenches and service routes to the building
- Extend underground drainage points to new locations within building
- Cable duct requirements around the building/site
- Forming & Sealing of pipe/duct/cable service penetrations through the building
- Access doors and ladders to roof voids
- Plant/ Ductwork Roof Supports

SECTION 4 – A64 GENERAL CONDITIONS

100.000 PROJECT PARTICULARS

100.010 THE PROJECT:
Particulars of the project as a whole are as the Main Contract Preliminaries by Gleeds

100.020 THE EMPLOYER:
As the Main Contract Preliminaries by Gleeds

100.030 THE PURCHASER:
As the Main Contract Preliminaries by Gleeds

100.040 CONTRACT ADMINISTRATOR:
The term Contract Administrator (CA) is used throughout this specification and his duties will be carried out as the Main Contract Preliminaries by Gleeds

100.050 PROJECT MANAGER:
As the Main Contract Preliminaries by Gleeds

100.060 THE ARCHITECT:
As the Main Contract Preliminaries by Gleeds

100.070 QUANTITY SURVEYOR:
As the Main Contract Preliminaries by Gleeds

100.080 BUILDING SERVICES COST CONSULTANT:
As the Main Contract Preliminaries by Gleeds

100.090 MECHANICAL SERVICES CONSULTING ENGINEER:

As the Main Contract Preliminaries by Gleeds

100.100 ELECTRICAL SERVICES CONSULTING ENGINEER:
As the Main Contract Preliminaries by Gleeds

100.120 STRUCTURAL ENGINEER:
As the Main Contract Preliminaries by Gleeds

100.130 PLANNING SUPERVISOR:
As the Main Contract Preliminaries by Gleeds

100.140 LANDSCAPE ARCHITECT:
As the Main Contract Preliminaries by Gleeds

100.150 MAIN CONTRACTOR:
As the Main Contract Preliminaries by Gleeds

100.160 EMPLOYER'S SITE STAFF:
As the Main Contract Preliminaries by Gleeds

100.170 DELEGATION:
The CA may delegate certain powers and duties. The CA will indicate the duties and powers of the following:
- Clerk of Works
- Building Services Engineering site staff.

100.180 STATUTORY AUTHORITIES:
- Building Control
- Fire Officer
- Environmental Health
- Drainage

100.190 UTILITY SERVICE PROVIDERS:
- Water Supply
- Supplier – N/A
- Supplier reference N/A
- Gas Supply
- Supplier – N/A
- Supplier reference N/A
- Electricity Supply
- Supplier – UK Power Networks (Operations) Ltd
- Supplier reference 401453327/QID193645
- Manage the provision of a new-metered electricity supply to the site by the supply authority.
- Telephone Service - BT
- Supplier - BT

200.000 DEFINITIONS

200.010 GENERAL:
Where used in the documentation the following definitions shall apply and shall be interpreted as such:
- Works: All services shown on the drawings and described in the specification shall be deemed to be included in the contract.
- Drawings: The tender drawings.
- Elsewhere: Detailed or specified elsewhere in other clauses, sections, shown on the drawings or contained in the specification or conditions of contract.
- Services: Services means the inclusion of one or more system.

- System: All equipment, accessories, controls, supports and ancillary items, including supply, installation, connection, testing, commissioning and setting to work necessary for that section of the Works to function.
- Design process: All the activities necessary to convert contractors design input into design output
- Review: Give notice and submit details to the CA for his comment and review, which shall be granted in writing only. In the event of the CA not accepting that submitted, resubmit alternative details for review or modify that submitted in accordance with the CA comments. Review of any submittal by the CA shall not mean that the CA is responsible for the correctness of the submittal or its suitability for purpose and does not relieve any contract responsibilities.
- Competent person: A person, by reason of theoretical and practical training or actual experience or both, is competent to perform the task or function or assume the responsibility in question and is authorised to perform such a task or function.
- Duct: An enclosed space specifically intended for the distribution of services, with direct access for personnel.
- Trench: A covered horizontal service space in the floor or ground with access from above.
- Cavity: A space enclosed within the elements of a building within which services are installed, e.g. the space between ceiling and floor above. See Building Regulations.
- Service Areas: Includes areas within a building with limited finishes such as loading bays, car parks etc.
- Concealed Services: Includes installations within ducts, trenches or cavities.
- Exposed Services: Includes installations outdoors or unprotected within service or occupied areas.

- Terminal Units: Terminal units such as radiators, convectors, fan coil units, induction units, variable or constant volume air boxes and other like equipment.
- Ancillaries: All specified fittings, accessories, inserts, test points, bracketing, terminal equipment connected to and installed in the engineering services system.
- CIBSE: The Chartered Institution of Building Services Engineers
- BSRIA: The Building Services Research and Information Association
- IET: The Institution of Engineering and Technology
- IOP: Institute of Plumbing
- FRS: Fire Research Station
- HSE: Health and Safety Executive

200.020 DEFINITIONS OF TECHNICAL TERMS
The definitions of technical terms associated with the engineering services installations are those included the latest edition of:
- CIBSE - Guides; Commissioning Codes; Technical Memoranda; Building Energy Codes; Lighting Guides; Application Manuals;
- IOP - Plumbing Engineering Services Design Guide
- BSRIA - Technical Publications
- Loss Prevention Council - Rules for Automatic Sprinkler Installations
- BS 7671 Requirements for Electrical Installations (IEE Wiring Regulations)
- British Standards, including Codes of Practice.
- Statutory Acts.
- NHS Estates -

300.000 TENDERING INSTRUCTIONS

300.010 GENERAL:
This section outlines the tendering procedures and requirements.

300.020 SCOPE:

- These conditions are supplementary to those stated in the invitation to tender and on the Form of Tender and Agreement.

300.030 TENDER DOCUMENTS
The tender documents consist of the following:
- Invitation to tender.
- Form of tender.
- Project health and safety plan.
- Specification for the Works.
- Set of tender drawings for the Works.
- Pricing schedule for the Works.
- Declaration of non-collusion.
- Contract programme.
- Warranty.
- Draft log book.
- The tender drawings are
- Refer to schedule of tender drawings.

300.040 PRIVACY OF INFORMATION:
The information contained in the tender documentation shall be treated as private and confidential.

300.050 CHECKING DOCUMENTS:
Check the tender documentation for obvious errors and omissions. Should any such errors or omissions be discovered inform the office issuing the documents immediately in writing in order that a correction may be issued before the date for submission of the tender.

300.060 TENDER ACKNOWLEDGEMENT:
Acknowledge receipt of the tender documentation and confirm submission of a tender in accordance with the instructions to tender.

300.070 PERIOD OF VALIDITY:
Tenders must remain open for consideration (unless previously withdrawn) for a period from the date fixed for submission of tenders of not less than – Refer to Main Contract Preliminaries.
The date for possession/commencement is – Refer to Main Contract Preliminaries.

300.080 TENDER PROCEDURE:
Tendering procedure is in accordance with the principles of – Refer to Main Contract Preliminaries.

300.090 ACCEPTANCE OF INSTRUCTIONS:
The submission of a tender will denote the acceptance of an undertaking to comply with all the clauses contained in the tender documentation unless items of non-compliance are identified as part of the tender submission.

300.100 ACCEPTANCE OF TENDER:
The Employer and his representatives
- Offer no guarantee that the lowest, or any tender, will be recommended for acceptance or accepted.
- Will not be responsible for any cost incurred in the preparation of any tender.

300.120 INSPECTION OF SUPPLEMENTARY DOCUMENTS:
Supplementary documents relating to the contract are available for inspection prior to the submission of the tender.

No adjustment shall be made in the tender sum or claim for additional monies or an extension of time allowed due to failure to inspect the above documents and to make due allowance for the information contained therein.

- Architectural documents may be inspected
- Structural documents may be inspected
- Building services documents may be inspected

300.130 SITE VISIT:
Before tendering, ascertain the nature of the site, access thereto and all local conditions and restrictions likely to affect the execution of the Contract Works.

- Inspect any existing installations relevant to the works and study any relevant existing records.
- No claims will be allowed after submission of a tender for lack of information or other reasons which could have been resolved by such a visit to the site.
- Arrangements for visiting the site must be made with prior agreement through:
- The office issuing the tender documentation: Scott Kenna of Gleeds T - 0115 977 8234

300.140 RETURN OF DRAWINGS AND SPECIFICATIONS:
The complete tender documentation is to be returned to the office of issue when requested should the Tenderer not be successful in their bid.

300.150 ALTERATIONS TO TENDER DOCUMENTS:
No alterations or erasures to the text of any part of the tender documentation shall be permitted.
Any tender containing such alterations or erasures may be rejected.

300.160 TENDER ERRORS:

- Errors in the priced subcontract specification will be dealt with in accordance with the Code of Procedure for Single Stage Selective Tendering 1996.
- In the event of a Tenderer discovering a genuine error in their tender after it has been deposited, attention in writing may be drawn to the error and an amendment submitted. The amendment may be accepted if deposited on or before the time fixed for receipt of tenders.
- No adjustment shall be permitted to the sum inserted in the form of tender after the date and time fixed for receipt of tenders.

300.170 UNQUALIFIED TENDERS:

- Other than as part of an alternative offer as described elsewhere, no account will be taken of any qualification or special conditions that a Tenderer may impose on their tender.
- Any tender containing such additional conditions may be rejected.

300.180 ALTERNATIVES:

- Alternative equipment, specialists or methods of carrying out the works in addition to those described in the tender documents may be submitted. Alternative offers shall be indicated on the appropriate document and include:
- Details of the alternative equipment, specialist or method proposed.
- Full technical data for each such alternative together with details of any consequential amendments to the design and/or other parts of the works. Demonstrate compliance with any stated British (or other equivalent recognised International) Standards.
- A detailed breakdown of any omissions or additions to the basic tender sum indicated on the appropriate document.
- The impact of all proposed alternative equipment or materials on Part L compliance including
- The CO2 Target Emissions Rate.

- The final 'as constructed' CO2 Buildings Emissions Rate.
- Confirm equivalence in quality, operation and space requirements to those items which have been specified by name. Demonstrate the proposed alternative is fully equivalent to the specified item and identify any constructional, cost, programme, maintenance or other differences
- Include for all necessary measures to ensure alternative manufacturer's equipment and the total installation is equivalent to that specified.
- The Tenderer shall include the costs necessary for re-sizing and reselection of associated equipment (including pipework, ductwork and cable sizes) resulting from the proposed alternative together with all resulting design and coordination.
- Alternative offers will only be considered if accompanied by a compliant tender.

300.190 EXCLUSIONS:
If any part(s) of the Works cannot be tendered as defined in the tender documents, the CA must be informed as soon as possible, defining the relevant part(s) and stating the reasons for the inability to tender.

300.195 INTERPRETATION OF THE TENDER DOCUMENTATION:
- Should there be any doubt about the precise meaning of any item for any reason whatsoever, the tenderer must inform the office of issue of the tender documents in writing in order that the correct meaning may be given.
- Any clarification of the meaning or intent shall be issued in writing only and no other means of communication shall be valid. All Tenderers will be notified of any such explanation.
- No liability will be admitted, nor claim allowed, in respect of errors in a tender due to mistakes that should have been rectified in the manner described above.

300.200 PROCUREMENT OF MATERIALS:
Allow for the procurement of materials and equipment from suppliers at such a time, and in such a manner as may be necessary to allow for the completion of the Works in accordance with the contract programme.
Clearly state in the tender submission any foreseen difficulties with delivery periods for selected equipment or proposed alternatives.
- No additional costs resulting from non-compliance will be accepted.

300.201 A LIST OF PROPOSED MANUFACTURERS/SUPPLIERS:
A list of proposed manufacturers/suppliers of products, equipment and plant, including all items for which the choice of manufacturer/supplier is at the discretion of the Subcontractor, must be submitted
- Preliminary list to be issued with the tender submission. Final list to be issued before commencement of the works.

300.202 SELECTION OF MANUFACTURERS/SUPPLIERS:
Where manufacturers, suppliers or installers of products are not identified by name select products that comply in all respects with the specification and demonstrate such compliance.
- Where manufacturers, suppliers or installers of products are identified by name, or names, but reference is made to "Or approved" equivalent the submitted tender must include the named or one of the named suppliers. Alternatives may be selected and shall be submitted to the CA for approval, separately

300.210 SUBLETTING:
- Where it is proposed to sublet any portion(s) of the Works a schedule must be submitted with the tender .
- The schedule should define such portion(s) and give for each the details of the proposed company.

310.000 TENDER SUBMISSION

310.010 GENERAL:
This section details the particular tender submission requirements.

310.020 RETURN OF TENDER:
- The tender documentation is to be returned to: Refer to Invitation to Tender letter.
- The tender documentation is to reach the return address not later than:
- Date - Refer to Invitation to Tender letter.
- Time - Refer to Invitation to Tender letter.

310.030 TENDER SUBMISSION DELIVERABLES:
- To be compliant the tender submission must include the following deliverables as detailed elsewhere:
- A tender pricing schedule completed in full.
- Outline programme.
- Daywork rates form completed
- Declaration of non-collusion
- Preliminary list of manufacturers/suppliers/sub-contractors

310.031 TENDER STAGE METHOD STATEMENTS:
Method statements must be submitted:
- When requested by the CA.

310.032 PROGRAMME:
Submit with the tender a programme indicating the sequence and timing of the principal parts of the works including periods for planning, design, procurement, installation and commissioning.

310.040 MAINTENANCE CONTRACT:
- The contractor shall allow a separate cost for 12 months maintenance of mechanical services from the date of practical completion.

310.050 PROPOSALS FOR ANNUAL MAINTENANCE CONTRACT:
- The contractor shall allow a separate cost for 12 months maintenance of mechanical services from the date of practical completion.

310.060 TECHNICAL INFORMATION:
Technical information relating to the tender must be submitted
- When requested by the CA.

320.000 PRICING AND COSTS

320.010 GENERAL:
This section details particular requirements for the pricing of the tender documentation and cost procedures during the contract.

320.020 BASIS OF CONTRACT:
The contract shall be
- on a lump sum based on the specifications and drawings.

320.030 TENDER PRICING DOCUMENT:
Alterations and qualifications to the specification must not be made without the written consent of the CA. Tenders containing such alterations or qualifications may be rejected.
Costs relating to items in the specification that are not priced will be deemed to have been included elsewhere in the tender.

The Tenderer shall complete all sections of the tender pricing document in full.
Items described in the pricing document are abbreviated for the purpose of the schedule. The Tenderer is to make full allowance for all works associated with the installation of a particular element.
Items entered in the pricing document shall be deemed to include all costs involved in carrying out the Works.

- Where required the Tenderer must identify separately the cost of all items specifically described under preliminaries.
- Provisional items will be adjusted at the final agreed rates when information is issued in respect of these items.

320.030 SUBMISSION OF PRICED CONTRACT SPECIFICATION:
The priced contract specification must be submitted

- When requested by the CA.

320.040 SCHEDULE OF RATES:
A schedule of rates must be submitted

- When requested by the CA.

320.050 ERRORS:
Errors in the priced subcontract specification will be dealt with in accordance with the Code of Procedure for Single Stage Selective Tendering 1996.

320.060 PROVISIONAL SUMS:
Include in the contract price the provisional sums detailed in

- the specification
- Any part or the whole of these sums unexpended will be deducted from the final amount due.

320.070 PRIME COST SUMS:
The term Prime Cost Sum shall mean the nett cost paid for an item or items of equipment or material or work executed.
The Tenderer shall indicate the percentage addition required for any profit and costs for handling, ordering and Main Contractor's discount, etc., in addition to P C Sum in

- the specification
- Where prime cost sums are included these shall be at the disposal of the CA who shall give written instructions for their expenditure and the CA shall have the power to nominate persons or firms to execute work or supply goods against such sums.
- All prime cost sums shall be adjusted by the CA in the final account, the work undertaken or goods supplied against such sums being charged on the basis of the net accounts of the installers or suppliers, plus the percentage addition stated in the tender to cover profit.

320.080 OVERTIME AND ALLOWANCES:

- Include for all necessary overtime and other expenses in the contract price that may be necessary in order to complete the Works in compliance with the contract programme.
- Payment will be made for the extra cost of overtime only if a prior written CA instruction to work such overtime has been issued together with agreement to accept the costs involved.

320.090 SUBMISSION OF FINAL ACCOUNT:
Submit a draft final account to the CA using the contract procedures for checking purposes together with all the necessary supporting documents.

- Immediately after the practical completion of the contract Works.

Prepare the valuation of variations, omissions and provisional work forming part of the Works and where appropriate in accordance with principles defined in this sub-clause.

The basis for the determination of such valuation shall be the Quantified Schedule of Rates prepared and submitted at the time of tender and accepted by the CA.
All valuations as aforesaid prepared shall be submitted using the contract procedures to the CA for approval.

320.100 INSTRUCTIONS AND VARIATIONS:
All instructions shall be issued in writing and confirmed in a similar manner.
Submit the cost of each variation showing the quantities and rates applicable for all materials, etc employed in accordance with the agreed contract schedule of rates.
Submit to the CA
- Within 10 working days of the receipt of written instructions.

No work will be certified for payment until all the necessary information is provided.

320.110 DAYWORKS:
Where authority is given for work to be executed on a daywork basis, original vouchers giving the full particulars of hours worked, names of craftsmen and labourers, description of work executed and materials and plant used, must be forwarded to the CA.
Submit to the CA using contract procedures not later than the end of the week following that in which the work has been executed.
The daywork sheets shall be numbered in sequence, and all sheets are to be signed by the
- Site representative of the CA.

Such signatures are only to be taken as certifying that the time, materials and plant are correct, and shall not be held to justify a claim that the work shall be so charged or that it cannot be measured and priced according to the terms of the contract.
- The value of work accepted by the CA to be paid on a daywork basis shall be calculated in the manner and in accordance with the rates quoted in the daywork schedule.
- Dayworks shall be allowed only in the case of works that cannot be measured and valued.

400.000 CONTRACT CONDITIONS
- Refer to Main Contract Preliminaries.

410.000 PARTICULAR CONDITIONS

410.010 GENERAL:
This section details particular conditions and requirements for the project.

410.041 CO-ORDINATION OF TRADES:
Allow for co-ordinating the contract works with the works of other trades and installations which may be on site during the period of the contract.

410.042 CO-OPERATION WITH OTHERS:
Ensure that the contract works integrates with that of others and that full co-operation is maintained during the execution of the Works with that of others.
Co-operate with the Contractor, other subcontractors, suppliers, local authorities and statutory undertakings, UoB Facilities & estates and the department of Art & Design in the execution of the Works.
In the event of any extra costs being caused by failure to programme and arrange the execution of the Works so that it fully integrates with that of others, the installer of the Works may be liable for any additional costs thereby incurred.

410.050 NOTICE OF OPERATIONS:
Work that requires interruption or interference with the operation of any existing services or buildings shall not be commenced without prior written permission of the CA.

410.060 NOISE AND NUISANCE:
Ensure that the contract works are undertaken with as little noise as possible.
- Ensure no nuisance by noisy working is caused to
- the Employer
- occupants of premises next to the site boundary

Take all necessary precautions to prevent nuisance from smoke, rubbish and other causes.
Fit all compressors, percussion tools and vehicles with effective silencers of a type recommended by the manufacturers of the equipment.

410.070 SUPPRESSORS:
Ensure all internal combustion engines used in the execution of the contract works are fitted with efficient suppressors in the ignition system in accordance with the recommendations of British Standards so as to prevent electrical interference to radio or television receiving equipment in the vicinity.
All temporary electrical installations, such as motors or the like, shall be prevented from creating such interference and shall be fitted with suppressor equipment in accordance with British Standards and to the satisfaction of the CA.

410.080 PROGRAMME:
Provide a detailed programme(s) clearly illustrating how the overall programme
- Will be achieved within the contract period.
- Demonstrate compliance with the Main Contract programme.

Provide the detailed programme
- within one month of the award of the contract

Due allowance is to be made in the programme(s) for, but not limited to, the following:
- Statutory authority approvals including Building Regulations.
- The latest dates for release of final information required from the CA.
- Ordering dates and manufacturing periods. The proposed delivery to site for each item of major plant to be clearly defined.
- The period required for the production, approval and issue of:
- builder's work information
- co-ordinated working drawings
- installation drawings
- manufacturers drawings.

Allow adequate time for the examination and approval by the CA. Actual activities of production, adjustment, resubmission and review must be identified
- Installation periods for each system
- Work resulting from instructions issued in respect to the expenditure of provisional sums.
- Any temporary works necessary for the completion of the engineering services installations.
- Period required for operating the systems, load simulation tests and final adjustment.
- Environmental load testing.
- Period for instructing the Employer training.
- Pre-commissioning, commissioning and performance testing of the engineering services installations.
- Provide programme information as
- critical path network.
- Provide a separate and detailed commissioning programme for agreement with the CA. Make due allowance for the following.
- Commissioning, demonstration and instruction procedures.
- Provision of written notice before each (or series of) test, inspection, commissioning or demonstration procedures are to be carried out, not less than
- Demonstration to the CA that test instruments and equipment are accurate.

410.090 PROGRESS:
At regular intervals as agreed with the CA provide progress reports during the execution of the contract works in addition to any other similar information required by the contract conditions.
The reports shall include:
- particulars of materials and equipment on site, or installed
- site labour employed
- progress of the works

Mark up for inspection and record purposes a set of the latest drawings as the works progress. The progress drawings shall be available for inspection by the CA at any time.

410.100 ORDERING SCHEDULE:
- Prepare an ordering schedule for submission to the CA that shall indicate the following data:
- Item of material or plant
- Manufacturer
- Date of order and reference number
- Acknowledgement of order and reference
- Delivery period quoted
- Date required on site
- Allowable programme float
- Date delivered to site
- Update and modify and submit the ordering schedule on a regular basis as agreed with the CA. Indicate on the schedule any possible problems and when delivery to site has been achieved.

410.110 CONTINUITY OF THE WORKS:
No undertaking is given that the works will necessarily be able to proceed continuously.
- No claim will be allowed for discontinuity of work due to the necessity to conform to the contract programme.

410.120 DRYING OUT:
Make due allowance in the sequence of the work to provide heat for drying out. This activity shall not relieve any responsibilities to hand over the installation in good order. The interim period from the time of commencement of use for drying out to the handover shall not be considered as constituting any part of the defect liability period.

410.130 WORKING HOURS:
- Refer to Main Contract Preliminaries.
- Working hours to be agreed with Main Contractor.

410.140 ACCESS TO THE SITE:
- Refer to Main Contract Preliminaries.
- Access to the site to be agreed with Main Contractor.

410.150 METHOD AND SEQUENCE OF WORK:
- Refer to Main Contract Preliminaries.

410.160 USE OF THE SITE:
- Refer to Main Contract Preliminaries.

410.170 WORKING AREA:
- Refer to Main Contract Preliminaries.

410.180 POLICE REGULATIONS:
Ascertain and comply with any Police regulations or requirements as may affect the contract works.

410.190 USE OR DISPOSAL OF MATERIALS:
- Clear all rubbish and any debris arising out of the execution of the contract works to a central area where others will remove it from the site
- on a daily basis.
- Do not discharge any oil, noxious liquids or gases and all water discharged shall be reasonably free from impurities.
- Comply with UoB site waste management policy document.

410.200 STORAGE:
Weatherproof, safe and secure storage shall be provided for all materials and equipment.
All materials and equipment and materials shall be offloaded, stored and transported in accordance with manufacturer's recommendations.
All electrical equipment and components shall be kept dry and free from dust.
Plug, cap or seal open ends on all ductwork, tubes, conduit, trunking and associated equipment whilst in storage and during transportation to site.
Provide racks to prevent distortion of pipes, conduit and similar materials.

410.210 PROTECTION AND PACKAGING:
All plant, equipment, materials and prefabricated elements of the Works shall be properly packaged and protected against damage during delivery, storage and until fully, finally and properly installed and set to work.
Protection shall also include adverse effects of environmental conditions prevalent in the stored and installed location.
Any plant or equipment subject to incorrect storage or inadequate protection will be deemed unacceptable for incorporation into the works and new plant or equipment will be required as a replacement.
Damaged plant, equipment and materials or that suffering from deterioration shall be replaced prior to handover.
All plant, equipment and materials shall be protected against ingress of water and dust, formation of condensation, extremes and rapid changes of temperature, building works and operations of others.
All open ends of pipes, ducts, conduit, and trunking etc shall be capped except when being worked upon.
Install items such as grilles, diffusers, light fittings, switches, electrical accessories etc as near to practical completion as practicable.

410.220 CONFIDENTIALITY:
No information related to the contract works shall be given to the press or other media without the written permission of the CA or Employer.

410.230 PHOTOGRAPHS:
Provide progress colour photographs of the contract works. The frequency, location, and photograph size shall be agreed with the CA. All photographs shall be dated and location stated.
No unauthorised photographs of the site or the Works or any part thereof shall be taken except with the permission in writing of the CA.
Photographs shall not be published or otherwise circulated without the permission of the CA.

410.240 MATERIALS USED:
No acoustic insulation or thermal insulation or sound attenuation materials shall be manufactured with any form of animal hair.
All materials supplied shall be a type that will not support bacteria.
Substances publicised by the Health and Safety Executive, Building Research Establishment, British Standards Institution or other authorities or professional bodies

as being deleterious to Health and Safety shall not be incorporated into any part of the Works.
Deleterious materials shall not be utilised on any part of the Works. Deleterious materials include but not limited to:

- halon/CFC's
- asbestos or products containing asbestos
- urea formaldehyde or materials which may release formaldehyde

- materials comprised in whole or part of man-made and/or naturally occurring mineral fibres which have a diameter of 3 microns or less and a length of 200 microns or less or which contain fibres not sealed or otherwise not stabilised to ensure that fibre migration is prevented
- lead where the metal or its corrosion products may be directly ingested, inhaled or absorbed
- polyurethane or polyisocynate foam
- polychlorinated biphenyls (PCBs) or similar compounds
- pentachlorophenol, lindane or tributyltin (TBT) oxide
- extruded polystyrene other than low ozone depletion materials
- any other substances generally known to be deleterious at the time of installation

All jointing materials shall be of a type approved by the respective authority.
Warrant that deleterious materials are not incorporated in the Works.
Notify the CA, in writing, as soon as reasonably practicable of any material designated by the Building Research Establishment, British Standards or codes of practice as deleterious at any time during the contract.

410.250 ADVERTISING:
No form of advertising will be allowed on any part of the site or the Works without written CA approval.

410.260 PATENT RIGHTS:
Indemnify against all claims, costs or expenses in connection with any patented, copy righted or protected articles supplied and used on or in connection with the Works.

- Any payments or royalties payable in one sum or by instalments shall be included in the contract price and paid to whom so ever they may become due.
- In the event of any claim being made in connection with such patented or protected articles, conduct any negotiations or litigation in connection with such claim at own expense.

410.270 BENEFICIAL USE OF INSTALLATIONS:

- Systems shall not be used before practical completion without prior approval of the CA.
- Systems used before practical completion not for the benefit of the Employer must have all defective consumable elements replaced by new including:
- lamps and tubes
- filters

Replacement of consumable elements shall be not more than 5 working days prior to practical completion.

- If instructed by the CA operate the installations or any part of them prior to practical completion, provided that such operation is practicable and does not prejudice the responsibilities and obligations under the contract.
- All costs arising from the use of such installations will be reimbursed at rates or where no such rates are applicable at reasonable rates agreed with the CA before commencing operation of the installations.

410.280 DEFECTS LIABILITY:

Liability for making good defects in the Works shall be for a period of 12 months from the date of issue of the certificate of practical completion for the installations.

410.290 RIGHT OF ACCESS DURING DEFECTS LIABILITY PERIOD:
Right of access will not be unreasonably withheld, at all reasonable working hours and at own risk and expense, to any part of the contract works for the purpose of inspecting the working of the installations or to the records of the working and the performance thereof.
Subject to CA approval, that shall not be unreasonably withheld, undertake any tests considered necessary at own risk and expense.
During the defects liability period and all necessary remedial works and/or rectification of defective materials and equipment liaise closely with the Employer's staff. All such work shall be carried out in such a manner as to avoid or minimise shut-down time and inconvenience to the Employer.

410.300 RATIONALISATION OF COMPONENTS:
Similar items of apparatus and equipment shall be made and provided by the same manufacturer where practicable and corresponding parts of all apparatus and equipment shall be interchangeable to reduce the need for different attention and spares.

410.310 SUPPLY OF COMPUTER HARDWARE AND SOFTWARE:
Obtain on behalf of the end user all appropriate licences, permissions, copyright waivers, rights of use and the like from the owners of the software rights. Ensure that the end user is properly registered with the software supplier for support and appropriate updating. Ensure that application software is written in compliance with BS 7649.

410.320 FIRE PRECAUTIONS:
Take all reasonable fire precautions in respect of stores, workshops and other installations. Where it is necessary to use any naked flame or welding equipment in executing the contract works and where combustible materials are in use, adequate protection shall be given to other adjacent materials and personnel. Suitable fire extinguishers shall be readily available at the position where such work is proceeding.

410.321 INTERFERENCE WITH TRAFFIC:
Maximum facilities for access and transit shall be provided in all works that may interfere with the traffic on the roads, paths and footways. Should any part of the Works be executed in such a way as to cause unnecessary obstruction to traffic with neglect to remove or remedy the same forthwith when called upon to do so, then any obstruction shall be removed and the costs recovered.

410.330 DAMAGE TO STRUCTURE:
- Exercise due care and attention in carrying out the contract works and be fully responsible for any damage caused to the structure or building finishes.
- Obtain permission from the CA before any holes are cut in floors, walls or steelwork, etc.

410.335 METHOD STATEMENTS:
- Submit method statements to the CA prior to commencement of the contract works for the following work activities
- Each item of work

410.340 INSPECTION BEFORE CONCEALMENT:
Whenever work requiring inspection or testing is subsequently to be concealed give the following the notice to the CA so that inspections may be made or tests witnessed before concealment

- 5 working days notice

410.350 EQUIPMENT GUARANTEES:
Plant and equipment guarantees shall commence at the date of practical completion and run for a minimum of 12 months after this date.
Any costs associated with this requirement shall be included in the contract price.
An asset schedule is to be provided c/w relevant guarantee/warranty information at practical completion.

410.360 SITE MODIFICATIONS:
Site modifications to assemblies shall not be made without written approval of the CA.
Where site modifications to assemblies are authorised undertake in accordance with manufacturer's certified drawings and instructions.
Ensure that all modifications undertaken comply with the relevant standards and all test certification obtained.

410.370 DIMENSIONS:
- Where installations are dependent upon site dimensions ensure that these are available before proceeding with the Works.
- Dimensions should not be scaled from drawings.
- Where dimensions are indicated on drawings check these on site, as appropriate, to ensure building construction tolerances and manufacturing tolerances can be accommodated.
- Equipment should not be ordered or manufactured using dimensions indicated on the Tender drawings.

430.000 QUALITY

430.010 QUALITY CONTROL:
Prepare and submit to the CA a method statement to indicate fully the quality control programme for the contract works

430.020 WORKMANSHIP AND MATERIALS:
All materials, articles and workmanship shall be of the best quality and execution as detailed in the specification and drawings.
All equipment and materials to be installed shall be new unless otherwise indicated.
All equipment shall be installed in accordance with the manufacturer's written instructions and recommendations.
All materials considered by the CA to be unsound or not in accordance with the specification shall immediately be removed and properly replaced to the satisfaction of the CA at no additional cost. All work carried out imperfectly or with faulty materials must be immediately removed and properly replaced to the satisfaction of the CA at no additional cost.
The manufactured articles specified shall serve as a quality standard.
Where manufactured items are not specified by name submit with the tender all necessary details of proposed articles. The CA shall approve these articles before their use is permitted.

430.030 DEFECTS:
Agree with the CA a system of recording defects that should include
- A reference to identify the defect
- Description of the defect
- Remedial works proposed
- Agreement to remedial works proposed
- Confirmation of defect clearance

500.000 ORGANISATION AND DESIGN MANAGEMENT

500.010 SITE STAFF:

- Refer to the Main Contract preliminaries.
- Employ a competent full-time site based project manager/engineer and supporting team dedicated full time to the project and not involved in the installation of the Works who shall have full authority to act in connection with the contract works.
- Staff of sufficient number and competence in the opinion of the CA, shall be provided as necessary for design, drawing and technical information production, programming and administration to ensure efficient and satisfactory execution of the contract works.
- Provide all necessary superintendence during the execution of the contract works. The said staff shall be in attendance on site during the whole time that work is in progress.
- Employ on the site suitable qualified engineering staff to be in charge of the contract works from commencement to completion. The said staff shall be in attendance on site during the whole time that work is in progress.
- Responsibility for all drawings and technical information production shall be undertaken by a nominated engineer
- Curriculum Vitae shall be submitted with the tender for
- all key staff
- Any change made to the appointment of staff during the contract works shall be agreed with the CA with maximum notice being provided.
- If the CA is of the opinion that any member of the site staff has been guilty of a serious breach of his duties, he may by notice require that person to be replaced within weeks of the notification.

500.020 DESIGN COSTS:

- The costs for undertaking the design activities and production of information during the design stage shall be stated in the tender.
- A letter of intent for the award of the contract will be issued by the Employer to allow immediate commencement of the contract design stage activities.
- Should the contract works not ultimately proceed nor the design be completed due to unforeseeable circumstances then
- the design cost or proportion thereof to equate to the work completed, shall be paid by the Employer

500.030 DESIGN MANAGEMENT:

- Employ a design manager throughout the design process who shall have the full authority to make decisions. The design manager shall be suitably qualified to the satisfaction of the CA.
- The design manager shall
- attend all design team meetings as required
- be a participating member of the overall team during the development of the design
- Once construction has commenced the design manager shall be involved until such time as all the production information has been completed and the Works are generally under construction.
- Appoint the appropriate staff and necessary skills to undertake the design activities to the satisfaction of the CA.
- Submit with the tender curriculum vitae of all key design staff.
- Any change made to the appointment of design staff shall be agreed with the CA with maximum notice being provided.
- Throughout the design stage be actively involved with the Employer's design team
- Undertake and prepare any such design information required by other design team members to enable their element of the work to be detailed.
- During the design and production information stages the CA will monitor by such means considered necessary the performance in the development of design and in the production of the detailed design and co-ordination drawings.

- Should any part of the design not meet the required standard of the CA then modify and re-issue such work to the required standard at no additional cost or delay to the programme.
- On completion of the contract design stage activities and prior to commencing the production information submit to the CA a statement of compliance that the design of the systems will meet the specification design and performance intent.
- Submit a statement to the CA signed by a "competent person" prior to commencement of works on site that the systems can be properly prepared and commissioned and agrees with the intent of the design.

500.040 DESIGN WARRANTY:
- The successful tenderer will be required to complete a form of warranty in favour of the Employer prior to the commencement of the contractors design stage.

510.000 SUBMITTALS AND APPROVALS

510.010 GENERAL:
This section outlines the requirements and procedures for submittals to the CA.

510.020 SUBMITTALS:
Prior to any orders being placed the CA shall review all drawings and manufacturer's details.
Submittals shall be in a clear, definable and easily read format with the specified technical details, notes, performance data and calculations where applicable all in the English language.
Where drawings are to be examined the manufacturer's details shown on the drawings must have been previously approved.
Include all costs for attending meetings associated with the submittal review procedure.
Agree with the CA where samples of materials offered for review are to be sent.
Issue progressively drawings, calculations and submittals as agreed in advance with the CA for review.
All correspondence related to the examination and review procedure shall be directed through the office of the CA.
The timescale for review or comment or otherwise on all submittals shall be
- 10 working days from the date of receipt by the CA.

510.030 SCHEDULE OF DRAWINGS AND SUBMITTALS:
- Provide a schedule of all proposed drawings and submittals required for comment.

Indicate as a minimum the following information on the schedule:
- Drawing number and revision number
- Drawing title and service
- Scale
- Latest date required on site and/or for manufacturing purposes
- Date required for final comment
- Date for submission for comment
- Date of commencement of drawing production

The schedule shall be updated as necessary on a regular basis at intervals agreed with the CA during the contract period.
The programme for production of drawings and other submittals should include the necessary time for:
- Submission
- Examination
- Alterations and re-submission in the event of the initial submission not being accepted
- Final issue

Allow adequate time in the programme in order not to cause delays.
The full extent of all submittals shall be indicated in the schedule.

Group submittals for a particular part of the building or building engineering service as agreed with the CA.

510.040 CALCULATIONS:
All calculations must be presented in a logical format and prepared to a recognised and agreed format and be suitably indexed.
All software programs used in the preparation of designs shall be agreed with the CA prior to commencement of design activities. The use of unverified software must be declared and the initial outputs justified by full and complete hand calculations.
Software used in calculating the energy performance of buildings, as required under Part L of the Building Regulations, shall be agreed with CA prior to commencement of use.
Calculations that are preliminary in nature, i.e. do not form part of the final submittal, are to be referenced independently and clearly indicated 'Preliminary'.
State the methodology, formulae, design criteria, assumptions and all design margins used in the calculations.
Where necessary calculation sheets shall be accompanied by an annotated layout drawing identifying terminals, fittings and the particular sections of ductwork or pipework.
Each calculation sheet, drawing or schedule shall clearly identify the originator, date of production, checker (who signs or initials) and date of check.
The timescale for review or comment or otherwise on all submittals shall be 10 working days from the date of receipt by the CA

510.050 EQUIPMENT PERFORMANCE DETAILS:
Details of the equipment selected for inclusion into the Works shall include the following information:
- Plant item description, reference identification and serial number.
- Electrical input rating - kVA, Volts, Phase.
- Operating mode - duty, standby, generator etc.
- Starting characteristics - starter type, current, starts/hour and starting time.
- Performance characteristics - (full load current and power factor).
- Noise level.
- Weight.

The format of the information shall be as agreed with the CA.
The above details are also to be included on the asset schedule at practical completion.

510.051 PREPARATION OF DRAWINGS:
Agree with the CA a document numbering system prior to preparing any documents.
All drawings shall be prepared using a computer aided draughting system and the software used to produce drawings shall be approved prior to commencement of drawing production.
Each service shall be represented by a separate layer/overlay, for subsequent easy modification.
Prior to commencement of drawing production agree the sequence of layers, pen colours and sizes.
The medium for transfer of information shall be
AutoCad drawing files shall be
- DWG
- DXF
- PDF

Drawing plots shall be "A" size to British Standard, with an agreed logo/title block.
The standard drawing size is to be
- A1
- A0

Scales used on drawings shall be
- selected to convey clearly the proposals

510.060 REVIEW OF SUBMITTALS:
Submittals will be examined for
- compliance in principle with the design intent

Such examination shall not relieve any responsibilities and obligations under the contract.
Examination of any submittal by the CA shall not mean that the CA is responsible for the correctness of the drawing or submittal or its suitability for purpose. These responsibilities shall remain as defined elsewhere and as the contract.
Allow adequate time in the programme for submittals with due allowance for incorporation of comments and resubmission in order not to cause delays.
Each package shall contain all drawings, design calculations, support information, manufacturer's literature, etc necessary to facilitate examination by the CA.
Revised items on drawings shall be clearly indicated and annotated with a revision number/letter.
Submittals will be returned indicating "A", "B" or "C" action.
"A" action
- Examined no comments
- Examined for construction purposes

"B" action
- Examined subject to minor amendments
- Examined subject to incorporation of comments indicated
- For construction provided that work is in compliance with comments made

"C" action
- Examined subject to major amendments
- Rejected with or without comments

In this case the drawings shall be re-submitted after correction or with further information added.
Drawings and submittals with "B" or "C" action, shall be adjusted/revised for comments immediately and re-submitted to the CA within 10 working days or earlier if site progress dictates.
Where drawings are revised and updated during the construction stage these shall be issued to the CA for examination of the revision only, the revision being clearly marked.
- Builder's work information and installation drawings shall not be examined in detail but shall be examined by the CA for general suitability.
- Record drawings are to be prepared as the contract works progress and shall be examined in the same manner as for other submittals.
- The timescale for review or comment or otherwise of record drawings shall be 20 working days from the date of receipt by the CA

510.080 SAMPLES:
Provide free of charge samples of material and workmanship proposed to be used in the Works.
Samples shall include all alternative finishes available if required.
In the case of articles of special construction:
- drawings may be temporarily substituted for the samples
- drawings when approved will be retained until the articles concerned are supplied, as a sample

The samples submitted and approved, shall remain the property of the Employer until the completion of the contract.
Approval of the CA shall be obtained before equipment is placed on order
- The CA will undertake to approve samples within 10 days from receipt.

Samples to be submitted:
Include all alternative finishes available for the following samples:

510.081 FORM AND NUMBER OF SUBMITTALS TO BE PROVIDED:
All submittals shall be issued to the

- CA
- Provide drawn information in the following forms:
- Initial copies for comment
- print form
- copy negative form
- CAD format
- comply with BS EN ISO 13567-1
- comply with BS EN ISO 13567-2
- Final copies for distribution
- print form
- copy negative form
- CAD format
- comply with BS EN ISO 13567-1
- comply with BS EN ISO 13567-2
- Provide copies of drawn information as follows:
- Sketch drawings
- Initial copies for comment (no)
- Final copies for design team (no)
- Sketch Schematic drawings
- Initial copies for comment (no)
- Final copies for design team (no)
- Detailed Schematic drawings
- Initial copies for comment (no)
- Final copies for design team (no)
- Detailed design drawings
- Initial copies for comment (no)
- Final copies for design team (no)
- Co-ordination working drawings
- Initial copies for comment (no)
- Final copies for design team (no)
- Installation drawings
- Initial copies for comment (no)
- Final copies for design team (no)
- Manufacturer's drawings
- Initial copies for comment (no)
- Final copies for design team (no)
- Builder's work information
- Initial copies for comment (no)
- Final copies for design team (no)
- Record drawings
- Site record copy in print form (no)

510.090 REVISIONS TO DRAWINGS:
Where revisions take place either under the authority of a CA instruction, or by written agreement with the CA or when revised architectural, structural or services information is issued, all drawings shall be modified accordingly and shall be re-issued for construction purposes subject to examination by the CA.
The issue of revised drawings shall be in accordance with and with regard to the agreed programme for construction and where time is available re-issues shall be grouped together, as agreed with the CA.
520.000 OBLIGATIONS AND RESPONSIBILITIES

520.010 GENERAL:
This section details the specific obligations, duties and responsibilities undertaken as part of the contract works.

520.020 OBLIGATIONS AND RESPONSIBILITIES:

GENERAL

- Complete the contractors design development.
- Undertake the contractor's detailed design.
- Undertake the responsibility for resolving final spatial co-ordination.
- Undertake specific detailed design tasks as indicated elsewhere in the specification.
- Prepare construction programmes for the Works as stated elsewhere and for design activities.
- Co-ordination of the engineering services, with each other and with the building structure and fabric.
- Undertake all on-site co-ordination with all other trades, disciplines, manufacturers and suppliers.
- Incorporate details provided by others into the
- Design development.
- Installation information.
- Provide the following drawings as defined elsewhere
- Detailed design
- Co-ordinated working
- Installation
- Manufacturer's
- Record
- Carry out final detailed location and dimensioning of second fix equipment based on architectural information
- Luminaires
- Control devices
- Electrical switches, outlets etc
- Grilles
- Prepare such reports, calculations and details as required for submission to any appropriate authority including the co-ordination of such information by suppliers, specialists, etc needed to be included in any submission.
- Notify the necessary statutory Authorities (Building Control, Fire Officer, Environmental Health etc) in respect of all tests and demonstrations required
- Building Control
- Fire Officer
- Environmental Health

Arrange all necessary attendance, documentation to ensure full approval.

- Seek full statutory approval of the Works and arrange all necessary attendance, documentation to ensure full approval.
- Demonstrate that all plant and equipment incorporated into the works can be safely and easily maintained in compliance with current legislation.
- Provide compliance statements for all selected plant and equipment demonstrating full compliance with the specification prior to order and commencement of the Works. Highlight for review all non-compliances.
- Fully re-evaluate and take full responsibility for all parts of the design and building elements that may be affected by acceptance of alternative plant selections.
- Modify the final detailed spatial co-ordination for approved alternative equipment or materials.
- Supply, deliver to site, unload, store, protect and co-ordinate movement of all plant, equipment and materials required for the Works including lifting and hoisting.
- Fix and install correctly all plant, equipment and materials and ensuring that all associated works are correctly executed.
- Inspect all plant, equipment and materials as delivered or where specified at the manufacturer's works. Inspection and/or tests to be carried out at the manufacturers' works jointly with the CA for equipment as stated elsewhere. Include for the travel and other expenses of the CA for the inspection and/or tests to be carried out at the works.
- Prepare detailed electrical wiring diagrams of all equipment supplied showing all interconnections between equipment to enable all necessary wiring to be undertaken

- Check software engineering and programming is completed so that systems function in the prescribed manner.
- Provide:
- Suitable accommodation.
- Workshops.
- Stores.
- Removal of rubbish and redundant materials.
- Clearance on completion.
- Obtain final quotations for incoming services based on final agreed building loads.
- Seek utility company comments on the spatial requirements and builder's work associated with the provision of incoming services.
- Assist and collaborate with others in liaison with Statutory Authorities with respect to Building Regulations approvals and compliance. Prepare supporting documentation.

BUILDER'S WORK OBLIGATIONS AND RESPONSIBILITIES:

- Check the provisions for, and adequacy of builder's work information previously issued prior to the award of the contract.
- Check the spatial requirements and adequacy of builders work information previously issued by others for utilities works.
- Provide final builders work details based on the installation and manufacturer's drawings to facilitate the installation of the works. Provide fully dimensioned drawings showing both size and position of builder's work making due reference to the structural engineering and architectural final dimensioned detailed drawings.
- Detail all access requirements including access to false ceilings and ducts for maintenance.

Provide fully dimensioned and annotated drawings.

- Undertake the redesign of the associated builder's work for approved alternative equipment or materials which subsequently varies the works in any way whatsoever.
- Detailed design and locations of brackets and supports.
- Submit details of all types of brackets and supports including fixing details.
- Submit load and thrust calculations.
- Design, supply and installation of support for plant and services.
- Steelwork.
- Brackets.
- Hangers and clips etc.
- Plinths.
- Inertia bases.
- Detail and supply sleeves, inserts, frames, fixing anchors etc., and any other items required to be cast or built into the structures by others, including coordination of positions to such extent and accuracy to allow structural construction to proceed.
- Detail design, supply, installation and co-ordination of all access platforms, access covers, gratings, ladders, stairs, rails and protecting elements required for future maintenance and operation of plant/equipment.
- Provide fully dimensioned and annotated drawings.
- Undertake and detail all fire stopping and sleeving systems for the Works where they pass through fire compartments.
- Detail and install fire barriers where a fire rated partition is penetrated.
- Undertake and detail the weatherproofing of all services passing through external elements of the building.
- Undertake and detail all acoustic stopping associated with the Works.
- Detail the final requirements for access to ceiling voids and builder's work ducts for maintenance and operation.

MECHANICAL SERVICES OBLIGATIONS AND RESPONSIBILITIES:

- Detail design of the mechanical services systems
- Detailed design and final location of drain and vent points and pipework gradients.
- Design of adequate provision for movement of services and systems due to thermal expansion and contraction, hydraulic pressures and building movement.
- Include cold draw calculations.
- Proving of expansion loops in lieu of expansion equipment.
- Detailed design and location of expansion anchors and guide locations including:
- Fixing details.
- Load and thrust calculations.
- Calculate all final pump system resistances based on the final equipment selection and co-ordinated working and installation drawings.
- Calculate all final fan system resistances based on the final equipment selection and co-ordinated working and installation drawings
- Detailed design and sizing of refrigerant pipework between items of equipment provided as part of the Works based on the final equipment selection and co-ordinated working and installation drawings.
- Calculate system water capacities and quantities of chemical additives based on the final equipment selection and co-ordinated working and installation drawings.
- Design and install all necessary temporary facilities for flushing, commissioning, etc
- Undertake the final sizing, selection and determination of final locations of commissioning sets including any proportioning of mains losses, etc based on the final equipment selection and co-ordinated working and installation drawings.
- Final selection of system(s) pressurisation units and expansion vessels based on the final equipment selection and co-ordinated installation drawings.
- Final sizing of sections of ductwork between terminal units and diffusers to ensure the specified acoustic criteria and duct velocities.
- Final selection and location of control dampers, control valves, etc to achieve the specified function and to suit the characteristics of items served and final system configurations based on the final equipment selection, co-ordinated working and installation drawings. To include required access requirements.
- Final design of flues to include the incorporation of the requirements of the respective manufacture, building control, environmental health officer and current legislation eg Clean Air Act.
- Determining the extent and design of trace heating systems for frost protection of relevant services and temperature maintenance on domestic hot water systems.
- Detail design of
- Fire rated ductwork systems.
- Ductwork fire protection systems.
- Obtain all necessary statutory approvals.
- Final detailing and confirmation of the location and sizes of duct connections to external louvres.
- Design and selection of sound attenuation equipment to satisfy the particular performance requirements of the specification and the spatial allowances based on final equipment selection and final co-ordinated working and installation drawings.
- Design of final acoustic requirements or modification of equipment to attain the particular performance requirements of the specification.
- Final selection of all anti-vibration mountings to suit the particular application of the mounts.
- Undertake the redesign of the final acoustic requirements associated with approved alternative equipment or materials which subsequently varies the Works in any way whatsoever.
- Provide a report confirming that the results of the leakage tests are in compliance with the specified ductwork leakage requirements.

ELECTRICAL SERVICES

- Detail design of the electrical services systems
- Selection of fuse sizes installed in plug tops appropriate for the rating of the connected equipment.
- Design of cable or cable containment terminations on to electrical equipment.
- Dimensioning and final installation details of electrical switchgear including.
- Provision of safe operating and maintenance clearances.
- Acceptable cable entries for the final location.
- Detailed design of earthing and bonding requirements for:
- Electrical engineering services.
- Mechanical engineering services.
- Architectural elements.
- Structural elements.
- Design of fixing, connections and bonding details as required for final installation of lightning protection systems.
- Check that cable size selections as specified are not invalidated by the selection of alternative routes during installation or selection of alternative manufacturers.
- Detailed sizing, location, routes and design of electrical containment systems
- Trunking.
- Tray.
- Supporting structures, brackets, fixings etc.
- Design of electrical conduit systems including capacity, location, routes and fixing.
- Verify cable sizes, voltage drops, discrimination and fault handling of cables based on the installation drawings, selected equipment and actual installed cable lengths for:
- CCTV.
- Access control.
- Final detailed design of the fire alarm system including component and cabling requirements to meet with particular manufacturer's recommendations, the engineering specification and requirements of statutory bodies, standards and codes.
- Detailed design of the lightning protection system in accordance with the engineering specification requirements and current code of practice and standards.
- Undertake a study to determine compliance with G5/4 and IEC 61000-2-4 (electromagnetic compatibility)
- Assimilate all relevant technical data including the final selected equipment from all parties prior to the study being undertaken.
- Issue a report on the study findings in due time to suit the requirements of the programme for the Works.
- Verify spatial requirements, routes and anchor points for cable pulling.
- Provide a report confirming the final metering strategy as installed.

PUBLIC HEALTH SERVICES OBLIGATIONS AND RESPONSIBILITIES:

- Detail design of the public health services systems
- Carry out final detailed co-ordination of above and below ground drainage with superstructure and substructure.
- Modify distribution systems and equipment capacities as may be required as a result of final detailed spatial co-ordination.

AUTOMATIC CONTROLS/BMS OBLIGATIONS AND RESPONSIBILITIES:

- Detailed design and development of automatic controls systems insofar as it is required to meet with the operational, functional and spatial requirements of the specification.
- Check the full compatibility of the plant and equipment with the controls system and specified function.
- Prepare:

- Detailed BMS point schedules.
- Wiring schematics.
- Control panel labelling details.
- Equipment schedules for the complete Works.
- Design and incorporation of all interfaces (including relays or other devices or modifications to hardware and/or software).
- Undertake the dimensioning and final installation details of automatic control panels to suit the detailed requirements of the agreed supplier of the controls equipment including provision of safe operating and maintenance clearances and ensuring acceptable cable entries/exits in the final location.
- Final locations of
- Test points.
- Control sensors.
- Detectors.
- Thermostats.
- Sizing of cable terminations on all items of equipment.
- Prepare detailed electrical wiring diagrams of all equipment supplied showing all interconnections between equipment to enable all necessary wiring to be undertaken.
- Detailed sizing, capacity, location, routes and design of electrical containment systems including supporting structures, brackets, fixings etc associated with the automatic controls and BMS
- Conduit.
- Trunking.
- Tray.
- Verify all cable sizes, voltage drops, discrimination and fault handling of cables based on the installation drawings, selected plant/equipment and actual installed cable lengths.
- Ensure that software engineering and programming is completed and undertaken so that systems function in the prescribed manner.

EXISTING SERVICES OBLIGATIONS AND RESPONSIBILITIES:

- Remove the following existing services:

All redundant gas/water/electric utility supplies to the building and redundant mechanical & electrical services installation

- Prepare method statement(s) for the removal of the stated existing services including
- Risk assessments.
- Permit to work.
- Temporary works.
- Method of removal.
- Submit with tender.
- On appointment.
- Prior to commencement of works
- Prepare method statement(s) for the maintenance of existing services
- Prior to commencement of works.
- Maintain the following existing services during the duration of the contract including the provision of any additional work and materials necessary
- All existing services.
- Determine and define any physical site restrictions, constraints and hazards which may affect the undertaking of visual inspections, including health and safety matters, prior to commencement of the Works.
- Assess the general condition of the following services, based on visual inspection, indicating any faults or defects found and recommended where further specialist investigation is required. Prepare a report.
- Prior to commencement of works
- Survey the existing services installations to determine

- Condition.
- Function.
- Size.
- Material.
- Location with respect to existing structure and architecture.
- Safety.
- Maintainability.
- Hazardous substances/materials.
- Compliance with current statutory regulations, codes of practice or normal good practice.
- Incorporate the survey data into the installation information.
- Produce new record drawings for the complete existing.
- Provide supporting detailed reports and photographic material.
- Prior to commencement of works.
- Prior to commencement of the production of the installation drawings.
- Determine the presence of deleterious materials relating to the services. Submit a report to the CA.
- Survey the existing structure
- Incorporate the survey data into the installation information.
- Include the following information:
- Dimensional data.
- All structural data.
- Topographical data.
- Undertake an assessment relating to the prevention and control of legionella.
- Advise on the requirement for any urgent works or required action as a result of non-compliance and any parts of the services installation found to be potentially hazardous.
- Identify special training and other requirements that should be satisfied before commencement of the Works.
- Produce record drawings for the complete existing services.

COMMISSIONING

- Undertake the testing, commissioning, regulation and setting to work of the Works.
- Design all necessary facilities required for setting to work commissioning and testing of the completed installations.
- Appoint an independent specialist responsible for the testing and commissioning.
- Ensure that the commissioning requirements are compatible with any project restraints concerning sectional handover/ phasing.
- Review all designs to ensure that systems are commissionable and highlight for review by the CA any considerations in respect of commissioning.
- Provide a statement
- On appointment.
- Prior to commencement of the Works.
- Provide a report signed, by a competent person confirming, prior to installation that all system designs can be commissioned.
- Incorporate into the systems design the essential components and features necessary to enable the proper preparation and commissioning of the building services.
- Prepare comprehensive commissioning method statements including procedures, logic diagrams and risk assessments for:
- Pre-commissioning checks.
- Setting to work.
- Commissioning and testing.
- System proving.
- Environmental testing of the Works.

- Prepare flushing, chemical cleaning and water treatment method statements, logic diagrams and programme
- On appointment.
- Prior to commencement of Works.
- Provide full certification of water treatment/testing works i.e. chlorination.
- Produce a detailed commissioning programme
- On appointment.
- Prior to commencement of Works.
- Establish procedures with all parties to allow the demonstration of normal, emergency, shutdown and standby mode operation of plant and systems.
- Prepare method statement
- Provision of all necessary facilities to enable tests to be witnessed and inspections carried out including all necessary instruments and recorders to monitor systems during the commissioning and environmental proving period.
- Produce record pro-forma documentation for review by the CA relating to the commissioning and testing of plant and systems
- On appointment.
- Prior to commencement of the Works.
- Co-ordinate the activities of:
- Specialists.
- Manufacturer's.
- Provide all necessary attendance.
- Measure and reconcile noise levels to verify compliance with the design criteria:
- external noise levels.
- internal noise levels.
- Ensure all certification is attained and witnessed as necessary for inclusion in the record documentation.
- Maintain a log of all significant activities during the testing, commissioning and system proving process.
- Record all plant and system settings.
- Provide and submit a report for every test, demonstration, balance or commissioning activity witnessed, together with an engineering appraisal on the performance, either on or off-site.
- Provide a final commissioning report, signed by a competent person, detailing the results of the commissioning and commenting on the performance of systems. The report to confirm that each installation is correctly tested and commissioned, achieves the specified performance and in accordance with CIBSE Code M.
- Demonstrate that equipment is capable of the performance and method of operation specified.
- Demonstrate that the overall and complete systems perform correctly in the required manner and as intended by the specification.

HANDOVER
- Prepare log book(s) in accordance with the requirements of the specification and Building Regulations
- Use CIBSE TM 31 template.
- Appoint an independent specialist author for the production of operating and maintenance manuals. Identify four specialists as part of the tender return.
- Prepare operation and maintenance manuals in accordance with the specified requirements.

Ensure that information needed for inclusion in the operating and maintenance manuals is obtained as the works progress. Identify individual sources of information.
- Produce record drawings.
- Modify the record drawings as the works progress so that all alterations from the installation drawings are recorded as the work proceeds
- Modify and update operating details to reflect commissioning results.
- Record all water, gas and electricity meters on completion of the works.

- Prepare planned preventative maintenance schedules for
- 12 months from practical completion.
- Submit with tender.
- On appointment.
- Prior to commencement of works.
- Instruct the Employer's staff in the use, operation and maintenance of the installations.
- Fully operate and maintain the installations in accordance with the Employer's normal occupational requirements prior to practical completion.
- Prepare a schedule of all spare parts require for the works including recommendations of any others not stated in the specification.
- Prepare a schedule of all tools require for the works including recommendations of any others not stated in the specification.
- Supply and handover over:
- All tools.
- Spares
- Keys

DURING THE 12 MONTHS AFTER PRACTICAL COMPLETION
- Record all plant and system settings following any fine tuning activities.
- Fine tuning activities
- Assess the need for fine tuning of the Works and prepare statement.
- Prepare programme in advance and agree with CA.
- Arrange for the relevant parties to be retained and appointed to provide input to fine tuning activities.
- Planned with regard to the health and safety of occupants and such that any disturbance to them is minimised.
- Attended meetings to deal with issues arising from fine-tuning of the Works.
- Carry out visits to undertake fine tuning of the Works
- As stated elsewhere.
- Provide a mechanism by which the Employer can provide feedback on the performance of the building both before and after fine tuning.
- Ensure that BMS trend logs are maintained
- For the whole of the 12 month period.
- Can be readily accessed by the CA.

520.040 ALTERNATIVE EQUIPMENT:
Where the CA has accepted proposed alternative equipment or materials prior to the award of the contract and which subsequently varies the main works and/or the Works in any way whatsoever, then:
- Be responsible for meeting all the additional costs and technical requirements arising from such a change
- No claim for additional costs or delay to the completion of the works will be allowed.
- Undertake the redesign of all engineering services and builder's work affected by these equipment changes at no additional cost or extension or delay to the programme.
- Be responsible for ensuring that alternative equipment, materials and variations to the Works do not impact on the Target Emissions Rate and on the 'as constructed' calculation Buildings Emissions Rate not achieving compliance.

Should any alternative item proposed not carry appropriate certification, ensure independent testing is carried out to confirm compliance at no additional cost.

520.050 CO-ORDINATION OF SERVICES:
All aspects of the works require detailed co-ordination to avoid any possible clash or conflict with other trades and disciplines. Undertake such co-ordination in relation to the works.

- No extra cost or claim will be allowed due to conflict of works or installations, where full liaison with other trades and disciplines would have prevented such an occurrence.

When any new, revised or updated architectural, structural or services information is issued by the CA under the authority of an instruction, examine such information and if necessary modify the works accordingly to prevent any clashes or abortive work due to such instruction.

- No extra cost or claim will be allowed to cover any clashes or abortive work that result from not requesting an explanation or seeking clarification in respect of any such revision.
- No extra cost or claim will be allowed due to conflict of works or installations, where full liaison with other trades and disciplines would have prevented such an occurrence.

520.060 CO-ORDINATION OF SERVICES ON SITE:

Allow for co-ordinating the contract works with the works of other trades and installations which may be on site during the period of the contract either during or prior to their incorporation into the works.

Where minor clashes of services occur on site that were not foreseeable at the design or co-ordination drawing stage then these clashes or minor co-ordination matters shall be resolved by discussion and agreement with other trades and disciplines. The CA shall be informed of the action to be taken by an approved means.

- No instructions will be issued to cover such minor clashes.

520.070 SURVEYS:

- Ascertain the nature of the site and all local conditions and restrictions likely to affect the execution of the Works.
- Before commencing work, carry out a survey and examination of buildings, structure and engineering services affected by the works.
- Examine all available drawings of the engineering services and report any discrepancies to the CA.

520.080 SITE DIMENSIONS AND LEVELS:

Install all engineering services using a laser levelling system wherever possible and co-ordinate the measurements with all other trades and disciplines to prevent any clashes.

Obtain all dimensions and levels on site for the actual setting out of the works.

As the development advances measure on site all works by others that may foreseeably affect the works. These dimensions shall be incorporated into the installation drawings or marked up on revised drawings if already issued.

- No extra cost or claim will be allowed for any errors arising from inaccurate setting out or failure to check actual site dimensions.
- Reimbursement will be sought for any abortive expenditure.

520.090 MAINTAINABILITY:

Demonstrate that all plant and equipment incorporated into the Works can be safely and easily maintained in full compliance with:

- Health and Safety legislation.
- CDM requirements.
- British Standards.
- Health Technical Memoranda.

Ensure that adequate space is provided for future replacement of plant or parts and that all access panels/doors are unobstructed.

520.100 TERMINAL UNIT LOCATIONS:

The positions of all connection points, accessories, apparatus, equipment and other room terminals shown on the tender drawings are approximate and for guidance in the preparation of the tender.

Agree, with the CA, which terminals are subject to final positioning on site.
Allow for the movement of all such terminals:
- Up to a radius of 3m from the positions shown on the drawings.

Mounting heights indicated in the tender documents are for tender purposes only.
Confirm mounting heights with the CA before commencing work on site.

520.110 CO-OPERATE:
Co-operate with the contractor, other subcontractors, suppliers, local authorities and statutory undertakings in the execution of their work.
In particular, the following works carried out by others will require close and careful liaison and co-operation.

520.120 STATUTORY AUTHORITIES:
Orders for the incoming utility services shall be
- undertaken by The Main Contractor
- Liaise with the Statutory Authorities and provide any test notices required to ensure final connections are made in accordance with the requirements of the programme.

530.000 LOCAL AUTHORITY REQUIREMENTS

530.010 GENERAL:
This section details the requirements for compliance with Local Authority By-laws.

530.020 STATUTORY AUTHORITY APPROVALS:
- Make full and formal submissions to Building Control/District Surveyor at the earliest opportunity to ensure the approval of the Statutory Authorities for the proposed installation works.
- Notify the District Surveyor, Building Control Officer and Fire Officer directly in respect of all tests and demonstrations relevant to life safety installations, and include for all necessary attendance, documentation, etc., to ensure full Statutory Authority approval of the installation.
- Include for all fees and charges legally required under such Act of Parliament, Regulations or By-Laws in respect of the Works.

530.030 AUTHORITY NOTICES:
- Documents requiring the Employer's signature shall be forwarded to the CA in time to meet the contract works programme in order for the necessary test and supply arrangements to be made.
- No additional costs or extension to programme shall be allowed due to reconnections, revisits etc by supply authorities or failure to programme the works.

530.040 BYE-LAWS, NOTICES, ETC:
Observe and comply with the requirements of all Statutes and Bye-Laws.
Serve notices on the Authorities having control of the road surfaces before the same are broken up and likewise serve notices on the owners of sewers, drains, water, gas or other mains, electric cables, tramways and other services which may in any way be affected by the execution of the Works.
Inform all necessary parties when work necessitates such notices to be given.

540.000 HEALTH AND SAFETY

540.010 GENERAL:
- Refer to the Main Contract Preliminaries for the requirements of safety, health and welfare.
- Conform to all safety rules, regulations and codes of practice.
- Check that facilities provided by others fulfil the obligations and advise accordingly.
- Provide all necessary first aid facilities.

- Appoint a "competent person" on the site to manage health and safety during construction.
- Ensure, so far as is reasonably practicable, that all persons employed on, or visiting, the site are adequately informed, instructed, trained, supervised and equipped such that they are able to carry out their duties safely.
- Ensure that safety helmets and other necessary protective clothing are available to site visitors.
- All safety helmets and protective clothing must comply with the latest British Standards.
- Ensure that only authorised persons are allowed into any construction area.
- Ascertain the accuracy and sufficiency of information provided by the Employer or the CA to ensure the safety of all persons and the Works.
- Wherever possible labour saving lifting devices shall be used and materials sized to allow easy manual lifting.

540.020 CDM REGULATIONS:

- The management of health and safety is to be undertaken in conformity with the requirements of The Construction (Design and Management) Regulations 2007,
- Supply any method statements and comply with all CDM procedures required by the CDM Co-ordinator and the Principal Contractor.

540.040 COSHH REGULATIONS:

- Comply with The Control of Substances Hazardous to Health Regulations and The Control of Substances Hazardous to Health (Amendment) Regulations 2003.
- Provide with the tender an assessment of the risks in undertaking the contract works
- Provide with the tender a method statement on the steps proposed to meet the requirements of the Regulations
- Undertake COSHH assessments for all activities and substances provided or used on site to assess their potential health hazards.
- Copies of all relevant COSHH assessments must be issued to the operatives concerned and strictly monitored. Particular attention must be given to the use of glues and sealant.
- Where the use of substances falling within the scope of the Regulations forms part of the contract works notify the CA in writing, together with the additional costs, if any, of use of non-hazardous alternative.
- Ensure during the course of the contract works, and under all circumstances, that all substances falling within the scope of the Regulations are positively so identified at all times and that they are transported, handled, stored, used and disposed of in strict accordance with their manufacturer's/supplier's recommendations.
- Where use of substances falling within the scope of the Regulations are required for the operation and maintenance of the completed contract works, ensure that
- Suitable facilities are available for the on site storage of such substances and that all necessary warning/instruction notices are provided at the point of their storage and use
- Provision of any special protective clothing, eye protection and similar safety equipment for the operation and maintenance of the Works and in sufficient quantity for
- 1 year operation
- Employer's staff have been fully trained in the use, handling, storage, transport and disposal of the substances concerned prior to handover.
- The type, use and control of the substances have been fully and correctly identified in the operating and maintenance manuals/health and safety file.

540.050 ASBESTOS:

- No material or goods containing asbestos shall be incorporated in the contract works.

- Be responsible for certifying at practical completion of any section of the contract works that no asbestos or asbestos related materials have been incorporated or by any sub-contractor employed.

540.060 RISKS TO HEALTH AND SAFETY:
Submit a statement with the tender describing any significant and unavoidable risks which may arise as a result of carrying out the contract works and the measures proposed to safeguard the health and safety of operatives and of any person who may be affected by the contract works.

550.000 BUILDING REGULATIONS REQUIREMENTS

550.010 GENERAL:
This section details the requirements for compliance with the Building Regulations.

550.020 BUILDING REGULATIONS APPROVALS:
- Make full and formal submissions to Building Control/District Surveyor/Approved Inspector at the earliest opportunity to ensure the approval of the relevant Authorities for the proposed installation works.
- Notify the District Surveyor, Building Control Officer and Fire Officer directly in respect of all tests and demonstrations relevant to life safety installations, and include for all necessary attendance, documentation, etc., to ensure full relevant Authority approval of the installation.
- Include for all fees and charges legally required under the Building Regulations in respect of the Works.

600.000 THE SITE

600.010 GENERAL:
This section outlines information on the site.

600.020 SITE LOCATION:
The site is located at –
Holborn Police Station and Associated Office Block,
10 Lambs Conduit Street,
London,
WC1 3NR.

600.030 DESCRIPTION OF THE SITE:
Refer to Main Contract Preliminaries

600.040 THE BUILDING:
Refer to Main Contract Preliminaries

600.050 RISKS TO HEALTH AND SAFETY:
- The nature and condition of the site/building(s) cannot be fully and certainly ascertained before opening up.
- The following risks are or may be present

The employer or the CA do not guarantee the accuracy and sufficiency of this information:
Undertake responsibility to obtain any information required to ensure the safety of all persons and the Works.
Comply with the requirements of the CDM Regulations by
- compiling risk assessments for the contract works.
- providing information on the contract works which might affect the health or safety of any person.
- providing appropriate input to the health and safety plan and file for the works.

700.000 DESCRIPTION OF THE WORKS

700.010 GENERAL:
This section outlines the extent of the works and provides a description in a brief manner of the scope of each of the building services installations.

700.020 SCOPE OF WORKS:
The engineering services included in the Works and covered by this contract comprise:
- Mechanical services.
- Public health services.
- Electrical services.
- Automatic controls.
- Building management system.
- Lift installations.

700.030 EXTENT OF THE WORKS:
- The extent of the Works is detailed elsewhere within this Specification.

720.000 BUILDERS WORK

720.010 BUILDERS WORK PROVIDED:
- Where structural and/or architectural facilities or provisions, for engineering services are already indicated check that these are correct, satisfactory and adequate for the purpose and confirm same in writing to the CA.

720.020 BUILDER'S WORK RESPONSIBILITIES:
- The requirements for and responsibilities with regard to builder's work items are in addition to that normally provided as is normal custom and practice in the building industry.
- Confirm and amplify any information provided by the CA.
- Provide builder's work information, appropriate to the stage of design development. Revise, supplement and/or issue final information, drawings/details for the actual requirements of the contract works.
- Provide fully dimensioned drawings showing both size and position of builder's work making due reference to the structural engineering and architectural final dimensioned detailed drawings.
- As approved by the CA Mark out on site, all cut holes and chases required, any pockets cast in concrete, any inserts, any built in sleeves or similar items.
- All builders work information shall be provided to comply with the programme and include sufficient time for the necessary approvals.
- All materials provided for fixing by others are to be included in the contract works cost and supplied in accordance with the programme.

720.030 SCOPE OF BUILDER'S WORK:
- Builder's work is to be advised by the M&E Contractor to the Main Contractor at tender stage
- The builder's work to be carried out by Main Contractor in conjunction with M&E Contractor input
- Builder's work excludes drilling and/or plugging walls, floors, ceilings etc., for fixings for services and such work is included in the contract works.
- Provide the following as necessary for the complete installation
- all supporting steelwork
- brackets, clamps and fixings
- Pipe, duct and cable sleeves through walls, floors, slabs etc.
- Supply all sleeves and hand-over to others for fixing
- Making good around sleeves to provide correct fire barrier shall be by
- Puddle flanges
- Supply all puddle flanges and hand-over to others for fixing

- Pipe and duct penetrations through the building envelope
- Carry out final weatherproof flashing over pipe or duct angle flange
- On ducts through roofs the provision and fixing of timber or metal up-stands will be by others
- Sanitary fittings
- Undertake water and waste final connections to all sanitary fittings
- Fire dampers
- Supply fire damper frame
- Undertake fixing as part of contract works
- Supply and install fire damper
- Making good around damper frame to provide correct fire barrier
- Duct and louvre connections to walls
- Supply and installation of timber or angle iron frame and making good
- Supply and install all louvres
- External louvres.
- Agree fixing details with all parties prior to ordering louvres
- Supply and fix louvres
- Concrete bases and plinths
- Supply and install holding down bolts
- Where equipment fixings are drilled into bases, undertake drilling and "making good" after installation.
- Making good around holding down bolts after installation
- Included in the contract works
- Inertia pads and inertia block bases
- Where neoprene inertia materials are to be provided in concrete bases supply and hand over materials to others for correct fixing and final construction of base.
- Hand over framework for inertia block bases (including holding down bolts and AV mounts) for others to fix and fill the inertia block with concrete and make good.
- Include filling the inertia block with concrete and making good.
- Steelwork bases
- Supply and install steelwork bases, plinths, channel support steels for fixing and weatherproofing by others.
- Secondary steelwork for support
- Provide suitable secondary steelwork and undertake permanent fixing for the support of engineering services
- Preparation of holes and making good around fixing shall be by others for cast in fixings.
- Anchor points and guides
- Supply and hand over to others for fixing permanently to the building structure
- Ceiling grilles and diffusers
- Cut tiles where appropriate and fix ceiling grilles or diffusers to tiles or ceiling support frame as applicable.
- Undertake final connection of diffuser or grille to ductwork spigot
- Wall or floor grilles or diffusers
- Supply and fix grille or diffuser
- On floor grilles not fixed to a timber frame undertake the final fixing of the grille to match up to final floor finish.
- Preparation of holes or slots, fixing of timber frames and making good around frames for grilles or diffusers
- By others
- Roof or wall fixed fans
- Supply fixing frames, boxes or curbs (other than timber curb up-stands) and hand over to others to prepare hole, fix, weatherproof and make good
- Undertake final fixing of fans
- Anti-vibration mountings
- Install Anti-vibration mountings
- Undertake direct drilling fixings if applicable.

720.040 MARKING OUT OF BUILDER'S WORK HOLES ON SITE:

- If approved by the CA, mark on site actual locations of minor non-structural holes through walls, partitions, floors etc and also chases in non fair-faced walls, etc for conduits, pipes and the like in preference to providing drawings of such builder's work requirements. The CA is to be given the opportunity to inspect prior to work being carried out.
- The CA shall inspect all marking out on site prior to work commencing.
- Establish a method of working with the CA to ensure the works may proceed without hindrance.
- The maximum size for a non-structural hole for marking on site shall be 150mm

720.050 BUILDER'S WORK INFORMATION TO BE PROVIDED:

- All builder's work drawings shall be fully dimensioned.
- Builder's work drawings to be provided shall be as follows:
- Details of all bases for plant formed in concrete, brickwork or blockwork
- Details of all attendant builders work, holes, chases, etc for conduits, cables and trunking etc and any item where access for a function of the installation is required
- Details of all types of purpose made brackets for supporting service or plant/equipment
- Details of all accesses into ceilings, ducts, etc
- Details of all special fixings, inserts, brackets, anchors, suspensions, supports etc
- Details of all sleeves, puddle flanges, access chambers
- Submit all necessary load and thrust calculations with drawings/details.

720.060 STRUCTURAL STEELWORK:

- No steelwork shall be cut, drilled or welded without written approval from the CA.
- The cutting and drilling of structural steelwork shall be agreed with the CA prior to the commencement of the work and shall require application in writing with all necessary drawings/details.
- Fixings to steelwork shall be
- the approved clamp type
- All fixings shall be of the correct size and type for the fixing load applied and the type shall be approved prior to commencement of the works.

720.070 PRE-CAST CONCRETE:

- Holes may not be cut in precast concrete without written approval from the CA.
- Under no circumstances will holes be cut in pre-stressed concrete.

740.000 COMMISSIONING AND TESTING

740.010 DEFINITIONS:

Where used in the documentation the following definitions shall apply and shall be interpreted as such:

- Commissioning: The advancement of an installation from the stage of static completion to working order to the specified requirements
- Testing: The measurement and recording of specified quantifiable characteristics of an installation or parts thereof and includes off site testing.
- Setting to work: The process of setting a static system in motion
- Regulation: The process of adjusting the rates of fluid flow in a distribution system to achieve specified values
- Environmental testing: The measurement and recording of internal environmental conditions
- System proving: the measuring, recording, evaluating and reporting on the seasonal performance of the systems against their design values

- System demonstration: Demonstrating the capability of the installation to achieve and maintain the specified performance criteria
- Fine-tuning: The adjustment of the system where usage and system proving has shown such a need and includes the re-assessment of design values and control set points to achieve the required system performance.

740.020 PROGRAMME:
Prepare comprehensive programmes for the pre-commissioning checks, setting to work, testing, commissioning, system proving and environmental testing of the contract works.

740.030 COMMISSIONING SPECIALIST:
- Employ an independent company who specialises in testing and commissioning of building services to undertake all commissioning and testing activities associated with the contract works
- The commissioning specialist shall be a member of The Commissioning Specialists Association (CSA).
- Specialist to be declared at tender as part of preliminary sub-contractor list.

740.040 COMMISSIONING AND TESTING:
When the contract works or parts thereof are ready for testing and commissioning notify the CA in writing.
All necessary facilities shall be provided to enable tests to be witnessed and inspections carried out including all necessary instruments and recorders to monitor systems during commissioning system proving and environmental testing.
Provide information where access is required into ceiling voids, service risers etc and ensure these points are not closed up until the commissioning and testing is complete.
Where commissioning, testing, balancing, adjustment, is undertaken in an area of the building taken over and occupied by the Employer, then take all necessary precautions against and be responsible for any damage caused whilst working in such areas for that purpose.
Prior to witnessing and inspection by the CA the contract works shall be fully tested, commissioned and be fully operational
Where portions of the work are required to be commissioned and tested separately, then upon final completion, demonstrate to the CA that all the several portions are capable of proper simultaneous operation in accordance with the requirements of the specification.
If testing demonstrates that the plant and equipment is not properly installed and/or not functioning correctly carry out such remedial measures and adjustments as may be necessary and repeat the commissioning and testing procedure to the satisfaction of the CA.
Complete all tests before any paint, cladding or similar materials are applied or before services are concealed.
Ensure all requirements such as cleanliness, protection from harmful external and internal elements are provided prior to commencement of commissioning
Undertake to:
- Commission, test, regulate and set to work the installations that form the contract works.
- Prepare comprehensive programmes, commissioning plans, schedules and method statements and procedures supported by risk assessments for the pre-commissioning checks, setting to work, commissioning, system proving and environmental testing of the contract works.
- Comply with the requirements of the Building Regulations (Approved Document Part L2) for the inspection and commissioning of the building services systems. Prepare all necessary submittals including commissioning plans and reports. Obtain all compliance approvals from the building control bodies.
- Provide all specialist personnel including manufacturer's representatives and coordinate their activities, together with providing any attendance required.

- Prior to commencement of the works submit to the CA for approval sample pro-forma for the various commissioning record and certification documentation.
- Provide reports detailing progress of testing and commissioning activities at intervals agreed with CA.
- Maintain a diary/log of significant commissioning and testing activities.
- Measure and reconcile noise levels at agreed locations to verify compliance with design criteria.
- Submit to the CA all certification documents prior to any system being offered for final acceptance
- Confirm in writing to the CA that each installation has been correctly tested and commissioned and that the performance requirements can be achieved.
- Ensure all certification is attained and witnessed as necessary for inclusion in the record documentation.
- Submit a report for every test, demonstration, balance or commissioning activity witnessed, together with an engineering appraisal on the performance, either on or off-site.
- Co-ordinate and liaise with the Employer's representative.

Maintain on site full records of all testing, commissioning and performance testing.
The extent and proportion of results to be witnessed by the CA will be at the discretion of the CA.

- The CA will
- examine subsequent to setting to work and regulation of the contract works the results of the commissioning and the documentary records thereof.
- only witness test proceedings to establish a level of confidence in the commissioning results being presented.
- confirm recorded results
- determine if the specified requirements have been satisfied.

740.050 STATIC TESTING:
Progressive static testing shall include the following tests, but other tests may be required and witnessed:

- Insulation resistance
- Earth fault loop impedance
- Earth continuity
- Pressure testing of hydraulic systems
- Air leakage testing of ductwork systems

The CA shall be given the opportunity to witness all static tests.
Advance notice of the tests shall be given to the CA.

740.060 PRE-COMMISSIONING CHECKS:
Ensure all pre-commissioning examinations and tests have been undertaken and that each system, including components, or item of equipment is complete and in a safe condition prior to start-up.
All necessary notices shall be displayed.

740.070 FUEL FOR TESTING:
Fuel for testing and operating the contract works shall be included within the contract price and due allowance made within the tender

740.080 SYSTEM DEMONSTRATION:

- Subsequent to the completion of all testing and commissioning to the satisfaction of the CA and when directed operate the plant and demonstrate that the overall systems function correctly in accordance with the requirements of the specification.
- Fully run and operate the following systems to demonstrate correct function in accordance with the requirements of the specification:
- The period of operation shall be:

- Weeks (1 No.)
- Allowed in the programme.
- Be witnessed by the client and any third party of their chosing.
- During this period be responsible for the recording of results and the operation and maintenance of the plant.
- Provide the following:
- An operational report of the demonstration
- Schedule of the conditions maintained within the space for a period of 1 week.

740.090 PLANT AND EQUIPMENT PERFORMANCE TESTING:
Where stated elsewhere plant and equipment shall be tested at the works of the manufacturer or in a recognised and approved testing facility to demonstrate the performance complies with the stated and specified duties.
These tests shall be in addition to works tests as stated elsewhere.
Performance testing shall demonstrate but not limited to the following:
- Full, partial and minimum load
- Response to load change
- Efficiency
- Noise levels

The tests shall be conducted to simulate design conditions and all ancillary plant and equipment needed to support the tests together with all instrumentation shall be provided and included in the contract cost.
Upon successful completion of the performance tests the plant and equipment shall be thoroughly cleaned and returned to its new condition and correctly packaged for delivery to site.
Test certificate records of the tests shall be issued to the CA as stated elsewhere.

740.100 INSPECTIONS AND TESTS:
Submit schedules indicating those parts of the contract works for which inspections and tests are required to substantiate conformity with the specification.
Should any alternative item be proposed that does not carry appropriate certification, ensure independent testing is carried out at no expense to the contract works to confirm compliance.
Provide method statements supported by risk assessments detailing the procedures for carrying out on site tests.
Agree in advance with all parties procedures for inspections and tests including periods of notice.
Where a test indicates non-compliance with the specification submit immediately details of the non-compliance and details for corrective action.
Maintain records of all specified inspections and tests performed including third party and works testing.
Maintain all records on site for inspection.

740.110 TEST CERTIFICATES AND RECORDS:
Ensure that test certificates include:
- project title
- details and date of test
- instruments used, serial numbers, calibration dates
- signature of those witnessing test
- installers name
- specific location of the item in the contract works

740.120 WORKS TESTING:
- All costs of such tests

Where required provide method statements supported by risk assessments detailing the procedures for carrying out the tests.

Notify the CA and all other parties in advance of such tests and provide for approval a programme for the visit, procedures for inspections and testing to be undertaken.
All ancillary plant and equipment needed to support the tests together with all instrumentation shall be provided and included in the contract price.
Should the tests indicate non-compliance with the specification submit immediately details of the non-compliance and proposals for corrective action. No additional costs or extension to the programme will be allowed for re-testing or other non-compliance corrective action.
Signed certificates of tests carried out at the manufacturer's works for any items of plant shall be forwarded to the CA prior to delivery of equipment to site.
Attendance by the CA or otherwise during specified inspections or tests will not reduce the obligations or responsibilities under the contract.
Carry out all tests required by legislation.
Upon successful completion of the testing the plant and equipment shall be thoroughly cleaned and returned to new condition and correctly packaged for delivery to site.

740.130 ENVIRONMENTAL TESTING:
Provide a temporary installation of portable recorders to
- record temperature
- record humidity
- simultaneously record temperature and humidity

740.140 BMS WITNESSING REQUIREMENTS:
- The CA or nominated representative will implement the following witnessing requirements.
- Ensure that on-site commissioning staff facilitate the following witnessing process.
- The BMS hardware is installed in accordance with the requirements as stated elsewhere.
- Verify any operator software and associated graphics.
- Witness completely the control of any main and/or critical items of plant along with a random sample of other points.
- Points witnessing
- If less than 300 points, witness all points.
- Between 300 and 1000 points witness 50% (minimum of 300 to be witnessed).
- If more than 1000 points witness 20% (with a minimum of 500 points witnessed).
- Reserve the right to witness 100% of the points if the failure rate is greater than 5%.
- Witness a sample of specific functions, eg 10% of alarms and 10% of data logging.
- Witness one of several identical items of plant in detail with the others witnessed on a random basis.
- Verify the system security access.
- Verify that all safety-related functions perform to that specified, eg plant shutdown on fire condition.
- Verify all plant restarts according to that specified after building power failure and local power failure.
- Witness all power meter data-points to ensure that they match the meters.
- Ensure that trend logs are used when witnessing points in order to monitor the performance of control actions
- Verify the handover of all operating manuals and system documentation.
- Verify the handover of backup copies of software.
- Verify the completion of any specified system operator training.

740.150 BMS - POST HANDOVER CHECKS:
Ensure that the following post-handover checks are performed:

- Global level checks.
- Internal air temperature.
- Relative humidity.
- Ventilation.
- Energy consumption (ensure that the pulse-input counters match the meters).

Check that each of the above meets the specified requirements.

- System level checks
- Control strategies. Check that any suspect control strategies are appropriate for the intended application. Check that the suspect control strategy has been implemented and commissioned correctly. Check that the control strategy is still appropriate for the intended use.
- Network communications. Check that all relevant field controllers communicate properly. Check for correct sharing between controllers of relevant data and correct inter-controller operation.
- Control set-points. Check that the set-points in question are correct and appropriate.
- Control loop settings. Check that the control loop settings result in accurate and stable control. Check that all self-learnt characteristics are valid.
- Control zones. Check that the control zones are appropriate.
- Occupant controls. Check that occupant controls work correctly.
- Sub-system/component level
- Sensors. Check the accuracy and location of any suspect sensors.
- Actuators. Check that any suspect actuators operate correctly.
- Dampers and valves. Check that any suspect dampers and valves are not jammed and that they operate as intended.

740.160 ROTATING EQUIPMENT:
Immediately prior to practical completion adjust, ease and lubricate moving parts as necessary to ensure easy and efficient operation.
Ensure that temporary electrical supplies are provided to enable rotating plant items delivered and/or installed to be run at regular intervals to avoid damage or deterioration. If temporary electrical supplies are not available ensure that rotating plant is hand-turned.
800.000 DRAWING DEFINITIONS

800.010 GENERAL:
This section defines each of the main drawing types and outlines the extent and content of drawn information.

800.020 THE TENDER DRAWINGS:
Drawings produced to enable those tendering to interpret the Clients requirements and contractor design and to submit a tender for executing all or any part of the Works as defined elsewhere.
The tender drawings are scheduled elsewhere within this specification.

800.030 SKETCH DRAWINGS:
Line diagrams and layouts indicating basic proposals, location of main items of plant, routes of main pipes, air ducts and cable runs in such detail as to illustrate the incorporation of the engineering services within the project as a whole and with respect to any zoning.
M&E Contractor to further develop the design & detail development of tender drawings at tender stage.

800.035 SKETCH SCHEMATICS:
Line diagrams indicating main items of plant and their interrelationship in such detail as to illustrate the incorporation of the engineering services within the project as a whole.

M&E Contractor to further develop the design & detail development of tender drawings at tender stage.

800.040 DETAILED SCHEMATICS:
The M&E Contractor is to produce detailed schematics for the engineering services install. Line diagrams describing the interconnection of components in a system and showing the engineering principles.
The main features of a schematic drawing are as follows

- The drawings include all the functional components that make the system work, such as ducts, pipes, cables, busbars, plant items, pumps, fans, valves, dampers, control devices, strainers, terminals, electrical switchgear and components, security and fire sensors and control equipment.
- Symbols and line conventions in accordance either with a recognised standard, such as ISO or BS, or a supplied legend.
- Drawings labelled with appropriate pipe, duct, busbar and cable sizes, pressures and flow rates.
- The drawings indicate components which have a sensing, control or measurement function.
- Identify major components on the schematic drawing for cross-referencing purposes.
- All data essential to testing and commissioning including:
- Volumetric flow rates.
- Design total pressure losses at equipment.
- Location of dampers.
- Location of valves and flow measuring stations.
- Electrical fault levels.
- Current ratings.
- Short circuit capacities and tripping times.

800.050 DETAILED DESIGN DRAWING:
The M&E Contractor is to produce detailed drawings for the engineering services install. A drawing showing the intended locations of plant items and service routes shall be provided, in such detail as to indicate the design intent. The main features of detailed design drawings should be as follows:

- Plan layouts to a scale of at least 1:100.
- Plant areas to a scale of at least 1:20 and accompanied by cross-sections.
- The drawing will not indicate the precise position of services, but it should nevertheless be feasible to install the services within the general routes indicated. It should be possible to produce co-ordinated working drawings or installation drawings without major re-routing of the services.
- Pipework and cable containment represented by single line layouts.
- Ductwork represented by either double line or single line layouts as required to demonstrate that the routes are feasible.
- Symbols and line conventions in accordance with either a recognised standard, such as ISO or BS, or supplied legend.
- The drawing should indicate the space available for major routing in both horizontal and vertical planes.

800.060 CO-ORDINATED WORKING DRAWINGS:
The M&E Contractor is to produce detailed drawings for the engineering services install. Drawings showing the inter-relationship of two or more engineering services and their relation to the structure and building fabric. The main features of co-ordinated working drawings are:

- Plan layouts to a scale of at least 1:50, accompanied by cross-sections to a scale of at least 1:20 for all congested areas.
- The drawings should make allowance for installation working space and space to facilitate commissioning and maintenance.

- The drawings should be spatially co-ordinated and there should be no physical clashes between components when installed. Critical dimensions, datum levels and invert levels should be provided.
- The spaces between pipe and duct runs down on the drawing should make allowance for the service at the widest point. Insulation, standard fittings dimensions and joint widths should therefore have been allowed for on the drawing.
- The drawing should indicate positions of main fixing points and supports where they have significance to the structural design of spatial constraints.

800.070 INSTALLATION DRAWING:
The M&E Contractor is to produce detailed schematics for the engineering services install.

A drawing based on the detailed drawing or co-ordination drawing with the primary purpose of defining that information needed by the tradesman on site to install the works. The main features of installation drawings should be as per co-ordinated working drawings plus:
- Allowances should be made for inclusion of all supports and fixings necessary to install the works.
- The drawing should make allowances for installation details provided from manufacturer's drawings.
- Allowances should be made for plant and equipment. This includes any alternatives to the designers original specified option that have been chosen.

800.100 MANUFACTURER'S DRAWING:
Drawing prepared by a manufacturer, fabricator or supplier for a particular project, and which is unique to that project. Examples include drawings for ductwork, pre-fabricated pipework, sprinkler systems, control and switchgear panels and associated internal wiring, pre-fabricated plant, customised plant and equipment.

800.120 RECORD DRAWING:
Drawing showing the building and services installations as installed at the date of practical completion. The main features of the record drawings should be as follows.
- The drawings should be to a scale not less than that of the installation drawings
- Locations of all mechanical, electrical and public health systems and components installed including ducts, pipes, cables, busbars, plant items, pumps, fans, valves, dampers, control devices, strainers, terminals, electrical switchgear and components, security and fire sensors and control equipment.
- The drawing should be labelled with appropriate pipe, duct and cable sizes, pressures and flow rates.
- The drawings should have marked on them positions of access points for operating and maintenance purposes.
- The drawings should not be dimensioned unless the inclusion of a dimension is considered necessary for location.

BUILDER'S WORK DETAILS
Drawing to show requirements for building works necessary to facilitate the installation of the engineering services.
Unless stated or agreed with the CA the following builder's work details can be marked out on site:
- Holes less than the threshold dimension stated elsewhere.
- Electrical socket and switch boxes.
- Openings that are best cut into blockwork and partitions.

Builder's work drawn information to be provided shall include:
- Details of all bases for plant formed in concrete, brickwork or blockwork to a scale of not less than 1:20

- Details of all attendant builders work, holes, chases, etc for conduits, cables and trunking etc and any item where access for a function of the installation is required to a scale of not less than 1:100
- Details of all purpose made brackets for supporting service or plant/equipment to a scale of not less than 1:50
- Details of all accesses into ceilings, ducts, etc at a scale of not less than 1:50
- Details of all special fixings, inserts, brackets, anchors, suspensions, supports etc at a scale of not less than 1:20

800.170 PLANTROOM SCHEDULES AND SCHEMATICS:
Provide good quality plant and switch room drawings, schedules, schematics and instructions and hang in the respective plant room or any other appropriate location or where directed by the CA.
Protect surfaces of such information by
- Pressure lamination.
- Framing under glass or other rigid, transparent, cleanable and protective surface.

Hang using suitable fixings and provide backboards if necessary
A sample shall be submitted for approval to the CA prior to commencing production.
- Schematic drawings of circuit layouts showing:
- Location, identification and duties of equipment.
- Location of controls devices.
- Circuit layout.
- Valve schedules in the form of printed sheets showing the number, type, location, application/service and symbol, and normal operating position of each valve.
- Control schematics.
- Location of mechanical and electrical plant and equipment items.
- First aid instructions for treatment of persons after electric shock.
- Location of isolating switch for electricity supply.
- Location of main incoming gas valve serving gas meter and isolation point.
- Location of main incoming water main and isolation point.
- Location of sprinkler fire main control valve.
- Emergency operating procedures and telephone numbers for emergency call out service applicable to any system or item of plant and equipment.
- All other items required under Statutory or other regulations.

810.000 RECORD DOCUMENTATION

810.010 STANDARDS:
Provide operating and maintenance manuals, system records and full documentation in accordance with the following standards
- BS 4737 and BS EN 50131-1 - Intruder alarm systems.
- BS 5839 - Fire detection and alarms in buildings.
- BS 6651 - Protection of structures against lightning.
- BS 7671 - Requirements for electrical installations.(IEE Wiring regulations)
- BS EN 12170 - Heating Systems with a trained operator
- BS EN 12171 - Heating Systems not requiring a trained operator
- Building Regulations (Approved Document Part L2)
- Comply with the requirements of the CDM Regulations in providing the appropriate input to the health and safety file for the contract works.

810.020 RECORD DOCUMENTS:
Provide:
- Record drawings and schedules.
- Plant room and switch room drawings, schedules and schematics.
- Operating and maintenance manuals.
- Blank maintenance logs.
- Log books

- in accordance with CIBSE TM 31.
- Ensure record documents clearly record the arrangements of the various sections of the Works as actually installed and identify and locate all component parts.
- Ensure record documents make it possible to comprehend the extent and purpose of the Works and the method of operation thereof.
- Ensure record documents set out the extent to which maintenance and servicing is required and how, in detail, it should be executed.
- Ensure record documents provide sufficient, readily accessible and proper information to enable spares and replacements to be ordered.
- Correlate record documents so that the terminology and the references used are consistent with those used in the physical identification of the component parts of the installations.
- Demonstrate as required throughout the execution of the contract works that complete and accurate records are being maintained and that the record documents are being progressively compiled as the work on site proceeds.
- Ensure that building log books contain all the information necessary to comply with the Building Regulations Approved Document Part L2.

810.030 RECORD DRAWINGS AND SCHEDULES:
- Prepare record drawings and schedules based on the As Installed Drawings maintained on site during the progress of the contract works.
- The scale of the drawings shall be not less than .
- Each record drawing shall show the following information:
- The name of the contract and, where appropriate, the zone or floor designation.
- Description of drawing, drawing reference and scale.
- Name and address of the installer and the consultant.
- Endorse all such documents
- 'Record drawings'
- Where agreed with the CA certain detailed information may be provided in schedule form.
- Where portions of the work are to be concealed, draft copies of record drawings shall be supplied to the CA before the work is concealed in order to facilitate checking and examination.
- Prepare electrical drawings in accordance with BS EN 61082.
- Issue at practical completion the complete approved package of record drawings in the following numbers and format:
- CAD format on CD disk. Each CD shall be labelled and the CD jewel cases shall be labelled identifying project title, issue date and index of contents.
- Number of sets of complete record drawings (no)
- 'White' prints.
- Number of sets of complete record drawings (no)
- Provide reduced scale copies for inclusion in the operating and maintenance manuals as stated elsewhere.

Record drawings and schedules must include, but are not limited to:
- Location, including level if buried, of utility service connections, including those provided by the appropriate Authority, indicating points of origin and termination, size and material of service, emergency shut-off isolation locations, pressure and/or other relevant information.
- Disposition and depth of all underground systems.
- Schematic drawings of each system indicating principal items of plant, equipment, zoning, means of isolation, etc. in sufficient detail to make it possible to comprehend the system operation and the inter-connections between various systems.
- Details of the principles of application of automatic controls and instrumentation.
- Diagrammatic dimensioned plans and sections of each system or service showing sizes and locations of all ancillaries, plant, equipment controls, test points, and means of isolation etc. including any items forming an integral part of the engineering

systems provided by others (such as plenum ceilings, builders' work shafts, chimneys etc.).

- Identification of all terminals/cables etc. by size/type and duty/rating as recorded from the approved commissioning results.
- Detailed wiring drawings/diagrams/schedules for all systems, including controls, showing origin, route, cable/conduit size, type, number of conductors, length, termination size and identification, and measured conductor and earth continuity resistance of each circuit. Ensure routes indicate if cable/conduit is surface mounted, concealed in wall chase, in floor screed, cast in-situ, above false ceiling etc.
- Details of co-ordination of wiring and connections with cable core identification, notation of fire alarm, security, control and instrumentation and similar systems provided as part of the Works.
- Details to show inter-connections between the Works and equipment or systems provided by others to which wiring and connections are carried out as part of the Works.
- Location and identity of each room or space housing plant, machinery or apparatus.
- Dimensioned plans and sections of plantrooms, service subways, trenches, ducts and other congested areas where in the opinion of the CA smaller scale drawings cannot provide an adequate record. Indicate the location, identity, size and details of each piece of apparatus.
- The scale of drawings to be
- Manufacturer's drawings of equipment indicating
- general arrangement and assembly of component parts which may require servicing.
- internal wiring diagrams together with sufficient physical arrangement details to locate and identify component parts.
- Schedules as required to locate, reference and provide details of ratings and duty of all items incorporated into the Works together with all fixed and variable equipment settings established during commissioning.
- For each programmable control item
- schedules indicating for each input and output point connected
- full data in respect of that point including reference
- type of input/output
- connected equipment reference
- set values of temperature or pressure etc
- set values of start/stop/speed change times etc
- alarm priority
- control specification reference
- any other such applicable parameters
- Each spare input and output point including reference, type of input/output and space for future entry of appropriate parameters as listed above.
- Logic flow diagrams for each individual control or monitoring specification and for each building services engineering system to illustrate the logical basis of the software design.
- Schedules setting out details of all initial values of user-defined variables, text statements for alarm messages etc.

810.040 PLANT ROOM AND SWITCH ROOM DRAWINGS, SCHEDULES AND SCHEMATICS:

Provide good quality plant and switch room drawings, schedules, schematics and instructions and hang in the respective plant room or any other appropriate location or where directed by the CA.

- Protect surfaces of such information by
- Pressure lamination
- Framing under glass or other rigid, transparent, cleanable and protective surface

- Hang using suitable fixings and provide backboards if necessary
- A sample shall be submitted for approval to the CA prior to commencing production.
- Schematic drawings of circuit layouts showing:
- Location, identification and duties of equipment
- Location of controls devices
- Circuit layout
- Valve schedules in the form of printed sheets showing the number, type, location, application/service and symbol, and normal operating position of each valve.
- Control schematics.
- Location of mechanical and electrical plant and equipment items.
- First aid instructions for treatment of persons after electric shock.
- Location of isolating switch for electricity supply.
- Location of main incoming gas valve serving gas meter and isolation point.
- Location of main incoming water main and isolation point.
- Location of sprinkler fire main control valve.
- Emergency operating procedures and telephone numbers for emergency call out service applicable to any system or item of plant and equipment.
- Location of metering facilities.
- All other items required under Statutory or other regulations.
- Prepare electrical drawings in accordance with BS EN 61082.

810.050 OPERATING AND MAINTENANCE MANUAL SPECIALIST:
- Employ a specialist to prepare the operating and maintenance manuals.
- Submit details of the proposed specialist to the CA for approval

810.060 PRESENTATION OF THE OPERATING AND MAINTENANCE MANUALS:
- Agree format and contents with the CA.
- Provide the operating and maintenance manuals in the following form:
- Encase the manuals in A4 size, plastic-covered, loose leaf, four ring binders with hard covers, each indexed, divided and appropriately cover- titled. Fold drawings larger than A4 and include in the binder so that they may be unfolded without being detached from the rings.
- Electronic format stored on CD
- Provide copies of the operating and maintenance manual as follows:
- Draft copies for comment (1no)
- Final copies for Client use (3no)
- Provide a draft copy of the operating and maintenance manual to the CA for comment
- Weeks before the contract completion date (4 no)
- The draft copy of the manual shall conform to the final format required by the specification to enable all relevant comments to be made by the CA.

810.070 OPERATING AND MAINTENANCE MANUALS:
NB. A proposed O & M contents page shall be issued within 10 days of appointment for review and approval of the CA.
The operating and maintenance manuals must include:
- A full description of each of the systems installed, written to ensure that the Employer's staff fully understand the scope and facilities provided.
- A description of the mode of operation of all systems including services capacity and restrictions.
- Diagrammatic drawings of each system indicating principal items of plant, equipment, valves etc.
- A photo-reduction of all record drawings together with an index. Reduced size of drawings to be
- Legend of all colour-coded services.

- Schedules (system by system) of plant, equipment, valves, etc., stating their locations, duties and performance figures. Each item must have a unique number cross-referenced to the record and diagrammatic drawings and schedules.
- The name, address and telephone number of the manufacturer of every item of plant and equipment together with catalogue list numbers.
- Manufacturer's technical literature for all items of plant and equipment, assembled specifically for the project, excluding irrelevant matter and including detailed drawings, electrical circuit details and operating and maintenance instructions.
- A copy of all test certificates, inspection and test Records, commissioning and performance test records including, but not limited to, electrical circuit tests, corrosion tests, type tests, start and commissioning tests, for the installations and plant, equipment, valves, etc., used in the installations.
- A copy of all manufacturer's guarantees or warranties, together with maintenance agreements offered by subcontractors and manufacturer's.
- Copies of insurance and inspecting Authority certificates and reports.
- Starting up, operating and shutting down instructions for all equipment and systems installed.
- Control sequences for all systems installed.
- Schedules of all fixed and variable equipment settings established during commissioning.
- Procedures for seasonal change-overs and/or precautions necessary for the care of apparatus subject to seasonal disuse.
- Detailed recommendations for the preventative maintenance frequency and procedures which should be adopted by the Employer to ensure the most efficient operation of the systems.
- Details of lubrication for lubricated items including schedules of lubricant type, frequency, etc.
- Details of regular tests to be carried out (e.g. water analysis for pseudonomas.)
- Details of procedures to maintain plant in safe working conditions.
- Details of the disposal requirements for all items in the works.
- A list of normal consumable items.
- A list of recommended spares to be kept in stock by the Employer, being those items subject to wear or deterioration and which may involve the Employer in extended deliveries when replacements are required at some future date.
- A list of any special tools needed for maintenance cross-referenced to the particular item for which required.
- Procedures for fault finding.
- Emergency procedures, including telephone numbers for emergency services.
- Hospital Operational Policy.
- Back-up copies of any system software.
- Documentation of the procedures for updating and/or modifying software operating systems and control programmes.
- Instructions for the creation of control procedure routines and graphic diagrams.
- Details of the software revision for all programs provided.
- Two back-up copies of all software items, as commissioned.
- Copies of relevant HSE/CIBSE/IET Guidance notes etc.
- Contractual and legal information including but not limited to
- details of local and public authority consents
- details of design team, consultants, installation contractors and associated subcontractors
- start date for installation, date of practical completion and expiry date for the defects liability period
- details of warranties for plant and systems including expiry dates, addresses and telephone numbers.
- A provision for update and modification.

810.080 PROVISION OF INFORMATION:

- Co-operate with the specialist firm in the compilation of the manuals and provide them with copies of the following:
- Diagrammatic drawings of each system indicating principal items of plant, equipment, valves etc.
- Record drawings, together with an index.
- Plant room and switch room drawings, schedules and schematics, together with an index.
- Legend for all colour-coded services.
- Schedules (system by system) of plant, equipment, valves etc, stating their locations within the building, duties and performance figures.
- All Test Certificates, Inspection and Test Records, Commissioning and Performance Test Records (including, but not limited to, electrical circuit tests, corrosion tests, type tests, start and commissioning tests) for the installations and plant, equipment, valves, etc., used in the installations.
- All manufacturer's guarantees or warranties.
- Copies of insurance and inspecting Authority certificates and reports.
- Schedules of all fixed and variable equipment settings established during commissioning.
- Back-up copies of any system software.
- Two back-up copies of all software items, as commissioned.

900.000 COMPLETION AND HANDOVER

900.010 GENERAL:
This section details the requirements and procedures for completion and handover.

900.020 HANDOVER REQUIREMENTS:
As a pre-requisite to Practical Completion in respect of the contract works or part thereof, demonstrate to the satisfaction of the CA that:

- All the contract works are complete.
- With the exception of minor snags or limited defects as agreed with the CA that could be reasonably completed within an agreed programme without causing disruption to the Employer's use of the building or part thereof.
- All spares, keys, tools and other consumables as stated elsewhere have been supplied and handed over to the Employer.
- The instruction of the Employer's staff in the use and correct operation of the installation has been completed satisfactorily. In particular, safety devices and controls demonstration.
- All commissioning and testing completed
- including the issue of a final commissioning report signed by an approved competent person
- A complete demonstration of the contract works with fully functional operational controls tested has been undertaken in the presence and to the satisfaction of the CA.
- All necessary certification by the Employer's insurers has been completed.
- All approved record documentation including record drawings, operation and maintenance manuals, etc is issued
- All information required for the health and safety file is issued to the satisfaction of the Planning Supervisor.

The information shall include:

- A written description of plant operation.
- Control strategy/logic diagrams recording the final version of configuration software installed at handover.
- Details of system application software configuration.
- A points list including hard and soft-points (all points should have a unique mnemonic).
- A description of user adjustable points.
- Commissioning record details.
- Detailed data sheets for all control components and equipment.

- Wiring circuit details including origin, route and destination of each cable.
- Basic security access to the system.
- Comprehensive instructions for switching on, operation, switching off, isolation, fault finding and procedures for dealing with emergency conditions.
- Instructions for any precautionary measures necessary.
- Instructions for the routine operation of the control system including simple day-to-day guidance for those with limited technical skill.
- Instructions for servicing and system upkeep.
- A provision for update and modification.
- All necessary Statutory Authority approvals have been undertaken and written confirmation established
- Completion and issue of log books in accordance with Building Regulations.
- Air permeability test certificate in accordance with Building Regulations.
- Should adequate record documentation not be available Practical Completion will not be granted.

900.030 READING OF METERS:
Record readings of all water, gas, and electricity meters immediately on completion of the Works and forward to the CA.

900.040 RECOMMENDED SPARE PARTS:
Before Practical Completion submit to the CA a schedule of spare parts as stated elsewhere and recommend any that should be obtained and kept in stock by the Employer for maintenance of the installations included in the Works.
State against each item the manufacturer's current price, including packaging and delivery to site. Identify those items that are additional to those specified for inclusion as stated elsewhere.

900.050 INITIAL SUPPLY OF ADDITIONAL SPARE PARTS:
Submit to the CA a quotation, priced in detail, for the initial supply to the Employer of the additional spare parts identified elsewhere and including for:
- Checking that each spare part is suitable for the replacement of the corresponding part supplied with the item of plant or equipment.
- Checking receipt, marking and numbering in accordance with the schedule of spare parts.
- Referencing to the plant and equipment list in the operation and maintenance manual.
- Painting, greasing, etc. and packing to prevent deterioration during storage.

900.060 RECOMMENDED TOOLS:
Prior to Practical Completion submit to the CA a schedule of tools and portable instruments as stated elsewhere and recommend any that should be obtained and kept in stock by the Employer for maintenance of the installations included in the Works.
- State against each item the manufacturer's current price, including packaging and delivery to site. Identify those items that are additional to those specified for inclusion as stated elsewhere.
- Submit to the CA a quotation, priced in detail, for the initial supply to the Employer of the additional tools identified under the clause headed 'recommended tools'.
- Include for the following.
- Checking that each item is suitable for the intended application.
- Checking receipt, marking and identifying.
- Referencing, where appropriate, to the plant and equipment list in the Operation and Maintenance Manual.
- Protecting, greasing, etc. and packing to prevent deterioration.
- Providing a suitable means of storing and securing same.

900.070 SUPPLY OF TOOLS:
Provide all tools, keys and portable instruments as detailed elsewhere prior to practical completion and additional items if so instructed by the CA.

900.080 INSPECTION BY EMPLOYER'S INSURERS:

Where indicated elsewhere installations, equipment, plant or materials are to be inspected by a representative acting for the Employer's insurers.
The installations, equipment, plant or materials shall satisfy the insurance company's requirements in all respects.

- Inform the CA when the installation or equipment is ready for examination
- Provide a programme for the inspection and certification by the Employer's insurers.
- All necessary information shall be provided to enable the insurers to approve the design before manufacture.
- Arrange for the attendance of the insurance company's representative at agreed stages of manufacturer and installation.
- All necessary attendance, access and facilities for inspecting and testing as is required shall be provided.
- Certification shall have been received from the insurers before equipment or installations subject to inspection and certification will be accepted on behalf of the Employer.
- The order with the insurance company will be placed by the Employer
- All insurance company charges will be
- paid for by the employer

900.090 TRAINING OF EMPLOYER'S STAFF:
Prior to Practical Completion explain and demonstrate the purpose, function and operation of the installations including all items and procedures listed in the operation and maintenance manual

- to the Employer's maintenance staff.
- to the operational staff.

Submit to the CA for approval a detailed programme for the training of the Employer's staff.

- Employ the services of relevant specialists and suppliers for the purpose of training and instruction.
- Provide each person with a comprehensive set of teaching notes and diagrams.
- Be responsible for the correct operation and maintenance of the installation during such periods of instruction.
- All costs associated with the instruction of the Employer's personnel and required attendance following practical completion shall be included in the contract price.
- Following practical completion and occupation be available for a period as agreed with the CA to assist the Employer's personnel in the operation of the various systems together with the
- controls specialist
- commissioning specialist

Training

- Number of persons to be included for training is
- Include for not less than indicated number of operating days for this purpose and demonstrate the safe day to day running and maintenance of all systems, plant and equipment.
- Provide training for the operation of the controls, monitoring or BMS installations as follows.
- Carry out initial training at the works of the controls supplier.

- Include hands on experience of equipment and software similar to the installation.
- Include instruction on the procedures for testing and routine inspection of sensors and actuators to enable the operator to assess the nature of faults and extent of remedial action required.
- Provide all appropriate reference and training manuals.
- Complete initial instruction prior to commissioning of the installed system.
- Provide site instruction on the installed system.
- Include for training operating staff (no)
- Include for not less than indicated number of operating days for this purpose and demonstrate the safe day to day running and maintenance of all systems, plant and equipment.

900.100 OPERATION OF SYSTEMS BEFORE THE PRODUCTION OF DRAWINGS AND/OR OPERATING AND MAINTENANCE MANUALS:

- Provide attendance, at no expense to the Employer, to put into service, operate 24 hours a day and maintain the systems to the Employer's requirements, including the provision of suitable competent labour, in the event that the Record Drawings and/or Maintenance Manuals are not available when the Works would, in the opinion of the CA, otherwise qualify for Practical Completion.
- In the event of the Subcontractor failing to provide this service satisfactorily the Employer shall be entitled to make his own arrangements and recover the full cost through

910.000 MAINTENANCE

910.010 MAINTENANCE OF EXISTING SERVICES:

- Fully maintain the following existing services during the progress of the contract works
- Include in the contract price all costs to maintain the existing services at all times during the duration of the contract works.
- Submit with the tender a method statement outlining how the maintenance works is to be undertaken including any necessary specialist maintenance.
- Prior to commencement of the contract works submit a method statement to the CA outlining how the existing services are to be maintained including all planned and preventative maintenance measures.
- Provide any additional work and materials necessary to maintain these services at all times during the duration of the contract works.
- Make all connections to existing services out of normal working hours.
- Existing services disturbed or damaged during the contract works are to be reinstated
- Submit to the CA a method statement outlining the method and procedures for the remedial and reinstatement works.
- Any shut down of existing services to undertake remedial and reinstatement works shall be to an agreed procedure.
- Reinstate fully in accordance with the standards of quality as defined in the specification and to the satisfaction of the CA.

910.020 PROPOSALS FOR ANNUAL MAINTENANCE CONTRACT:

- Submit with the tender a supplementary proposal for an annual maintenance contract for the following:
- The proposal should include for
- Planned preventative maintenance to maintain the installations in efficient working order including routine checks, adjustments, lubrication and replacement of consumable spares, etc.
- Preparation of work schedules and recording activities.
- Providing breakdown and emergency cover.
- Planning and undertaking shut-downs for maintenance works.

- Employing of all necessary specialist maintenance.
- Attendance on and supervision of specialist maintenance.
- Carrying out all necessary safety checks.
- Carrying out system proving of the works to include the measuring, recording, evaluating and reporting on the seasonal performance of the systems against their design values.
- Water sampling including laboratory analysis and monitoring of heating, chilled, domestic water systems.
- Liaison with the employer.

The proposal should set out the terms of the offer, the work to be carried out, the guarantees of performance and the price of the first 12 months after Practical Completion of the contract works or section thereof.
The proposal will not necessarily be considered as part of the tender for the contract works and the Employer does not undertake to accept it.
Details of all the above shall be included within the required Asset schedule, requested previously above.