KJ TAIT ENGINEERS

MRC LABORATORY OF MOLECULAR BIOLOGY

NEW IT ROOM IS001

CAMBRIDGE

SPECIFICATION – VOLUME 1

OUTLINE OF ENGINEERING SERVICES

REVISION P03

TENDER ISSUE

Document History

SUITABILITY	REVISION	DATE	DETAILS	BY	CHKD
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How to Use This Specification

The MEP specification is divided into several volumes:

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0005	MEP Engineering Services Preliminaries
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All volumes of the specification shall be read in conjunction with all other specifications, drawings schedules and noted contract documentation. The Contractor shall allow for the mechanical, electrical and public health services installations to fully comply with the requirements of all specification volumes. If any discrepancies are found between volumes then the particular requirements of Volume 1 shall take precedence subject to written confirmation from KJ Tait Engineers.

The Specification sets out the principal requirements of the installation but does not relieve the Contractor of his responsibilities for any part of the installation to achieve the necessary performance.

1.0 INTRODUCTION

1.1 General

This Specification, the associated design drawings and the Materials and Workmanship Specifications define the performance required for the design and installation of the Mechanical and Electrical engineering services proposed for installation of a new IT Room within the Laboratory of Molecular Biology Building, Cambridge. The Mechanical and Electrical services design are described in the following sections.

1.2 Outline Scope of Works

Description of Works

The works comprise the conversion of an existing room (1S001) in the Ground Floor Zone D of the LMB Building to form a new IT room. The new IT Room will have provision for a total of twelve server racks to serve Cryo-EM data. The services infrastructure serving the room will be upgraded to support the full comms provision of 12No racks, including UPS power modifications, switchgear alterations and cooling provision. The initial room fit out shall incorporate 5No comms racks, i.e. the north row with space for a future 6th rack to be added to the east end. The south row of 6No comms racks will be installed in future.

Mechanical Services

The Contractor shall be responsible for the completion of the design where applicable and the supply, installation (including fabrication and delivery to site), testing, balancing, commissioning and setting to work the complete mechanical installation to the standards and regulations specified, together with all planning and management necessary to ensure a logical, efficient and satisfactory execution of the works.

The mechanical services shall include the following services in their entirety:

Alteration of existing Processed Chilled Water (PCHW) pipework system
Installation of new IT-PCHW pipework to room IS001
Installation of server rack cooling system

The above summary is intended for the general guidance of the Contractor only in the preparation of their tender. No omission from this description shall relieve the Contractor of his obligation to carry out the whole of the works hereinafter described.

Electrical Services

The Contractor shall be responsible for the completion of the design where applicable and the supply, installation, testing and commissioning of the complete electrical installation to the standards and regulations specified, together with all planning and management necessary to ensure a logical, efficient and satisfactory execution of the works.

The electrical services shall include the following services in their entirety:

Main switchgear
Containment systems
Sub-main distribution cabling and switchgear
Electrical services associated with mechanical plant supplies
Earthing and bonding

1.3 Design Responsibility

KJ Tait Engineers are responsible for fully detailing the scheme including the outline drawings and performance specification for all aspects of the mechanical and electrical services installations, with the exception of any Contractor Designed Portions (CDPs).

The Contractor shall be responsible for any Contractor Designed Portions as identified in the Contractor Design Responsibilities Specification, and for the supply, installation (including fabrication and delivery to site), testing, balancing, commissioning and setting to work the complete mechanical and electrical installation to the standards and regulations specified, together with all planning and management necessary to ensure a logical, efficient and satisfactory execution of the works.

This report shall be read in conjunction with all other documentation produced by the Employer, Architect, Contract Administrator, Quantity Surveyor, Structural Engineer, Fire Engineer, Acoustic consultant and Landscape Architect.

1.4 Health and Safety/CDM

Consideration of health and safety shall be paramount at all times.

All risks and hazards associated with the MEP services installations have been and will continue to be reviewed throughout the design and construction process and all residual risks and hazards will be designed out as far as is practicable.

Residual or unusual hazards shall be clearly identified on our drawings and/or in our Designer's Risk Assessments to ensure that those carrying out the work are made aware.

1.5 Site Visit

It is highly recommended that the Contractor visits the site before submitting their tender to allow for all matters affecting the work, including restrictions imposed by the Employer, local conditions and accessibility of the site to be factored into the tender. Access to site shall be arranged in advance through the Client.

If the Contractor fails to attend site during the tender period any costs incurred as a result of this omission will not be considered.

1.6 Disruption and Shutdowns

It should be noted that the works are to be carried out in a live, business critical building that operates continuously.

All intervention works that may impact on the operation of the existing facilities must be carefully planned and coordinated with all parties well in advance to minimise disruption. The sequencing of the works needs to reflect this and ensure that any down time is kept to the absolute minimum. A permit to work shall be signed off by LMB prior to any works starting.

All interventions shall be undertaken during approved timeframes, which are likely to be outside of normal hours, therefore there is a requirement for the Contractor to work 'out of hours' and to phase the works to coordinate with approved intervention periods. Timings for the beginning and end of any shutdown shall be carefully coordinated between the Contractor and the Employer to suit necessary time frames to wind down the site, carry out the changeover works and return the site to full operational state ready for business to resume.

Works that do not involve an intervention to or shutdown of business-critical equipment can be carried out during normal working hours but any high-risk works must be carried out during an approved intervention period.

The organisation and coordination of the works will require close liaison with the Employer, KJ Tait and the Contractor. The Contractor shall provide detailed work programmes for the installation works, with particular emphasis on the shutdown periods. Work programmes shall be provided in advance and in good time to allow full review, comment and any subsequent revisions to be incorporated and resubmitted for approval.

1.7 System Validation

The Contractor shall fully validate all systems affected by the works to determine the condition and performance of the existing systems. Any defects or faults with the systems shall be highlight prior to any works being carried out. In particular, the following shall be carried out:

Water quality tests on the primary and secondary chilled water systems.
Chilled water flow rates.
Chilled water pressurisation.
BMS system operation.

The above list is not exhaustive and does not preclude carrying out a full validation of all affected systems.

1.8 Testing, Commissioning & Record Information

All services affected and modified by the proposed works shall be tested and commissioned, in accordance with the relevant codes of practice, regulations and manufacturer's recommendations. All commissioning data shall be recorded and all certification required by relevant BS and EN Standards shall be provided and included in the O&M manual.

As Installed record drawings, test certificates, O&M information and H&S information for all systems shall be provided. All record information shall be provided in electronic and paper format.

All systems affected by the works shall be updated and recommissioned to reflect the new layouts and system configurations, including BMS and fire alarm.

1.9 System Proving/Seasonal Commissioning

The seasonal performance of all mechanical systems shall be measured, recorded, evaluated and reported against their design values. The Contractor shall allow for revisiting the building over the first 18-month period after Practical Completion to carry out final control system adjustment to ensure the systems are set up efficiently to meet the design criteria and user requirements

1.10 Builders Works

All builders work and making good of all finishes affected by the works shall be carried out as part of the project works. All fire stopping where services pass through a fire rated construction shall be reinstated, made good and certified to match the rating of the existing construction.

1.11 Procurement

Reference should be made to UK SBS procurement documentation for further details.

1.12 Work Package Coordination

The Contractor(s) shall note that separate Minor Works packages may be implemented on site at the same time as the Major Works packages. Minor Works packages will be let and administered separately by the Client.

In addition, should the Major Works packages be let individually, other Major Works package contractors are likely to be on site concurrently.

The Contractor(s) shall make due allowance for coordinating their works with all other Major and Minor Works package contractors and shall allow for working concurrently with other contractors who may be carrying out works at the same time. All Contractors shall work together and coordinate their works with others and with the assistance of the Client/Project Manager/Engineer.

2.0 MECHANICAL ENGINEERING

2.1 Introduction

This section summarises the proposals for the mechanical and plumbing systems and establishes the basic design criteria for the mechanical systems for the proposed facility and shall be used to supplement governing standards and laws which are applicable to the work being undertaken and those laws dealing with environmental protection and occupational health and safety.

2.2 Regulations and Standards

All mechanical and plumbing systems will be designed and constructed in accordance with current good practice to comply with the following governing standards:

CIBSE Guides for Installation and Commissioning
BS and EN Standards
The Building Regulations
BSRIA Guidance
Local Standards and Guidelines having jurisdiction
Water Service – BS6700 and Water Requirements 2000
Gravity Drainage Systems Inside Buildings – BS EN12056
Temperature Maintenance Tape – CIBSE, TM13, BS6700 and BS6351
Other relevant international guidance/standards such as ASHRAE will be used where appropriate.

The governing standards applicable to this project shall be those in effect at the time of contract award and those versions currently acceptable to the authority having jurisdiction.

2.3 Design Criteria

The following design criteria shall be used as the basis of the design for the mechanical services installations:

1S001Internal Design Conditions	22°C (no supplementary control of RH, solely function of OA conditions and any tempering effect that arises from the use of the Semco Thermal wheels in the main AHU)
Internal Gains	
IT Rack Cooling	Day 1 cooling capacity 100kW total, 20kW per rack. Maximum cooling 192kW total, maximum 45kW per rack.
Lighting	8-12W/m^2
Occupancy	Transient
Noise Levels	Rack cooled doors – full speed 73.6dBa @ 1m – Normal running (30% fan speed) 47dBa @ 1m
Ventilation Rates	Controlled by VAV to meet internal heat gains
Pipework	
IT-PCHW Cooling System	240 N/m^2 maximum per metre run and 2.0m/s maximum for pipework 65mm diameter or above or 1.5 m/s for pipework of 50mm diameter or less (subject to noise criteria).
IT-PCHW secondary operating temperatures	14°C flow, 25°C return
PCHW operating temperatures	3.3°C flow, 10°C return

No allowance is made for the heat gain from lighting and occupants within the IT Rack heating load calculations.

2.4 Cooling System

The server racks within room 1S001 will be cooled via water-cooled doors mounted on the rear of each cabinet. The water shall be provided by extending the processed chilled water (PCHW) east distribution circuit to the space.

For procurement purposes, this work is divided into two major packages; the first package, Processed *Chilled Water (PCHW),* comprises of the alteration of existing Processed Chilled Water (PCHW) pipework system and installation of new IT-PCHW pipework to room IS001.

The second package, *local cooling units,* comprises of the installation of rack-mounted cooling doors on the rear of each server.

2.5 Processed Chilled Water (PCHW)

2.5.1 Processed Chilled Water (PCHW) Alterations

The PCHW east distribution circuit is located in the energy centre east tunnel and distributes processed chilled water throughout the building. The circuit terminates adjacent to riser 6 in zone D of the building. The double regulating valve (ET-32) is the demarcation point of where the existing pipework shall be altered to accommodate the IT-cooling requirements.

The pipework upstream of valve ET-32 shall be replaced with 80mmØ pipe with a new shut off valve installed in the return. Drawing 5505 shows the provisional route of the altered pipework and indicates how it shall connect to a new plate heat exchanger located in riser 5.

A Pressure Independent Control Valve (PICV) will be installed on the PCHW return. The valve will modulate and control the PCHW flow to maintain the IT-PCHW supply temperature at 14°C via integration with the BMS.

A differential pressure sensor shall be installed between the PCHW flow and return. This shall allow the pumps controlling the flow to the east distribution circuit to be modulate if this is established as the system index point. The contractor should allow for modification of the BMS to achieve this.

For further details of the system components and operation, refer to drawing 5503.

The PCHW east distribution circuit shall remain in operation during the works and a critical path analysis for a phased installation shall be produce to provided general agreement with the design team.

2.5.2 Potential Modification to East Distribution Pumps P-30 & P-31

The chilled processed water to the east distribution is circulated via pumps P-30 and P-31 which are located in the Energy Centre Level 1. These pumps are variable flow controlled and operate on a run and standby basis. They are connected to the essential electrical supply distribution board to provide continuous operation.

The (PCHW) Pumps P-30 and P-31 should have sufficient capacity to meet the cooling demands of the new IT room, however the control of these pumps is subject to an ongoing investigation to resolve a legacy issue of not modulating in response to changing demand. This issue will be resolved prior to these works starting, most likely through recommissioning the east distribution circuit.

It is possible that the investigation establishes that the current pump duty is insufficient. Therefore the contractor shall allow a provisional sum for replacing these pumps and associated controls to the new duty as defined in the Mechanical Materials & Workmanship Specification. An allowance should be included to modify the stool piece on the pump outlet to accommodate the new pump size (all other dimensions should remain the same).

During the pump upgrade, the PCHW system shall remain in operation. A critical path analysis for a phased installation of the pumps shall be produce to provided general agreement with the design team.

2.5.3 New IT PCHW Pipework to room 1S001

The IT PCHW pipework shall incorporate new run and standby pumps. These pumps shall be installed adjacent to the heat exchanger and be supplied electrically from the generator backed-up essential supply. The pumps shall be sized for duty of 4.1kg/s to ensure the maximum room cooling requirement of 192kW at a 14>25°C flow and return can be achieved and sized to overcome the pressure loss in the system.

The pumps shall be variable flow and controlled via the BMS from the output of a differential pressure sensor located within the room circuit. The pumps shall be capable of meeting the day-1 cooling requirements of 100kW (2.6kg/s).

The IT PCHW cooling circuit will incorporate a temporary fill connection, pressurization unit, and expansion vessel. The circuit shall be filled from the Cold Water circuit.

New 80mmØ IT PCHW flow and return pipework shall connect to the secondary side of the heat exchanger and rise to Level 1 Interstitial Service Void (ISV) via riser 6. The pipework will follow a suitable route through the ISV before dropping down into room 1S001 below. Drawings 5504 and 5505 show the indicative route.

The pipework within room 1S001 will split into two branches at high level serving the front and rear server installations. Drawing 5001 provides an indicative layout with drawing 5503 providing further details. The pipework shall be supported from the ceiling and installed below the electrical installation.

The contractor should allow for installing all pipework and ancillary items up to but not including flexible hoses to the rack cooled doors. The IT-PICV shall be free issued by the local cooling unit specialist, the contractor shall be responsible for procuring these directly from the specialist.

Ceiling mounted drip trays shall be installed to run below the pipework and will include leak detection connected to either the BMS). The drip trays shall provide a route to the building sanitary drainage system.

The new IT-PCHW pipework shall match existing including the thermal insulation.

2.6 Local Cooling Units

Cooling to the new IT server racks shall be met via rear mounted cabinet doors with integral cooling. The rack cooling system is based on CL20-12sc ColdLogik rear cooler cabinet doors which fit to the cabinets via an adaptor frame.

Each doors is capable of providing up to 45kW cooling which is modulated via fans built into the doors and the IT-PICV, however the total system capacity is limited to 192kW.

Based on feedback from the door manufacturer, the rack cooling shall operate as a stand-alone system controlled by the proprietary ColdLogik Room Management System (RMS), i.e. independent from the main BMS. An adjustable wall mounted touch screen will monitor and control the integral fans and IT-PICV to maintain the environmental conditions within each rack.

A Modbus RS485 communications card shall allow communication to the BMS. A floor level leak detection circuit is allowed for in the design which will run under the coolers and connect to the RMS.

Each door shall be supplied from branches from the IT Room cooling loop with 3m ColdLogik flexible hoses as final connections. All final connections should be clear of any drip trays.

The day-1 fit out shall comprise 5No cabinets, each with water-cooled doors as set out above. Provision shall be made in the day-1 infrastructure for the future connection of the full complement of 12No cabinets.

2.7 Leak Detection

A leak detection system shall be installed to the following areas:

ISV area above new comms room 1S001, to match provision to existing critical rooms.
Below cabinets in new comms room 1S001
Within drip trays in new comms room 1S001.

The system shall comprise leak detection tape/cable and control panel linked to the BMS. The system shall match that used in other areas of the LMB.

3.0 ELECTRICAL ENGINEERING

3.1 Introduction

This section summarises the proposals for the electrical engineering systems and establishes the basic design criteria for the proposed facility and shall be used to supplement governing standards and laws which are applicable to the work being undertaken and those laws dealing with environmental protection and occupational health and safety. Additionally, the drawings and specifications will provide details that supplement this narrative.

The electrical works generally comprise:

- Replacement of the existing UPS systems & addition of further battery strings room 1N104.
- Replacement of the SCHR UPS Input/Output/Bypass switchgear and provision of new mains distribution equipment to suit the new UPS system in room 1N104.
- Alteration/modifications to the existing electrical distribution switchboards in the East and West switch room (rooms 1N275 & 1N189).
- Installation of new electrical supply cabling and containment where required.
- Provision of 2No new power distribution units (PDU) to the new comms room 1S001 and all outgoing small power circuits and associated monitoring and controls.
- Provision of new power distribution cabling and services to the new IT room 1S001.
- Re-connection of the existing SCHR PDU supplies to the new UPS switchgear.
- Provision of new power supplies to new cooling pumps and mechanical equipment.
- Test, commission and set to work.

The works shall be carried out in a number of phases to suit the re-configuration of the existing main panels, UPS room and SCHR room. The contractor shall be aware of the need to maintain as much continuity of supply as possible to the existing facilities and systems during the term of the contract and that any downtime must be kept to an absolute minimum, with the particular need to maintaining a high level of resilience to the system.

3.2 Regulations and Standards

All electrical systems will be designed and constructed with current good practice to comply with the following governing standards:

1. All British Standard Specifications
2. All British Standard Codes of Practice
3. The Health and Safety at Work Act
4. Recommendations of the Health and Safety at Work Executive
5. Factories Act
6. Offices, Shops and Railway Premises Act
7. Electricity Acts
8. Electricity at Work Regulations
9. Building Research Station Digest Recommendations
10. Local Bye-Laws and Regulations
11. Requirements of the Building Control Officer, Fire Officer and Environmental Health Officer
12. The Employer's Insurers
13. Requirements of the local Water Supply Company, Electricity Supply Company and local Authority
14. The Institution of Electrical Engineers Regulations for Electrical Installations 17th Edition, including all amendments and Appendices

15. COSHH
16. Requirements of British Telecom and other telecommunications companies whose services will be taken into the building
17. Local Authority Regulations and Approvals
18. Local Water Supply Company Bye-Laws
19. All documentation, recommendations, guides, etc., produced by the Chartered Institution of Building Services Engineers (CIBSE), including:
20. Guides
21. Commissioning Codes
22. Technical Memoranda
23. Practice Notes
24. Energy Notes
25. Code for Interior Lighting Design
26. Code for Exterior Lighting Design
27. BSRIA Commissioning Codes
28. BSRIA Guidance
29. Manufacturer's stipulations and recommendations for installation, testing, commissioning and maintenance
30. All other bodies and authorities having jurisdiction
31. The Building Regulations
32. ACPO Policy (security systems)
33. NACOSS Code of Practice
34. Disability Discrimination Act
35. CDM Regulations
36. WEEE Directive
37. The Lift Regulations

The governing standards applicable to this project shall be those in effect at the time of contract award and those versions currently acceptable to the authority having jurisdiction.

3.3 Design Criteria

The following design criteria shall be used as the basis for the design of the electrical installations.

The design criteria shall satisfy the local Electricity Supply Company's requirements and also meet the following:

Method of protection against electric shock shall be in compliance with the IET Regulations

The baasis of calculation and impedance criteria to be used is as per requirements noted within the IET Regulations

Ambient temperature to be used for calculation shall be 30°C minimum, or as calculated

The power supplies and systems shall be sized using the following criteria, based on net internal floor area:

Power supplies and systems sizing – for IT Room (based on Net Internal Area)	
Lighting	10W/m^2, Diversity = 90%
Small Power	15W/m^2, Diversity = 80%
Mechanical	65W/m^2, Diversity = 90%
Computational	4475W/m2, Diversity=90%

Power supplies and systems sizing – for IT Room (based on Net Internal Area)	
power requirements	
Spare capacity	20% (of diversified load)
Power Factor	0.95 minimum

A spare capacity of 25% shall be included in all power system sizing, i.e. incoming supplies, switchgear, spare ways, cabling, etc. to allow for future expansion.

The lighting installation shall be designed and installed to provide the following average maintained illuminance levels (using CIBSE calculation methods and allowing for lamp ageing and maintenance factors for luminaires and room surfaces):

Area	Illuminance	Measured at
IT Rooms	200-500 lux	@FFL
Emergency Lighting	As BS5266 Requirements	

Fire alarm loop calculations shall allow for a minimum spare capacity of 50% of their overall capacity.

Containment systems shall be designed to provide spare capacity as set out in the IET Wiring Regulations utilising the factors within the IET on site-guide.

3.4 Pre-start survey

Prior to the commencement of any works, the Contractor will carry out an on-site investigation to check and confirm that the existing lighting & power systems within the UPS room 1N104 and the existing SCHR room are in full working order. Any damages, defects, faults and the like that are noted thereafter and in the opinion of the Service Engineer to be caused by the Contractor due to negligence shall be rectified and/or replaced by the Contractor at their own expense.

3.4.1 New UPS System

A new UPS shall replace the existing system within 1N104, currently supporting the SCHR room, with a larger capacity system that will support the SCHR and the new comms room.

This will require the existing UPS system to be decommissioned, removed and replaced with a new UPS unit to provide 400kW/400kVA, i.e. no de-rating due to power factor. The new UPS shall be software limited to 300kW. The existing lead acid batteries from the existing UPS unit are to be reused and re-configured within new battery racks to accommodate the maximum possible autonomy available within the room space available. The system shall achieve a minimum autonomy of 14 minutes.

The new UPS shall be a static monolithic unit and shall have two supplies A & B emanating from the local UPS Input/Output/Bypass switchboard, along with a wrap-around maintenance bypass to allow the UPS to be removed for maintenance. The design to date is based on an Eaton 93PM system, contact Adam Davies, 07813450048. Quote Ref:- EUGJ0517X7K2- however contractors may use an approved equivalent. See Approved Manufactures Schedules.

The new UPS shall be subject to full factory acceptance and site acceptance tests in accordance with relevant standards. It is anticipated that the factory acceptance tests (FAT) shall be witnessed by the Client, the Engineer and the Contractor.

The Contractor shall provide an inductive/resistive load bank and all necessary protection, temporary cabling, switchgear, etc. for the duration of all SATs.

3.4.2 New UPS Input/Output/Bypass Switchboard

In order to serve the new UPS system, the existing UPS Input/Output/Bypass (I/O/B) switchboard in SCHR UPS room 1N104 shall be removed and replaced. The new I/O/B switchboard shall generally match the specification of the existing switchboards and be rated to support the increased UPS capacity.

The new I/O/B switchboard shall be of a free-standing factory-built type and generally comply with the following:-

- Form 4 type 6 segregation.
- Front access
- Auto change-over units will be electrically & mechanically interlocked with voltage sensing relays & controlled via an integral PLC unit which will allow coordination with other PLCs & generator controls.
- Integral digital metering with RS485, Modbus or Pulse output facilities to suit existing BMS. All meters shall be connected to the BMS.

During the design stages Alan electrical Ltd Quote Ref:- T10475 has been used as the basis of design, however, contractors may use an approved equivalent. See Approved Manufacturers Schedules

Replacement of the I/O/B switchboard and the UPS shall require the existing Scientific Computing Hardware Room (SCHR) to be shut down. The quantity of shutdowns required and the duration of each will be reviewed as the design and procurement develop to minimise the impact on the operation of the facility. It is likely however that a series of shutdowns over a number of weekends will be required to implement the full changeover of the UPS and I/O/B switchboard. Coordination and agreement of shutdowns shall be agreed with the Client in advance with a minimum of 4 weeks' notice.

3.4.3 Alteration Works to Main Switchgear

In order to support the new UPS system, the existing circuit protection devices and outgoing cabling/busbar configuration for switchboards SWBD EDDP-E/W and SWGR-E/W shall be modified and reconfigured as indicated on the drawings. Each switchboard shall be modified to include new 800A outgoing ways c/w metering for the new A & B supplies to the new UPS Input/Output/Bypass panel.

All electrical meters shall be connected to the Building Management System (BMS) for the automated collection and recording of metering data.

All modifications and additions to the switchboards shall be completed by one of the specialists indicated within the approved manufacturer's schedule, and all switchgear and equipment shall match the specification of existing.

3.4.4 Power Distribution to SCHR & New IT Room

The existing power distribution within the SCHR room comprises power distribution units (PDUs) within the SCHR served from the existing UPS Input/Output/Bypass panel in an A&B system configuration. These existing PDUs and supply cables shall be disconnected from the existing UPS switchgear and will be re-used and connected to the new UPS Input/Output/Bypass panel. All existing circuits will be subject to a 100% electrical testing and inspection before reinstatement of supply.

It is understood that the LMB are installing new thermal monitoring and emergency power off (EPO) systems to these PDUs and that signal cabling has already been installed from the PDUs to

the UPS room for connection to the Input/Output/Bypass board. Further investigation has determined that the existing PDUs have the shunt trips and connections for these services and the connections shall be made to the PDUs rather than the I/O/B board. It is understood that these works will progress separately to the new comms room works.

In the new IT room 1S001, two new 48-way 3-phase PDUs shall be installed comprising TP&N pan assemblies, separate termination cubicles for each sub-circuit, dual earth bars, suitable internal cable containment and control section for emergency power off (EPO) and thermal cut-off. These will generally be based on the same design configuration as the existing PDUs in the SCHR room. However they will not include sub-circuit metering and monitoring as the existing system is not used. Sub-metering of power use within the new comms room shall be via intelligent PDUs within each comms cabinet.

The new PDUs to new comms room 1S001 shall be provided with shunt trips to the incoming circuit breakers for connection to emergency shut down alarm connections for emergency power off (EPO), BMS and thermal monitoring systems. Thermal monitoring shall be via independent room sensors installed as part of the rack cooling system, i.e. separate from the BMS. It is understood that these works will progress separately to the new comms room works.

On day one 5No. Cabinets will be completed with 1No. A and 1No. B 13Amp metal clad switch fused connection to serve the door cooling units. Each radial circuit shall be fed from either the A or B PDU units via a 10Amp Type C MCB as indicated on the drawings. This will be possible with limited disruption through the design of the PDUs which will allow wiring to be added without the need to isolate other supplies. The contractor shall within his/her tender allow for the connection of the 5 No cool doors to the dual A&B supply arrangement.

After the installation of all control circuits and essential mechanical system circuits, there shall be a minimum of 20% spare capacity on the PDU units.

3.4.5 Small Power Distribution and Systems

The contractor shall within his/her tender allow for the connection of the 5 No cool doors to the dual A&B supply arrangement. It is understood that all other small power works will be progressed separately to the new comms room works.

3.4.6 Power to Mechanical Services Systems

Electrical supply and control wiring shall be housed within general purpose earthed metal trunking containment systems, with additional conduit connections terminating at items of plant and control equipment.

Any large items of plant that may produce high currents loads during normal start-up procedure shall have a phased/timed return to service to reduce start-up load on the generator. A load-step schedule shall be developed by the Contractor and agreed to ensure that each load step is within the acceptance criteria of the generator sets. It is anticipated that this will be a modification to the existing load-step schedule/procedure.

Power supplies to all critical mechanical systems within room 1S001 shall be supplied from the new PDUs. The supplies to the new cooling pumps and associated equipment shall be fed from the local basement essential distribution boards and connected to the BMS.

3.5 Lighting Systems

It is understood that these works will progress separately to the new comms room works.

3.5.1 General and Emergency Lighting

It is understood that these works will progress separately to the new comms room works.

3.5.2 Containment Systems and Cabling

The following types of hot dipped galvanised (HDG) containment shall be used to house/support all cabling installed within the building

Cabling System	Containment Type
Sub-main cabling	Heavy duty galvanised steel ladder
Final circuit wiring – lighting & power	Galvanised steel trunking & conduit
Fire detection & alarm/ security systems	Medium duty galvanised steel tray
Telecommunications/Data	Galvanised steel wire basket
BMS	Medium duty galvanised steel tray

A general purpose earthed metal cable trunking containment system linking the final sub-circuit wiring, together with the cable ladder for sub-main armoured cables and cable basket for data and security shall run within the interstitial voids or within the basement tunnel.

Where possible the existing containment shall be utilised if sufficient spare capacity is available.

Where the quantity of fire alarm cables is 2No cables or less, then they will be clipped direct to the soffit. In all other areas, containment will be used to support the fire detection and alarm system cabling. The fire detection and alarm system cabling will be provided with dedicated containment.

The containment will be fixed to the soffit using steel drop rods and fixed to walls using proprietary steel brackets.

Sub-main cabling shall comprise XLPE/SWA/LSF/LS0H cabling, and sub-circuit wiring shall comprise XLPE/LSF single core cabling. All cabling shall be 90˚C thermosetting plastic insulated and low smoke zero halogen (LS0H) sheathed.

Any surface mounted cabling or containment shall be carefully selected to minimise visual impact regarding appearance and route. All surface mounted cable and containment routes shall be agreed with the design team prior to installation.

3.6 Security Systems

3.6.1 Vehicular Access Control

N/A

3.6.2 Intruder Detection and Alarm System

N/A

3.6.3 CCTV Installations

N/A

3.6.4 Access Control

It is understood that these works will progress separately to the new comms room works.

3.6.5 Central Control and Monitoring Facilities for Systems

N/A

3.6.7 Panic Alarms

N/A

3.6.8 Automatic Locking

N/A

3.6.9 Physical and Electrical Protection

N/A

3.7 Communication Systems & Containment

It is understood that the supply and installation of the data racks will progress separately to the new comms room works.

The contractor shall however include within his/her tender for the installation of the high-level basket containment system as described on the 61 series drawings.

It shall be noted that the containment will terminate just above floor level in the interstitial void level 1, for future extension at a later date by the Client.

No Wi-Fi access points are required in the new IT room.

3.7.1 Fire Detection and Alarm

It is understood that these works will progress separately to the new comms room works.

3.7.2 Public Address/Voice Alarms

N/A

3.7.3 Disabled Refuge Communication System and Disabled Persons Alarms

N/A

3.7.4 Induction Loops

N/A

3.7.5 Telecommunications/Data Distribution

N/A

3.7.6 Audio Visual Systems

N/A

3.7.7 Distributed TV System

N/A

3.8 EMI Shielding

N/A

3.9 Protective Installations

3.9.1 Earthing and Bonding

New earthing arrangements to the UPS Input/Output/Bypass panel, UPS, PDU distribution, IT equipment cabinets and supplies shall be provided in full compliance with BS EN 50310. Local type II surge protection shall be included within the new UPS Input/Output/Bypass panel. Local type III surge protection shall be included within the PDU distribution units.

Any circuits emanating from alternative distribution equipment shall have local surge protection mounted adjacent to the outlet, e.g. cleaners' socket.

The new IT room 1S001 shall be provided with a Type A star networking earth arrangement, utilising a separate 150mm^2 CPC emanating from the new UPS Input/Output/Bypass panel in room 1N104. This shall terminate at a Furse 14-way wall-mounted earth bar. All data cabinets (supplied and installed by the client) shall have separate 16mm^2 CPC earth connections from this point and all data cabinets shall be cross bonded to its local neighbour with 16mm^2 bonds to provide a suitable network earth.

3.9.2 Lightning Protection

N/A

3.10 Electrical Services Strip Out and Modifications

Removal and Disposal of Electric Lamps

Mercury inherent within electric lamps is classed as hazardous waste and must be dealt with accordingly. All electric lamps existing within the premises require to be removed from site and recycled in accordance with statutory requirements. The contractor shall sub-contract the disposal of lamps to an approved specialist.

Removal and Disposal of Electrical and Electronic Equipment

All relevant electrical and electronic equipment must be removed and disposed of in accordance with the Waste Electrical and Electronic Equipment (WEEE) Regulations 2006.

4.0 BUILDERS' WORKS

It is understood that the strip out and general formation of the New comms room will progress separately to the new comms room works. The contractor shall include within their tender for any penetrations through existing building fabric and fire stopping and to make good as part of their contract works.